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Installation Technology Transition Program

Operations & Maintenance (O&M) Facility Data Exchange Pilot Expansion to BUILDER SMS

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Operations & Maintenance (O&M) Facility Data Exchange Pilot Expansion to BUILDER SMS

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Final Report

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Abstract

The Army has many enterprise Operation and Maintenance (O&M) systems that require manual input of the same facility data collected throughout the facility life cycle. This manual input of data costs Army installations valuable time and labor. A standardized approach to deliver the O&M information in a consistent, accurate, timely, and digital method for expedited input into the numerous systems is needed. A United States Army Corps of Engineers (USACE)-led team consisting of O&M subject matter experts within USACE and industry developed a standardized process for collecting and exchanging facility data for downstream applications. The process is defined in the Engineering and Construction Bulletin (ECB) 2018-6 and includes utilization of Unified Facilities Guide Specification (UFGS) 01 78 24.00 10.

An initial pilot study verified that asset data collected during facility construction could effectively be imported into the Army General Fund Enterprise Business System (GFEBS). This second pilot study focused on facilitating the import of facility asset and equipment data collected during construction into the BUILDER Sustainment Management System (SMS) web-based software application. The project scope included investigation of current Army installations' processes as they relate to BUILDER SMS as well as initial testing of information transfer approaches.

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Preface

This study was conducted for Headquarters, US Army Corps of Engineers (HQUSACE) and the Office of the Assistant Chief of Staff for Installation Management (OACSIM) under the Installation Technology Transition Program (ITTP); “Operations & Maintenance (O&M) Facility Data Exchange Pilot Expansion to BUILDER SMS,” MIPR 11268077. The ITTP Program Manager was Natalie R. Myers, and the Technical Monitor was Wernher Heyres Department of the Army’s Assistant Chief of Staff for Installation Management-Facility Division Office (DAIM-ODF).

The work was performed by the Engineering Processes Branch of the Facilities Division, US Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). At the time of publication, Charles G. Schroeder was branch chief; and Giselle Rodriguez was division chief. The interim deputy director of ERDC-CERL was Michelle J. Hanson and the director was Dr. Andrew J. Nelson.

Special acknowledgement is given to the following USACE/Industry BIM Consortium members who were essential in the development and validation of the Facility Data Exchange (FDE) efforts:

- Brandon Tobias, Headquarters, NAVFAC (former HQUSACE)
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- Gaylord Y. Higa, chief, System Manager Branch JBLM
- Leigh-Ann Lelyveld, West Point DPW-BOID
- Colin Darby, Fort Hood, ISR-SMS DPW-BOID

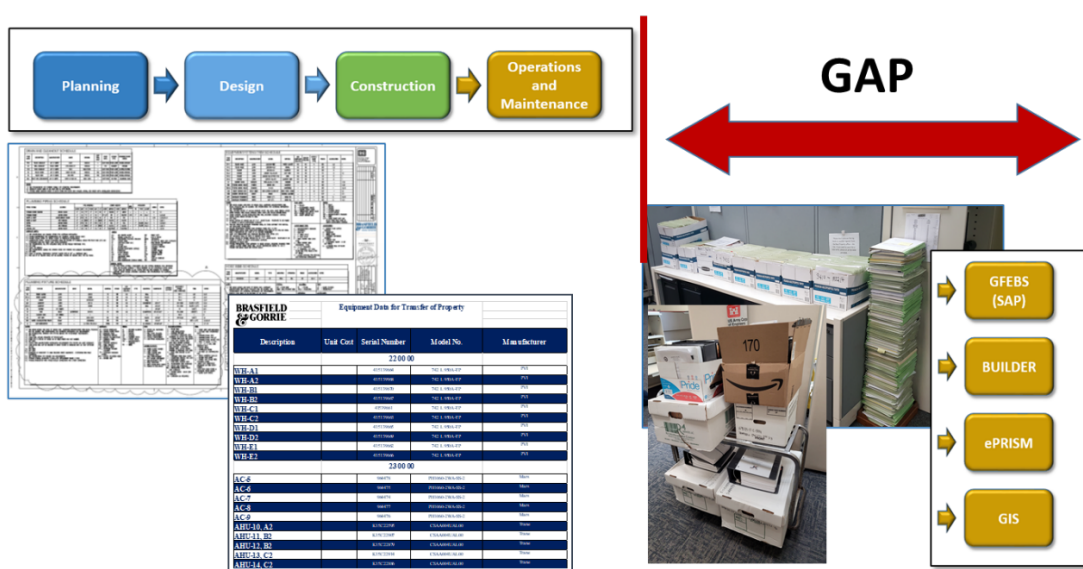
The commander of ERDC was COL Teresa A. Schlosser and the director was Dr. David W. Pittman.

1 Introduction

1.1 Background

The Army has many enterprise Operations and Maintenance (O&M) information systems that require redundant input of facility data collected through the facility life cycle of planning, design, construction, renovation, and demolition. Systems currently operate in a siloed environment, causing manual, labor-intensive, duplicative work that results in unnecessary costs to Army installations. While some progress has been made in recent years, the need for a standardized approach to deliver the O&M information in a practical, consistent, accurate, and digital method for expedited input into the numerous systems must be addressed across the enterprise. Developing and implementing improved and coordinated processes and data standards is critical to expedite population of O&M information systems, thereby enabling more efficient maintenance of the Army's equipment and assets. At minimum, the ideal solution should provide a digital data workflow that includes O&M data and document exchange in a practical, consistent, accurate, and user-friendly manner. Figure 1 illustrates the gap in data transfer from O&M activities to the numerous Army systems.

Figure 1. Current data exchange workflow.



A United States Army Corps of Engineers (USACE)-led project development team (PDT) consisting of Building Information Modeling (BIM), Civil Information Modeling (CIM), Architectural, Engineering and Construction (AEC), and O&M subject matter experts within USACE, and members of the USACE/Industry BIM and CIM Consortia developed a standardized process for collecting and exchanging facility data for downstream applications. This group of government and industry experts called the USACE/Industry Building Information Modeling (BIM) Consortium* established a Facility Data Exchange (FDE) working group to address this need. This new FDE group developed a new Unified Facilities Guide Specification (UFGS 01 78 24.00 10), which standardizes the process for collecting, delivering, and exchanging facility data for downstream applications (DoD 2018). The guide specification defines a prioritized set of facility assets and attributes and specifies a structured data format essential to populating Army installation O&M applications. A Facility Data Workbook (FDW) was also developed by the FDE working group as a support tool for the process outlined in the specification. A set of pilot projects were proposed to evaluate and validate feasibility of the newly developed tools to populate different downstream applications. A USACE Engineering and Construction Bulletin (ECB) mandates the use of UFGS 01 78 24.00 10 (HQUSACE 2020).

The first of two pilot studies focused on simplifying the import of facility asset and equipment data collected during construction into the Army's General Fund Enterprise Business System (GFEBS). Findings from the initial study, titled *Facility Data Exchange Pilot Demonstration for the Army General Fund Enterprise Business System (GFEBS)*, provided a better understanding of the data exchange practices in three installations, including the type of data being collected and the timeline for data to get recorded into GFEBS. The study confirmed that a siloed environment and a lack of standardization remain problems during the facility handover and O&M stages. These findings, along with recommendations on both the then newly developed specification and the overall data exchange process, were summarized in Brucker et al. (2018).

The effort reported here, executed under the advocacy of the US Army Assistant Chief of Staff for Installation Management (OACSIM) Installation

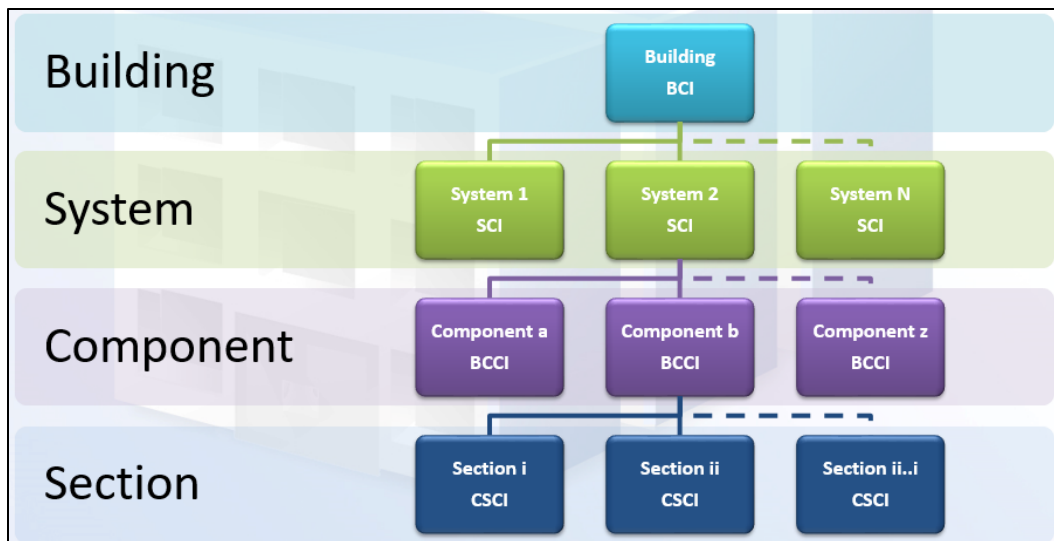
* The USACE/Industry BIM Consortium is a working group that collaborates on mutually beneficial advanced modeling requirements for projects developing the built environment.

Technology Transition Program (ITTP), and includes the FDE working group's modification of the original FDW to add the capability to convert the data into a format suitable for input into BUILDER SMS, the Army's required condition assessment system.

BUILDER is a web-based software application developed by the Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL) to help facility managers better manage their building assets. BUILDER is a Sustainment Management System (SMS), which uses a condition-based approach to facility management. Work activities for buildings are recommended based on the actual observed or expected condition state of the assets, instead of discrete deficiencies or age-based models. The Condition Index (CI) metric measures the accumulated damage and deterioration of a building, system, or component on a scale of 0 to 100 (100 is a brand-new component section). In BUILDER, the CI is ultimately based on the observations from a standardized inspection process. To ensure consistency and repeatability, inspection guidelines are established and are found in the Army's *BUILDER SMS Inventory and Assessment Guide* (ERDC-CERL, SMS 2019) at the following website:
<https://support.sms.erdcdren.mil/downloads/files/army-builder-implementation-standards-guide>.

BUILDER is available through most web browsers and uses a structure query language (SQL) server database as the backend storage. A building system inventory and condition assessment is performed by using the fast and repeatable Direct Condition Rating (DCR) method. Each building system is assessed at the component-section level. The BUILDER program performs overnight roll-ups, which are used to determine the aggregated condition index values from the component-section level up to a component level, system level and overall building level (ERDC-CERL, SMS 2020). Figure 2 below shows the building system breakdown and the condition index for each level.

Figure 2. BUILDER's building system breakdown with condition index at each level.



BUILDER is a work-planning tool that uses the building inventory and their life cycles to better plan for repair or replacement of components. BUILDER helps facility owners and managers ensure every building system is properly maintained to ensure repairs are performed at the right time and to minimize the risk of a component failure.

The BUILDER SMS maintains an inventory of the systems and equipment in the facility. Early population of building inventory and assessment in BUILDER is essential to obtain the sustainment needs of the facility. No production data were input or altered in conducting this project. All needed tests were performed in a training environment developed for the purpose of this project to prevent altering production data. Additional information about BUILDER SMS is available at www.sms.erdcdren.mil.

1.2 Objectives

The following objectives were set for this ITTP project:

- Develop a spreadsheet application to capture facility data required by UFGS 01 78 24.00 10 and related ECB policy and that is capable of converting the facility data to the exchange format for importing into the BUILDER SMS.
- Test the spreadsheet tool on real-world facilities located at multiple Army installations.

- Evaluate the results of the pilot test, identifying successes and performance gaps.
- Evaluate current data exchange practices and analyze synchronization with the BUILDER SMS.

1.3 Approach

Due to the short duration of ITTP projects, adding FDE deliverables to existing construction contracts was not feasible. Therefore, the approach was to have an FDW product delivery team develop the FDW according to the specification for selected facilities recently constructed at Joint Base Lewis-McCord, Fort Hood, and West Point. FDW were developed based on information provided by the USACE and Installation project team. A pilot was conducted at three different installations to identify any differences in BUILDER input and usability of data between the facilities. Due to the COVID-19 pandemic, a site visit to Fort Hood was not possible. This impacted data gathering about the information exchange process at this location.

A sample of data from a validated FDW was used to test input into BUILDER SMS using the SMS's Equipment Mapper (EquipMapper) tool. Overview of this tool is available in Appendix A. The PDT worked with ERDC and Installation BUILDER staff to test the input for accuracy, reliability, structure, and completeness.

1.4 Technology transfer

The main deliverable for this project was a technical report documenting the findings and recommendations to easily populate BUILDER SMS with design and construction information. Other technology transfer documents included the following:

- The FDW template, examples, and process guidance can be found on the USACE Computer Aided Design (CAD)/BIM Technology Center website at <https://cadbimcenter.erdcdren.mil>.
- References to any policy guidance affected (e.g., Engineer Regulations) can be found at <http://www.publications.usace.army.mil/>.

2 Installation Pilots

2.1 West Point

2.1.1 Facility data overview

The pilot project at West Point was a major renovation of Spellman Hall Cyber Center (Figure 3), with the following identification attributes:

- Real Property Unique Identification (RPUID): 375498
- Installation Code: 36993
- Building Number: 2101
- Category Code: 13131 Info Proc Ctr
- Basis of Design (BOD): 10/09/2020
- BUILDER SMS Assessment: Completed by contracting company Wood in 2019
- Area: 94,048 square feet
- Year Constructed: 1984
- Number of floors: 5
- Plant Replacement value: \$57,459,345

Figure 3. Building 2101 Spellman Hall Cyber and Network Enterprise Center (NEC).



The PDT for the West Point pilot study consisted of ERDC-CERL, West Point directorate of public works (DPW), Leigh-Ann Lelyveld, and New York District personnel, Jillian Martin. Before the site visit, the PDT was

provided contract award documents for the facility. Some rationale for selecting this facility for the study included the following:

- “Equipment-in-place” list was included in the contract specifications. The specifications for this construction request for proposals (RFP) included the “equipment-in-place” list in Specification Section 01 78 23 1.5.4 (Appendix B).
- The building was included in “BUILDER SUSTAINMENT MANAGEMENT SYSTEM (SMS) IMPLEMENTATION for Installation Management Command (IMCOM) Project” under RFP W91278-17-D-0041-00, Task Order: W9127818F0393.
- 50% as-built and equipment-in-place spreadsheets were available from the construction contract at the time of the BUILDER assessment and PDT visit. See Appendix F.
- Anticipated completion date aligned with reporting schedule for the program.
- PDT visit was able to be coordinated with the on-site data review and work-planning charrette and conclusion meeting, held at West Point from 18 to 21 June 2021. This allowed the PDT to experience first-hand the training of DPW personnel on BUILDER and see how the information is being received at the ground level. The agenda and meeting minutes can be found in Appendix C and Appendix D respectively.

2.1.2 Installation asset-management process

Findings from the first pilot study revealed that West Point has a structured process for collection and exchange of O&M data. That process includes collection in a specific format, the “Equipment Inventory Spreadsheet” shown in Appendix E, and communication with construction contractors, which distinguishes this installation from others included in the set of pilot projects.

The client for this project, the United States Army Garrison—West Point, Directorate of Public Works (DPW), requested use of the equipment-inventory-spreadsheet format for collection of the equipment information in this project. The Excel-based format was developed from the equipment upload function of the General Fund Enterprise Business System (GEFBS), which is the system that West Point often utilizes for tracking

equipment information in its buildings, as well as life expectancy, work orders, and preventative maintenance efforts for that equipment. The DPW operations and maintenance division chief was consulted in the development of the spreadsheet and the categories included in it. It should be noted that West Point has a significant number of in-house maintenance staff, and that equipment categories in the inventory list were developed based on how work orders are typically divided amongst the various maintenance shops. The spreadsheet format meets the “equipment-in-place” or EIP contract requirements the various maintenance shops must follow. The spreadsheet is a living document that is periodically updated to incorporate the needs of DPW. The version shown in Appendix E was the latest version at the time of this report.

Installation Management Command’s (IMCOM) BUILDER implementation, which included inventory and assessment of the equipment installed at Spellman Hall, was performed under a separate contract action. The final reports from BUILDER for Spellman Hall were generated on 17 June 2019. The BUILDER final reports, Appendix H, includes a final summary report (Figure H-1), system summary report (Figure H-2), component details report (Figure H-3), equipment details report (Figure H-4), and inspection summary report (Figure H-5) for all assets included in the BUILDER implementation. Woods was the architectural engineering contractor responsible for the BUILDER implementation effort at West Point that included Spellman Hall.

A list of documentation from the construction contractor is required by the DPW, building owner, and building operator as part of the turnover process. The turnover process typically starts once the construction contract has reached substantial completion. A list of documentation required by the DPW, building owner, and building operator as USACE turns the project over can be found in Appendix G. Once received by the Business Operations and Integration Division (BOID), the information will be manipulated as needed for mass upload into GFEBS. Then, equipment data will be available for preventative maintenance orders and demand work orders.

Currently at West Point, all turnover of project documentation takes place between the USACE West Point Office engineers and a designated representative of United States Army Garrison West Point (USAG WP) DPW’s Operations and Maintenance Department. The documents are transferred

via official memorandum with signature from the responsible USACE resident or area engineer, and receipt acknowledged by USAG WP DPW O&M. West Point's designated representative is then responsible for transferring the project documentation to the appropriate personnel within the DPW. It is of note that the designated representative responsible for receiving the project documentation has turned over multiple times in the recent past, which has decreased the efficiency of the process and led to the frequent misplacing of information.

2.1.3 Outcome

The PDT was able to participate in the conclusion BUILDER implementation meeting performed by architectural engineering contractor Wood. The meeting, led by the project manager from Wood was attended by personnel from USACE, New York District (the project manager), USACE Mobile District (the contracting officer representative), West Point DPW, and IMCOM (via phone). During the meeting, the contractor briefed overall results of the inventory and assessment effort performed over the course of four site visits during December 2018, followed by a question and answer (Q&A) session with West Point DPW and IMCOM. A total of 233 facilities, about 7.3M ft², were assessed in the BUILDER implementation effort at West Point.

The assessment team, who has performed BUILDER assessments for some years, indicated that BUILDER SMS had been prepopulated with Headquarters Installation Information System (HQIIS) real property data prior to exporting the team's BUILDER Remote Entry Database (BRED) file and prior to starting their building system inventory and assessments. During assessments, contractors walk each facility, collecting space and equipment data, including physical measurements and condition. Information gets recorded in BRED, utilizing mobile devices (tablets); the BRED file is uploaded to BUILDER after the data have been reviewed through their quality control process. Anomalies or variances in data are identified and corrected in BUILDER SMS during the assessment effort. Personnel from West Point DPW indicated that they had not participated in the assessments due, in part, to the short notices about site visits. The Q&A session included questions related to future plans for the collected data, such as who would be responsible for maintaining data up to date and integrating

the different systems currently in place. No definitive answers were provided as plans were still under development at the time. Later in the project, the PDT found that the DPW has used the information provided by Wood's assessment sparingly. The only time DPW uses the BUILDER data is when IMCOM requests information of a building associated with a major funding project.

During their visit to West Point, the PDT was also able to tour the Spellman Hall Cyber Center with the project manager and contracting officer representative, Denise Lenihan, and meet with DPW's Real Property Division to discuss the flow of information about real property assets. These meetings confirmed a lack of standardization and interoperability among the different systems of records (e.g., Real Property Planning and Analysis System [RPLANS], HQIIS, Enterprise Proactive Real Property Interactive Space Management Systems [ePRISMS], and GFEBS). Meetings also revealed that personnel are interested and optimistic about a smoother process as it will significantly enhance their workflow. Furthermore, conversations exposed that while assessment efforts are helpful to identify the current state of equipment and any discrepancies in records, the BUILDER data are not integrated into their system of record used for generating maintenance contracts.

In terms of the data exchange, when comparing the FDE in Table 1 (Appendix F) and BUILDER (Appendix H), it is clear that the same information was captured by both initiatives (see Figure 4–Figure 5 for several examples). While the construction contract only required equipment that was installed under the contract to be captured in the equipment-in-place list, the BUILDER assessment team captured any equipment that was located within the building at the time their inspection was completed. This was a duplication of effort. Ideally, the information captured via construction contracts will be easily transferrable to BUILDER in an effort to keep the data current and usable for future program planning.

Table 1. Data comparison—USAG—West Point equipment inventory.

Enter a number specifying the category of equipment: 1 - Conveying Systems 2 - Plumbing 3 - HVAC 4 - Fire Protection 5 - Electrical 6 - Kitchen 7 - Storage System	3	3	3	3
Enter a description for the piece of equipment. (40 CHAR MAX)	Chiller 3	Air Separator 1	Condenser Water Pump 1	Primary Chilled Water Pump 1
Enter the date on which the equipment became or will become the property of the government. Report in MM/DD/YYYY format.				
Enter the Manufacturer.	Daikin	Taco	Taco	Taco
Enter the Manufacturing Country US, MX, etc.	US	US	US	US
Enter the Model Number	WG130D	AC06F-125	KV4009	KV4007
Enter the Manufacturer Part Number.	WGZ130DW12-ER10	AC06F-125	KV4009AE2KCD930M	KV4007AE2JCD650M
Enter the Manufacturer Serial Number.	STNU12080066	R0553.5C	NONE	NONE
Weight of the piece of equipment in lb	4737	215	355	237
Include units of measurement.	149.4 in. × 35 in. × 65.5 in. H	20 in. × 37 in. H	382 GPM, 10 HP	255 GPM, 5 HP
Describe the location of this piece of equipment with the most detail possible. In some instances, floor and/or room numbers will not be appropriate.	Spellman	Spellman	Spellman	Spellman
	Chiller Rm	Chiller Rm	Chiller Rm	Basement
	B01	B01	B01	B04

How long is the piece of equipment expected to operate effectively? Report in years.				
If there is an active warranty on the item, enter the beginning and end dates in MM/DD/YYYY format.				
	12/30/1900	12/30/1900	12/30/1900	12/30/1900
Is this piece of equipment replacing an existing piece of equipment? Enter Y or N	Y	N	Y	Y
Describe the old piece of equipment with as much detail as possible - location, make, model, capacity, etc.				
Include information located on equipment tag (local numbering system).	CH-3	AS-1	CWP-1	PCHWP-1

Figure 4. Data comparison—BUILDER final report, component details.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
 Final 3 - Component Details Report Generated From BUILDER SMS on: 6/10/2019 1:26:05 PM																				
Installation Code	Installation Name	Special Area	RPUID	Bldg Num	Bldg Name	Area	MDI	System	Component	Mat/Equip Type	Comp Type	Section Name	Section Year	Section Source	Quantity	UM	CRV	CI	RSL (years)	Comments
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3020 HEAT GENERATING SYSTEMS	D302001 BOILERS	Gas, Hot Water - 1200-1000 MBH	BOILER 2	2009	Input	1	EA	\$92,565	87	17	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3020 HEAT GENERATING SYSTEMS	D302001 BOILERS	Gas, Hot Water - 1200-1000 MBH	BOILER 3	2009	Input	1	EA	\$92,565	87	17	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3020 HEAT GENERATING SYSTEMS	D302004 AUXILIARY EQUIPMENT	Chemical Feedwater - 175 PSIG, 5 gallon	BASEMENT CF-CHW	2018	Input	1	EA	\$2,075	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3020 HEAT GENERATING SYSTEMS	D302004 AUXILIARY EQUIPMENT	Chemical Feedwater - 175 PSIG, 5 gallon	BOILER ROOM CF-HHW	2018	Input	1	EA	\$2,075	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-1	2018	Input	1	EA	\$206,897	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-2	2018	Input	1	EA	\$206,897	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-3	2018	Input	1	EA	\$206,897	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-1	2018	Input	1	EA	\$68,203	93	12	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-2	2018	Input	1	EA	\$68,203	93	12	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-3	2018	Input	1	EA	\$68,203	93	12	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303002 DIRECT EXPANSION SYSTEMS	Condenser, DX, Air Cooled - Direct Drive, 14 ton	HIGH ROOF ACCU-1	2018	Input	1	EA	\$8,270	93	12	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304001 AIR DISTRIBUTION, HEATING & COOLING	Air Separator - Air control, air separator, 12" diameter, includes strainer	BOILER ROOM HHW-AS	2018	Input	1	EA	\$2,284	96	28	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304001 AIR DISTRIBUTION, HEATING & COOLING	Air Separator - Air control, air separator, 12" diameter, includes strainer	CHILLER ROOM CHW-AS	2018	Input	1	EA	\$2,284	96	28	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304001 AIR DISTRIBUTION, HEATING & COOLING	Ductwork	N/A	1989	Input	3,400	LF	\$162,558	64	10	[Michael Lindemann - Wood EIS - on 1/20/2019 10:58:26 AM] The component is not viable for inspection and the quantity was estimated based on architect / engineering judgement. The component condition age-based by BUILDER program degradation curves.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304003 HOT WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BOILER ROOM HWP-1	2018	Input	1	EA	\$36,306	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 3" size, 5 HP to 225 GPM	BASEMENT PCHWP-1	2018	Input	1	EA	\$23,701	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 3" size, 5 HP to 225 GPM	BASEMENT PCHWP-2	2018	Input	1	EA	\$23,701	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 3" size, 5 HP to 225 GPM	BASEMENT PCHWP-3	2018	Input	1	EA	\$23,701	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 3" size, 5 HP to 225 GPM	BASEMENT SCHP-1	2018	Input	1	EA	\$23,701	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BASEMENT CWP-1	2018	Input	1	EA	\$37,840	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BASEMENT CWP-2	2018	Input	1	EA	\$37,840	93	16	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	SPELLMAN HALL	94.048		D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BASEMENT CWP-3	2018	Input	1	EA	\$37,840	93	16	

Figure 5. Data comparison—BUILDER final report, equipment details.

Final 4 - Equipment Details Report		Download From BUILDER (MS) on 6/10/2019 14:33 PM		V0200762																				
Inst Code	Installation Name	Special Area	RPUID	Equip Num	Component Type	Section Name	Section Year	Section Year Source	Quantity	LM	CRV	CI	RSL ID Number (group)	Equipment Type	Equipment Make	Model	Serial Number	Capacity	Manufacturer	Date Manufactured	Date Installed	Control Type	Location	Comment
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-2	2018	Input	1	EA	\$206,893	93	16 NA	SCROLL R410A		WGZ1300W12-ER18	STN0170800068	130 TONS	DAIKIN INDUSTRIES LTD.	6/14/2017	2018	DDC	B01 MECHANICAL ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-3	2018	Input	1	EA	\$206,893	93	16 NA	SCROLL R410A		WGZ1300W12-ER18	STN0170800052	130 TONS	DAIKIN INDUSTRIES LTD.	6/14/2017	2018	DDC	B01 MECHANICAL ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-1	2018	Input	1	EA	\$68,283	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 18-2H8	17-806440	130 TONS	EVAPCO	1/11/2017	2018	DDC WITH VFD	PAD AT SW CORNER	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-2	2018	Input	1	EA	\$68,283	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 18-2H8	17-806441	130 TONS	EVAPCO	1/11/2017	2018	DDC WITH VFD	PAD AT SW CORNER	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-3	2018	Input	1	EA	\$68,283	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 18-2H8	17-806442	130 TONS	EVAPCO	1/11/2017	2018	DDC WITH VFD	PAD AT SW CORNER	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Condenser, DX, Air Cooled - Direct Drive, 14 ton	HIGH ROOF ACQU-1	2018	Input	1	EA	\$8,276	93	12 NA	ACQU TELCOM RWS R410A DUCTLESS VRF 9 WALL UNIT FCUS	CITY MULTI	PHVY-P18BTLMU-A	74000069	14 TONS	MTSUBISHI ELECTRIC	1/11/2017	2018	DDC	HIGH ROOF	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Air Separator - Air control, air separator, 12" diameter, includes strainer	BOILER ROOM HWW-AS	2018	Input	1	EA	\$2,284	96	28 NA	NA		ACOMF-125	627931	256 GPM	TACO INC.	6/15/2017	2018	NA	BOILER ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Air Separator - Air control, air separator, 12" diameter, includes strainer	CHILLER ROOM CHW-AS	2018	Input	1	EA	\$2,284	96	28 NA	NA		ACOMF-125	NA	110 GPM	TACO INC.	6/15/2017	2018	NA	CHILLER ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 5" size, 15 HP, to 1000 GPM	BOILER ROOM HWP-1	2018	Input	1	EA	\$36,309	93	16 NA	R-LINE WITH VFD		KV208A42KC08038	NA	18 HP, 256 GPM, 65 FT, 8.20 R DA	TACO INC.	6/15/2017	2018	DDC WITH VFD	BOILER ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 5" size, 15 HP, to 1000 GPM	BOILER ROOM HWP-2	2018	Input	1	EA	\$36,306	93	16 NA	R-LINE WITH VFD		KV208A42KC08038	NA	18 HP, 256 GPM, 65 FT, 8.20 R DA	TACO INC.	6/15/2017	2018	DDC WITH VFD	BOILER ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Heat Exchanger, Plate Type - 1200 GPM	BASEMENT HE-1	2018	Input	1	EA	\$169,281	93	16 NA	NA		AGE-FD	30117-01878	1200 GPM, 994 4 SF	ALFA LAVA	6/15/2017	2018	NA	B01 MECHANICAL ROOM	
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 3" size, 5 HP, to 225 GPM	BASEMENT PCHWP-1	2018	Input	1	EA	\$23,791	93	16 NA	R-LINE PRIMARY CHW WITH VFD		NA	NA	5 HP, 255 GPM, 45 FT	TACO INC.	6/14/2017	2018	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was partially covered. Section detail fields with "NA" represent data that was not found.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 3" size, 5 HP, to 225 GPM	BASEMENT PCHWP-2	2018	Input	1	EA	\$23,791	93	16 NA	R-LINE PRIMARY CHW WITH VFD		NA	NA	5 HP, 255 GPM, 45 FT	TACO INC.	6/14/2017	2018	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was partially covered. Section detail fields with "NA" represent data that was not found.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 3" size, 5 HP, to 225 GPM	BASEMENT PCHWP-3	2018	Input	1	EA	\$23,791	93	16 NA	R-LINE PRIMARY CHW WITH VFD		NA	NA	5 HP, 255 GPM, 45 FT	TACO INC.	6/14/2017	2017	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was partially covered. Section detail fields with "NA" represent data that was not found.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 3" size, 5 HP, to 225 GPM	BASEMENT SCHP-2	2018	Input	1	EA	\$23,791	93	16 NA	R-LINE SUPPLY PUMP WITH VFD		KV308A42JC08058	NA	5 HP, 138 GPM, 55 FT, 7.50 R DA	TACO INC.	1/14/2017	2018	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was missing certain Section Detail fields. Section Detail fields have been populated and fields with "NA" represent data not found.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 5" size, 15 HP, to 1000 GPM	BASEMENT CWP-1	2018	Input	1	EA	\$37,849	93	16 NA	R-LINE WITH VFD CONDENSER WATER PUMP		KV4009A42JC08038	NA	18 HP, 382 GPM, 65 FT, 8.90 R DA	TACO	6/14/2017	2018	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was missing certain Section Detail fields. Section Detail fields have been populated and fields with "NA" represent data not found.
56993	West Point Military Reservation	West Point Military Reservation	375498	02101	Circulating Pump, End Section - 5" size, 15 HP, to 1000 GPM	BASEMENT CWP-2	2018	Input	1	EA	\$37,849	93	16 NA	R-LINE WITH VFD CONDENSER WATER PUMP		KV4009A42JC08038	NA	18 HP, 382 GPM, 65 FT, 8.90 R DA	TACO	6/14/2017	2018	VFD	B01 MECHANICAL ROOM	[Michael Lindemann - Wood ES - on 1/14/2019 9:53:22 AM] Nameplate on the component was missing certain Section Detail fields. Section Detail fields have been populated and fields with "NA" represent data not found.

Documentation transfer can be quite cumbersome as it typically includes both hard copy (Figure 6) and electronic copies of submittals, warranties, as-builts, and operations and maintenance documents. Electronic submissions are typically transferred via disc and DoD SAFE Transfer to offer redundancy. The transfer process also includes hard copies of the documents that are stored within the building to which they are applicable, while the electronic documents are stored centrally within a DPW server. Ongoing technological changes have offered challenges in transferring information as USACE and USAG DPW do not share networks and are not able to utilize external hard drives to move the documentation.

Figure 6. Project information transfer (hard copies) at turn over.



At the time of this report, DPW has not received any direction from IMCOM to change the data that were input into BUILDER SMS; therefore, data have not been updated since Wood developed the assessments, and

no USACE project data have been used to update the BUILDER information. DPW personnel are under the impression that IMCOM will be sending contractors. There has been, however, some work on using the BUILDER information to populate the Installation Status Report (ISR)-Infrastructure Quality Ratings. It has been implemented at some locations, but not yet at West Point. The ISR-I Mission Ratings will continue to be developed via the ISR-I spreadsheet workbooks.

2.2 Joint Base Lewis-McCord (JBLM)

2.2.1 Facility data overview

At Joint Base Lewis-McCord (JBLM) an aviation unit complex Attack/Assault/Calvary (AAC) Hangar, recently completed, was the second installation selected for this pilot project, with the following identification attributes:

- RPUID: 1287083
- Installation Code: 53465
- Building Number: 31010
- Category Code: 21110 Aircraft Maintenance Hangar
- BOD: 06/22/2015
- BUILDER SMS Assessment: Optional. Not completed at the time for the project.
- Area: 113,008 square feet
- Year constructed: 2018
- Number of floors: 1
- Plant Replacement Value: \$61,628,824

The PDT for the JBLM pilot study consisted of personnel from ERDC-CERL, Gaylord Higa (JBLM directorate), and Van Woods, Stephen Hutsell and Julia Gairhan (USACE-Seattle District). Before the site visit, JBLM personnel provided the PDT with design and construction data for the facility.

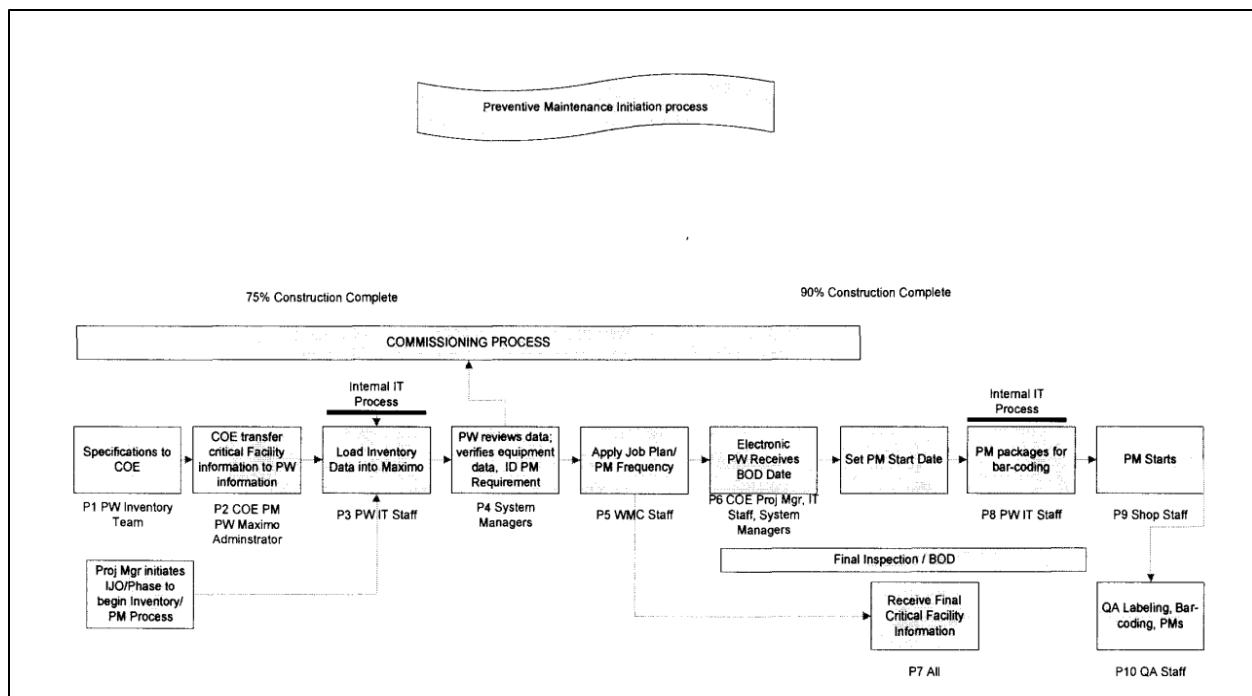
2.2.2 Installation asset-management process

While a robust approach is not currently in place for all projects, the installation does have a standing operating procedure (SOP) document in place for the transfer of critical building equipment information and inventory and preventative maintenance (PM) preparations (Fort Lewis

2007). The objective of the document from February 2007, is to ensure information is available to accomplish PM in a reasonable time after construction. A graphic for the PM initiation process included in the SOP is shown in Figure 7. The SOP is applicable to the installed equipment listed below:

- Air Conditioners
- Air Handler Units
- Fire Alarm Systems
- Fuel Storage Tanks and Associated Release Detection Systems
- Backflow Prevention Assemblies
- Boilers and Burners
- Chillers
- Air Compressors
- HVAC Controllers
- Emergency Generators
- Emergency Lighting Inverters
- Exhaust, Supply and Return Fans (Belt Driven)
- Fire Suppression Systems
- Kitchen Equipment (refrigerators, freezers, ice machines, etc.)
- Furnaces
- Hot Water Heaters (power burners) and Infrared Radiant Heaters

Figure 7. Preventive maintenance initiation process (Image reproduced from Fort Lewis 2007. Public Domain.)



Conversations with installation and district personnel revealed that while most projects under the purview of Seattle District include advanced modeling requirements, JBLM is still in the infancy stages of receiving and utilizing electronic submittals. An effort between district and installation personnel to ensure record models were provided was ongoing at the time of the visit. Other discussions related to the asset management process included a recent change in the computer maintenance management system (CMMS) from Maximo, a CMMS produced by International Business Machines, to GFEBS and confusion around the different systems of records. Lastly, the site visit revealed that the facilities' assessments focused on populating ePRISMS were conducted a year before the ones focused on populating BUILDER SMS. The ePRISM data collection was conducted to support capacity analysis and space utilization reports.

2.2.3 Outcome

During the visit to JBLM, the PDT was able to meet with project stakeholders from the district and the installation as well as personnel from the real property and planning sections of the Directorate of Public Works to discuss the project as well as the overall flow of information about real property assets. Observations and information found during the site visits and the course of the project are described below.

Multiple assessments efforts are conducted at JBLM on the same facilities targeting population of different downstream applications. This finding confirms the main problem outlined in this report: the impact of redundant data collection efforts and the lack of interoperability. Furthermore, it was found that, similar to the case of BUILDER SMS, data from ePRISMS assessment do not necessarily get recorded into the system of record in a timely manner as roles and responsibilities for updating information are very compartmentalized and specific.

Different stakeholders within the facility data exchange process understand their individual roles and responsibilities; however, they might not be fully aware or understand the overarching picture. Furthermore, lack of a clear and standard process often leads to a backlog in the data entry process, which adds to the delay to have up-to-date information.

USACE Seattle District feedback regarding the statement of intent in UFGS 01 78 24.00 10 (Section 2.2.2, “Assets”) was that in some cases it contradicts itself, making it sound like all equipment is required: “maintainable and warrantable equipment (assets) associated with each facility. This includes assets in contract scope and within project extents.” Versus later in the same paragraph that indicates a more limited scope: “Assets include, but are not limited to, those types described in the ‘Required Assets’ portion of the FDW template . . . and additional assets defined in the FDPxP” (DoD 2018).

District feedback regarding the FDW also included addressing usability issues in future releases (picklist issues, row insertion or deletion, etc.) and development of support documentation to include instructions on how to make the USACE macro-enabled workbook usable in the USACE context via Application Portal (AppPortal).

Contractor feedback to the district as it relates to the FDE effort included the suggestion for additional testing, streamlining, and documentation for the BUILDER export. Contractors also expressed that there is additional cost and complexity due to the fragmentation and lack of standardization in different facility data delivery approaches. For example, the range of approaches includes medical contexts where USACE Medical Mandatory Center of Expertise and Standardization (USACE-MX) for Military Health Systems (MHS), the Defense Health Agency (DHA), and the Veterans Af-

fairs (VA) all utilize the facility data in the Construction Operation Building Information Exchange (COBie). Whereas, Naval Facilities Engineering Systems Command (NAFAC) uses Facility Electronic Operation and Maintenance Support Information (eOMSI); USACE uses COBie and FDW; and other agencies utilize custom and/or COBie approaches. Contractors also indicated that it would increase efficiency to consolidate data requirements spread across different parts of the specifications to rely on one “single source of truth” and master equipment.

Recommendations from USACE project managers included progress reporting metrics during design and construction, which are described below:

- Design metrics suggested include the following: a) total number of equipment grouped by type/classification, b) percent complete on design stage data collection and formatting.
- Construction metrics suggested include the following: a) commissioned equipment collected and percent complete, b) total number of noncommissioned Mechanical, Electrical and Plumbing (MEP) equipment collected and percent complete, c) total number of noncommissioned, non-MEP equipment collected and percent complete, and d) a pre-delivery equipment list.

Lastly it was suggested to include the following criteria to ensure that drawings, equipment labels, and the CMMS all indicate the same equipment:

- A naming standard for equipment—including an acronym list
- Method to ensure labels on drawings and printed labels, phenolic tags, and nameplates all match
- If different names are warranted, then providing methods in BIM to revise record models rapidly across all sheets, to include both the contract document IDs as well as the barcode/tag/label IDs, to provide O&M users with cross-reference information needed to correctly identify equipment across the different documents and systems

2.3 Fort Hood

2.3.1 Facility data overview

At Fort Hood, the pilot project was the renovation of the former Carl R. Carnall Army Medical Center. The basic identification information is as follows:

- RPUID: 584449
- Installation Code: 48255
- Building Number: 36000
- Category Code: 51016 Medical CTR/Hosp.
- BOD: N/A
- BUILDER SMS Assessment: Nov 2018
- Area: 563,825 square feet
- Year Constructed: 1966
- Number of floors: 6
- Plant Replacement Value: \$385,322,326

There was no site visit by the PDT to Fort Hood due to the COVID-19 pandemic and restrictions on travel. Renovation of this building was performed and placed in service on 28 April 2010.

2.3.2 Installation asset-management process

Accurate information gathering regarding the current asset management process in this installation was hindered by the inability to perform a site visit. However, the PDT did obtain copies of the transfer and acceptance of DoD real property forms (DD FORM 1354), as-built drawings, and BUILDER final inspection reports.

2.3.3 Outcome

While on-site interviews were not possible at this location, the PDT noticed a gap between placed-in-service and posted-to-real-property dates in the provided DD Forms 1354. These forms also confirmed that some inventory assessment was conducted during March 2018, less than a year from the November 2018 inspection date recorded in the final assessment report.

3 Findings

As expected by the PDT, evaluation of installations' processes during this second pilot study revealed that there is not much difference between synchronization with the Army's GFEBS and synchronization with BUILDER SMS through the facility life cycle. Also, like in the first pilot, it was demonstrated that current available data can be, with appropriate restructuring, imported and utilized by downstream applications like BUILDER. These two main findings highlight that the root of the data exchange problem lies in identifying and specifying the appropriate level of detail needed to map data across the different system of records.

The overall pilot effort reemphasizes the need for cohesive policy and guidance that, in addition to the when and to whom, explicitly states which data are to be delivered and, most importantly, how the data should be delivered. It also emphasized the critical need to move away from the current siloed environment to a more collaborative operating one. The combination of these two elements, clear policy and guidance and a common operating environment, will represent a game changer for facility stakeholders as it would allow them to have the right data at the right time, thus enabling data-driven decision making. Furthermore, clear, data-driven workflow would allow facility owners and managers to adopt a more proactive and eventually predictive O&M culture instead of a heavily reactive one.

The equipment data list currently defined in the FDE specification and the FDW is not intended to be a complete list of every piece of equipment required to be included in BUILDER SMS or needing maintenance at an installation. At this point, its purpose is to identify a subset of equipment types and attributes to be further expanded and defined by facility owners and maintainers. Pilot study findings and observations are discussed below.

3.1 Facility Data Workbook (FDW)

The FDE working group used the COBie standard as the underlying exchange framework to develop the FDW but added data definitions and requirements within the template to improve exchange with downstream applications such as BUILDER SMS and GFEBS.

In addition to the findings described above, the pilot studies reinforced the fact that the information outlined in the FDW is similar to that currently required by standard specification language included in most USACE and IMCOM contracts. The FDW, therefore, is intended to provide a structure and standardized method to facilitate data submittal and exchange. Brucker et al. (2018) includes a summary of current language that supports this statement. In Section 3.1, the authors reiterate the need for data definitions and requirements within the template in order to improve exchange with GFEBS (Brucker et al. 2018).

Assets' classification is often a hurdle in the data exchange process as systems of records utilize different organizational standards (e.g., MasterFormat, UNIFORMAT, and OmniClass) or require different levels of detail when it comes to classification. Classification differences were a known constraint of this project as the initial version of the FDW was developed utilizing OmniClass, while BUILDER SMS catalog is based on UNIFORMAT II. Therefore, the project scope included modification of the original FDW to add the capability to convert data into a format suitable for input into BUILDER SMS.

The PDT worked with members of the USACE/Industry BIM & CIM Consortia to develop version 1.8 of the FDW template, which includes a required field for BUILDER Section Designation (Figure 8) and a macro-based export capability for input into BUILDER SMS. Testing and feedback received from this effort revealed that export capability needs further testing. It was also suggested that documentation along with training will be valuable to streamline and better understand the tool. A template FDW v. 1.8 and an example are available at the USACE CAD-BIM Technology Center website: <https://cadbimcenter.erdcdren.mil/default.aspx?p=a&t=1&i=56>.

Figure 8. FDW v. 1.8 required asset data.

Asset Data				
ID	Attribute	Definition	Example(s)	Submittal
A01	Asset Designation	Unique name for each asset to match name/mark in construction documents. Note: If multiple instances of the same asset designation exist, add a unique sequence number such as 1 and 2. If Asset Designation is not available on construction documents, use Asset Abbreviation provided, followed by a dash and sequence number (i.e. B-10 for a pump).	AHU-1 HVACEQPT-3	Design / Construction Progress
A02	Asset Description	Common language description of asset.	Air Handling Unit Air Source Heat Pump	Design / Construction Progress
A03	Space Designation	Designation of space from which the asset is accessed and maintained. Select from Space Designations from the Space Data.	N326 S127	Design / Construction Progress
A04	Spec Reference	Project-specific Unified Facility Guide Specification (UFGS) section for the asset. Click the "Import" button and select "SpecIntact Table of Contents" to import a project-specific picklist.	23 73 13 00 40: Modular Indoor Central-Station Air-Handling Units	Design / Construction Progress
A05	Product Classification	Category of the asset. Select most specific applicable category.	23-33 25 11 11: Built Up Indoor Air Handling Units 23-33 17 11 11: Air Source Packaged Heat Pumps	Design / Construction Progress
A06	BUILDER Section Designation	Designation of system section. Select most appropriate value from the picklist.	D304008: HVAC, DISTRIBUTION SYSTEMS, AIR HANDLING UNITS - Field Fabricated - 75000 CFM, VAV	Design / Construction Progress
A07	System Designation	System type / discipline. Select most appropriate system designation such as Conveying, Plumbing, HVAC, Fire Protection, Electrical, etc.	HVAC	Design / Construction Progress
A08	System Classification	Category of the system. Select the most specific applicable category.	21-04 30 00: Heating, Ventilation, and Air Conditioning (HVAC)	Design / Construction Progress
A09	Tag Number	Tag Designation / Barcode physically attached to the asset.	3D-219V	Construction Final
A10	Manufacturer	Manufacturer as it appears on the nameplate.	Example Manufacturing	Construction Final
A11	Manufacturer Model Number	Manufacturer provided model number as found on installed equipment nameplate.	CLCH-PRC022-EN	Construction Final
A12	Serial Number	Manufacturer provided serial number as found on installed equipment nameplate.	S017762-01	Construction Final
A13	Manufacturer Email	Email address for technical point of contact for asset.	info@company.com	Construction Final
A14	Installation Date	Date on which the asset was installed. Format is YYYY/MM/DD.	2015/10/15	Construction Final
A15	Warranty Start Date	Date on which the asset warranty begins. Format is YYYY/MM/DD.	2015/10/15	Construction Final
A16	Warranty Duration	Duration of asset warranty in months.	12	Construction Final
A17	Warranty Description	Description of warranty.	Manufacturer's comprehensive no dollar limit total system warranty.	Construction Final
A18	Warranty Priority Code	Warranty priority code as defined in UFGS 01 78 00 section 1.7.4 (Code 1, Code 2, and Code 3).	Code 1	Construction Final

While the basic process of populating the FDW (Figure 9) developed during the first study is still applicable, synchronization with BUILDER SMS significantly differs from synchronization with GFEBS. Details on the data input process are documented in Section 3.3. All other findings related to population of the FDW are similar to those outlined in Brucker et al. 2018.

ERDC/CERL TR-22-5



3.2 Recommended revisions of UFGS 01 78 24.00 10

Recommendations provided upon completion of the Facility Data Exchange Pilot Demonstration for GFEBS were adopted, and an updated specification was published in May 2018. Despite the improvements achieved by incorporation of the initial set of recommendations, this study revealed that the statement of intent for required assets is not clear to all.

A key recommendation specific to this effort is to update the specification and asset list to include all BUILDER assets. It is important to highlight that further evaluation is needed before implementing this recommendation as BUILDER data include group or assembly-type components. The current FDW is designed for unitary components; thus, including all BUILDER assets will require addressing system- and assembly-type assets.

The macro-enabled capability to export data in a format suitable for input into BUILDER SMS needs further testing. Additionally, development of support documentation on the export capability is recommended. It is worth noticing that these findings are typical after the first release and test of new capabilities.

FDW's tab "Required Assets" will need to be revised for synchronization as decisions to incorporate additional assets into UFGS 01 78 24.00 10 are made. Furthermore, revision and potentially a new version of the FDW suitable to address system- and assembly-type assets will be required if the decision to include all BUILDER assets is implemented.

3.3 BUILDER data input process

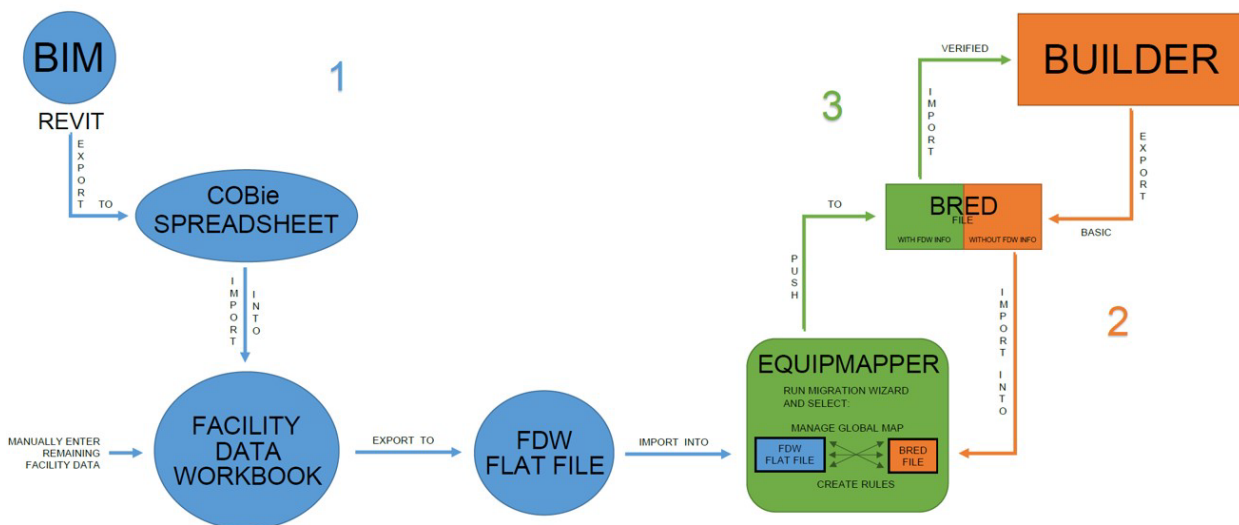
Facility data for BUILDER SMS is currently collected through facility assessments performed by contractors as part of IMCOM's BUILDER SMS implementation effort. Building system inventory and assessments are performed using BUILDER or BRED. Data collection includes equipment data, physical measurements and condition. Prior to contractors commencing inventory and assessment of building systems, the real property in BUILDER is updated with data from the Headquarters Installations Information System (HQIIS). Both HQIIS and BUILDER SMS are systems mandated by the Deputy Chief of Staff G-9 (US Army, Deputy Chief of Staff, G9 2020). During the facility assessment process, real property

square footage is identified and corrected in BUILDER SMS; however, these changes are overridden if the correction is not made in HQIIS (the system of record) before the next quarterly update. The contractors provide DPW personnel with a “discrepancy” report noting any facility square footage 10% greater or less than what is shown in BUILDER. This discrepancy report is provided to the DPW point of contact (POC) at the installation. The real property person at the installation is responsible for updating the HQIIS based on the discrepancy report.

3.3.1 BIM to BUILDER via FDW (tested approach)

Given the similarities between the data required by BUILDER SMS assessments and data already required by UFGS 01 78 24.00 10 (DoD 2018), a key focus of this study was to evaluate and test approaches for synchronization in order to facilitate population of BUILDER SMS. A graphic of the approach to be tested for synchronization is shown in Figure 10 below. In addition to the FDW, the data-flow approach included utilization of SMS EquipMapper and BRED as well as Autodesk’s BIM Interoperability Tools, specifically the COBie extension for Revit (Autodesk Inc. 2021).

Figure 10. Data-flow approach.



As stated in previous sections, this approach required modification of the FDW toll to include BUILDER specific fields. Once a new version of the FDW was created, the PDT developed a sample file with data provided by selected facilities to test the approach. As indicated by the third blue circle

in the diagram above, the FDW can be populated manually or by utilizing the macro capability to import existing preformatted data, which incorporates the COBie standard. This import method is suitable for projects with BIM or COBie requirements. An advantage of using the import method is the flexibility to obtain COBie spreadsheets directly from Autodesk Revit, as illustrated by the first two circles of Figure 10; the PDT performed the test using the import capability. Sections below further explain the diagram in Figure 10 as the test was performed.

3.3.2 Stage 1: BIM to flat file

The following steps were taken to format the BIM data file to a flat file:

1. Use the BIM Revit model that has COBie capabilities enabled and COBie schedules completed.
2. Export the COBie information into a COBie Excel spreadsheet using Revit's BIM Interoperability tools.
3. Check to make sure the spreadsheet information has populated correctly.
4. Open the FDW and import the COBie Excel file.
5. Manually enter any remaining data, such as installed equipment information.
6. Using the FDW macro, export the FDW into a flat file.

3.3.3 Stage 2: EquipMapper to BRED

Documentation on using the EquipMapper can be found on the SMS website: www.support.sms.erdcdren.mil/. The following steps were taken to use the EquipMapper to BRED:

1. Export a BRED file from BUILDER of the facility that needs to be updated.
2. Take the BRED file and the flat file with FDW information (making sure the FDW flat file and the Equipment Mapper's generic flat file format match) and place them into the EquipMapper.
3. Using the Global Mapper capability in the EquipMapper, manually map the FDW information from OmniClass format into the BRED file's "UNIFORMAT II" format. The OmniClass is based on the ISO 12006-2, *Building Construction—Organization of Information about Construction Works* (ISO 2015).
4. When the mapping rules are established, run the Migration Wizard and select to use the Global Map process. The UNIFORMAT II is an American

Society for Testing and Materials (ASTM) E1557-09 standard for classification of building elements (ASTM 2015).

3.3.4 Stage 3: BRED to BUILDER

This third stage requires the BRED file with the new equipment information to be uploaded into BUILDER:

1. Once the information has been successfully mapped into the EquipMapper, view the facility progress in the Migration Review window.
2. When the process has completed, populate the BRED file by “pushing” the information to the BRED file.
3. Next, take your updated BRED file with FDW data and import it back into BUILDER. This process is performed by opening up the BUILDER web application and selecting Tools-Import-Import from BRED.

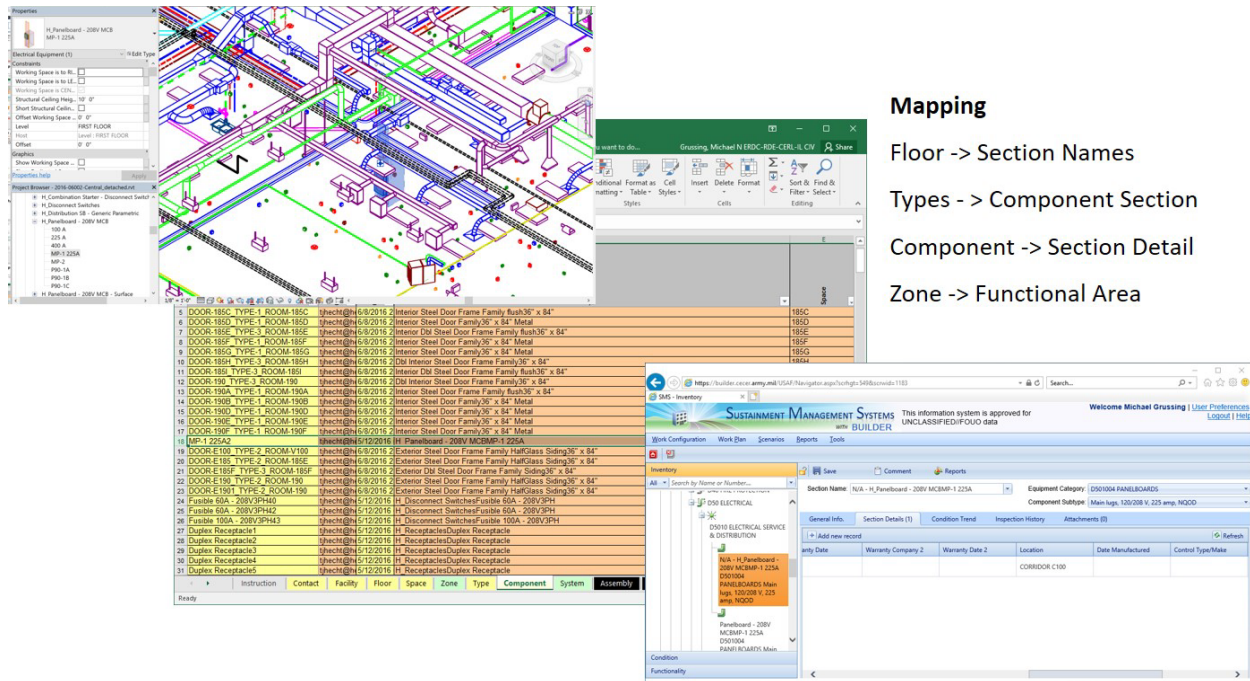
Synchronizing data collection efforts will add efficiency to the process. Synchronization will also significantly improve the ability to get up-to-date information, especially in those facilities being assessed not long after or at the same time as the handover process.

While the PDT was able to populate BUILDER SMS, the described approach is very cumbersome. Several iterations and meetings with experts in the tools were required before achieving success.

3.3.5 BIM to BUILDER alternative approaches (not tested)

Given that the system-based data required by BUILDER SMS can be found in COBie, it would be more efficient to import data into BUILDER directly from COBie. Like the tested approach, this would allow for data to be extracted directly from the model should BIM or COBie requirements be in place. Researchers at CERL have started exploring this approach under a different effort. Initial COBie-BUILDER mapping, depicted in Figure 11, was being developed at the time of this report. Further research is required to ensure the assembly-type assets are mapped correctly.

Figure 11. COBie to BUILDER initial mapping.



Aside from assembly-type assets, classification is another constraint of this approach. As noted previously, BUILDER catalog is based on UNIFORMAT II, a version of UNIFORMAT different than the one embedded in Revit Autodesk. Utilization of the Autodesk Classification Manager for Revit, one of the applications included in Autodesk BIM Interoperability Tools, could provide a solution to this constraint. As suggested by the name, the tool provides a database to map across different classification systems, allowing users to assign multiple classifications to an object in the model. In addition to the provided database for major classification systems, the tool allows the user to develop a customized database in order to assign a BUILDER-specific classification. An initial customized database was developed at CERL as part of a different research effort prior to this project. It is important to note that utilization of the tool would require creation of a parameter within the model to store the BUILDER classification data.

4 Summary and Recommendations

4.1 Summary

This report discusses a set of pilot studies designed by a USACE Facility Data Exchange (FDE) working group established to identify Army facility data requirements and options to standardize data exchange processes, including collection, import, and export of data for use by other Army applications. The effort documented in this report focused on identifying and evaluating population of BUILDER SMS with equipment inventory data required by the UFGS 01 78 24.00 10 specification supporting a standardized data delivery FDW format to facilitate data collection and exchange with other applications that require the same data.

West Point, Joint Base Lewis-McCord (JBLM), and Fort Hood participated in this project. Participation included selecting a recently constructed facility and providing data for use in the pilot test of the FDW. Each installation also agreed to facilitate a site visit for the PDT to tour the selected facility and meet with installation personnel to gather information related to the asset management process. Due to the COVID-19 pandemic, a site visit to Fort Hood was not possible.

Combined findings from the pilot studies reveal that the root of the data exchange problem is identifying and specifying the appropriate level of detail needed to map data across different systems of records. The overall effort reaffirms the need for cohesive policy and guidance that, in addition to the when and to whom, explicitly states which data are to be delivered and, most importantly, how the data should be delivered. The pilot study also highlighted the critical need to move away from the current siloed environment to a more standard operating one. The combination of these two elements, clear policy and guidance and a standard operating environment, will be a game changer for facility stakeholders as it would allow them to have access to the appropriate data at the right time, thus enabling data-driven decisions making. Furthermore, a clear, data-driven workflow would allow facility owners and managers to adopt a more proactive and eventually predictive O&M culture instead of a heavily reactive one.

4.2 Recommendations

The recommendations stated in this section should be considered additional to those stated in the first pilot study (Brucker et al. 2018). This section outlines recommendations in different categories, starting with those directly related to the results and findings of this FDE pilot demonstration. Additional suggestions are provided based on observations and lessons-learned that USACE, ACSIM, and IMCOM could consider to support expediting facility data exchange and integration for the benefit of all users and stakeholders.

4.2.1 FDE implementation recommendations

The facility data exchange implementation recommendations are the following:

1. Revise UFGS 01 78 24.00 10 specification and FDW for synchronization with BUILDER SMS implementation efforts.
2. Further test export to BUILDER macro capability.
3. Develop user documentation for FDW, such as written guides and training videos.

4.2.2 Related recommendations for USACE

Recommendations related to USACE training in order for the FDE process to be understood and followed include the following:

1. Evaluate current training opportunities for inclusion of FDE process training.
2. Evaluate R&D efforts for an opportunity to further develop approaches to streamline and standardized the facility data exchange process both within Army and across the DoD.

4.2.3 Related recommendations for ASCIM and IMCOM

Recommendations related to leadership are as follows:

1. Evaluate opportunities to further define roles, responsibilities, and timelines to synchronize data across multiple systems of records.

2. Develop or update policy or guidance to synchronize BUILDER SMS implementation efforts with FDE specification for internal acquisition projects.
3. Evaluate R&D efforts for an opportunity to further develop approaches to streamline and standardized the facility data exchange process.

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Acronyms and Abbreviations

Acronym	Full Term
AAC	Attack/Assault/Calvary
AEC	Architectural, Engineering, and Construction
AppPortal	Application Portal
ACSIM	Assistant Chief of Staff for Installation Management
ASTM	American Society for Testing and Materials
BIM	Building Information Modeling
BOID	Business and Operations Integration Division
BRED	BUILDER Remote Entry Database
CAD	Computer Aided Design
CI	Condition Index
CIM	Civil Information Modeling
CMMS	Computer Maintenance Management System
CoBie	Construction Operations Building Information Exchange
COR	Contracting Officer Representative
COVID-19	Corona Virus Disease 2019
DCR	Direct Condition Rating
DHA	Defense Health Agency
DPW	Directorate of Public Works
DoD	Department of Defense
ECB	Engineering and Construction Bulletin
eOMSI	Facility Electronic Operation and Maintenance Support Information
ePRISMS	Enterprise Proactive Real Property Interactive Space Management System
ERDC-CERL	Engineering Research and Development Center- Construction Engineering Research Laboratory
FDE	Facility Data Exchange
FDW	Facility Data Workbook
FEM	Facilities and Equipment Maintenance
GFEBs	General Fund Enterprise Business System
HQIIS	Headquarters Installations Information System
HQUSACE	Headquarters, United State Army Corps of Engineer
IMCOM	Installation Management Command
ISR-I	Installation Status Report- Infrastructure
ITTP	Installation Technology Transition Program
JBLM	Joint Base Lewis-McCord
MEP	Mechanical, Electrical and Plumbing

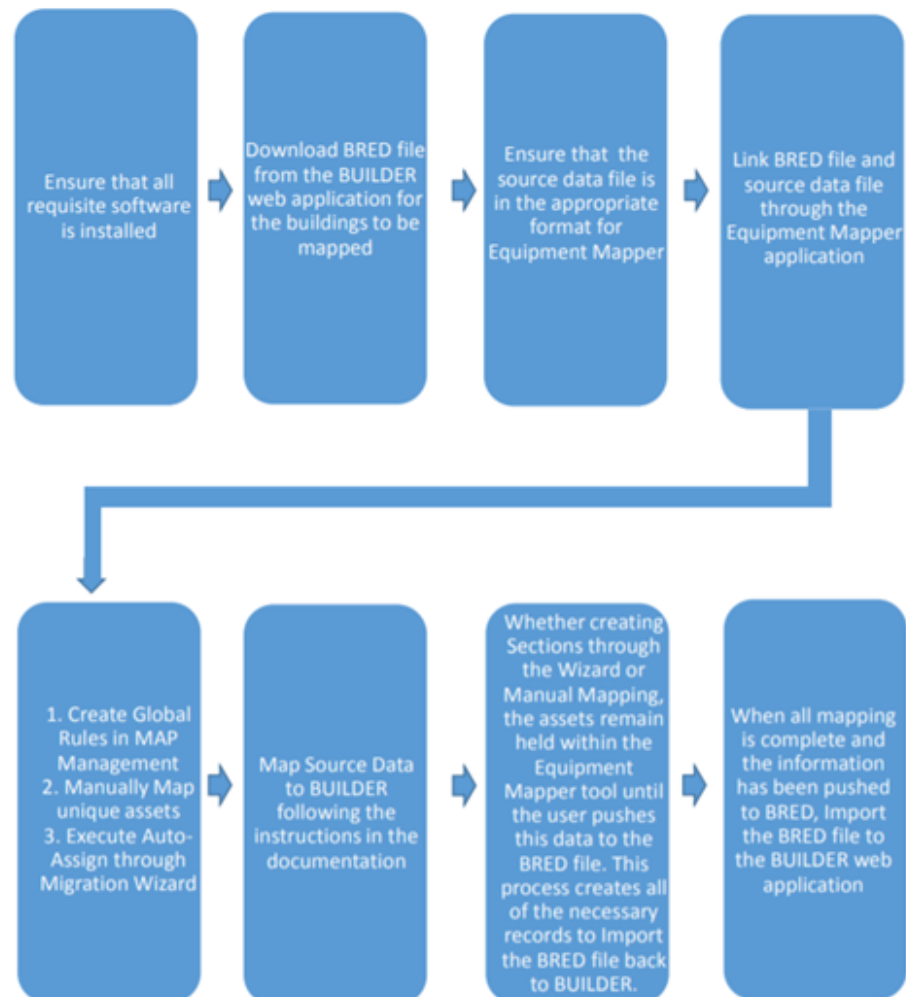
Acronym	Full Term
MHS	Military Health System
NAFAC	Naval Academy Foreign Affairs Conference
OACSIM	Office of the Assistant Chief of Staff for Installation Management
O&M	Operations and Maintenance
PM	Preventative Maintenance
POC	Point of Contact
PDT	Project Development Team
R & D	Research and Development
RPLANS	Real Property Planning and Analysis System
SMS	Sustainment Management System
SOP	Standard Operating Procedure
SQL	Structure Query Language
UFGS	Unified Facilities Guide Specifications
USACE	United States Army Corps of Engineers
USACE-MX	Medical Mandatory Center of Expertise and Standardization
USAG	United States Army Garrison
VA	Veterans Affairs
WP	West Point

Appendix A: BUILDER EquipMapper (Equipment Mapper)

EquipMapper is a tool developed to assist BUILDER customers transferring information from an asset management system into BUILDER. The tool, available at www.sms.erdcdren.mil, allows the customer to map the asset data directly into BUILDER using the BUILDER Remote Entry Database (BRED), provided that information is available in electronic formats. The asset data should be easily mapped with UNIFORMAT II or ASTM E1557-09 (Reapproved 2015). A graphical overview of the mapping process is shown in Figure A-1.

Data accuracy should be considered before using EquipMapper. Mapping into BUILDER is not recommended if the asset data have not been maintained unless there is a plan in place to update these data.

Figure A-1. EquipMapper graphical mapping process overview. (Image is reproduced from Fisher 2019. Public Domain.)



Appendix B: Spellman Hall Specification Section

The Spellman Hall Specification Section is taken from the “USACE Request for Proposal-Design Build-Spellman Hall Cyber Center Renovation Bldg. 2101” to show the Real Property Equipment List information required by the contractor to complete the “equipment-in-place list.”

1.5.4 Real Property Equipment

Provide a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Submit the final list 30 days after transfer of the completed facility.

Key the designations to the related area depicted on the contract drawings. List the following data:

SECTION 01 78 23 Page 6

Spellman Hall Cyber Center Renovation, Bldg 2101				USMASPELLMANHALL	
RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA					
Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used	
[]					

Appendix C: Agenda for West Point Conclusion Meeting/Data Review and Work-Planning Charrettes

The agenda for the conclusion meeting set up by Wood, the contractor responsible for BUILDER implementation at West Point, is shown in this section. As part of their conclusion meeting, they reviewed BUILDER fundamentals, work planning, scenarios and did a short summary of their findings.



AGENDA

West Point Conclusion Meeting/Data Review and Work Planning Charrettes

Day 1 - 18 June 2019

0800 – 0900	Conclusion Meeting
	Data Review Charrette
0900 - 1000	BUILDER Fundamentals Overview
1000 - 1010	Break
1010 - 1100	BUILDER Fundamentals Overview Demo
1100 - 1230	Lunch
1230 - 1345	SMS Support Site/Tech Support
1345 - 1400	Break
1400 - 1500	IMCOM HQ Q&A
1500 - 1600	BUILDER Indices/Reference Books

Day 2 - 19 June 2019

	Data Review Charrette
0800 - 0900	Army BUILDER SMS Manual
0900 - 0950	BUILDER Inventory Overview
0950 – 1000	Break
1000 - 1130	BUILDER Inventory Concepts Demo
1130 – 1300	Lunch
1300 -1400	BUILDER Data Collection
1400 – 1415	Break
1415 - 1600	BUILDER Remote Entry Database

Day 3 - 20 June 2019

	Data Review Charrette
0800 - 0900	BUILDER Condition Assessment Overview
0900 - 0945	BUILDER Condition Assessment Demo
0945 - 1000	Break
1000 - 1100	West Point Military Reservation Data Review
	Work Planning Charrette
1100 - 1200	BUILDER Work Planning Fundamentals
1200 - 1330	Lunch
1330 - 1415	BUILDER Work Planning Standards and Policies Demo
1415 - 1500	BUILDER Work Planning Prioritization and Funding
1500 - 1510	Break
1510 - 1600	BUILDER Work Planning Generation

Day 4 - 21 June 2019

	Work Planning Charrette
0800 - 0950	BUILDER Scenarios
0950 – 1000	Break
1000 – 1100	Recap/Q&A
1100	Conclusion

Appendix D: Meeting Minutes, West Point Conclusion Meeting

The meeting minutes from the conclusion meeting at West point are found in this appendix.



INSTALLATION CONCLUSION MEETING MINUTES WEST POINT MILITARY RESERVATION

Project: BUILDER SUSTAINMENT MANAGEMENT SYSTEM (SMS) IMPLEMENTATION for Installation Management Command (IMCOM)

Location: West Point Military Reservation (WPMR), Army Education Center, Building 683, Room 8

RFP: W91278-17-D-0041-001 **Wood Project:** 6143180933

Task Order: W9127818F0393 **Meeting Date:** 18 June 2019

Attendees checked (✓):

✓	IMCOM - Jason Zeller (via phone)	jason.zeller2.civ@mail.mil	210 466-0605
✓	USACE - Brian Peck	brian.e.peck@usace.army.mil	251-690-2750
✓	USACE - Jillian Martin	jillian.m.martin@usace.army.mil	917-790-8122
✓	USACE - Jeffrey Johnson	jeffrey.h.johnson@usace.army.mil	251-694-3624
✓	USACE - Linda Barnett	linda.t.barnett@usace.army.mil	251-694-3786
✓	ERDC-CERL - Brenda Mehnert	brenda.b.mehnert@usace.army.mil	217-373-3442
✓	ERDC-CERL - Mariangelica Carrasquillo	mariangelica.carrasquillo@usace.army.mil	217-373-3344
✓	DPW - Leigh-Ann Lelyveld	leigh-ann.lelyveld.civ@mail.mil	845-938-5345
✓	DPW - Heidi Rausch	heidi.e.rausch.civ@mail.mil	845-938-4647
✓	DPW - Terry Hora	terrance.m.hora.civ@mail.mil	845-938-5189
✓	DPW - William Johnson	william.m.johnson.civ@mail.mil	845-938-8508
✓	Wood - DeAllen Norris	deallen.norris@woodplc.com	678-699-4521
✓	Wood - Jeremy Simmons	jeremy.simmons@woodplc.com	478-955-3741
✓	Wood - David Howell	david.howell@woodplc.com	404-406-3479

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MEETING NOTES

1. Welcome and Introductions

- The conclusion meeting started at 0800hrs with a welcome to all attendees by Jeremy Simmons.

2. Safety Moment

- Safety Topic – Fire Safety

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3. About Wood Environment & Infrastructure Solutions, Inc (Wood)

- DeAllen Norris introduced himself as the Program Manager and gave a brief overview of the company profile.

4. Conclusion Meeting Agenda and Charrette Schedule

- Reviewed Conclusion Meeting agenda and schedule for the Data Review and Work Planning Charrettes.

5. Project Overview

- Jeremy Simmons provided an overview of the project requirements. Included in the discussion was the project scope, objective and methodology utilized to conduct the FCA.
- Scope:
 - Task Order (TO) – W9127818F0393 awarded 25 July 2018.
 - Period of Performance - 365 calendar days from TO award.
- Objective:
 - Provide technical assistance to IMCOM by conducting a Facility Condition Assessment (FCA) to physically inventory real property facilities and infrastructure listed in the Statement of Work (SOW) utilizing the BUILDER™ Sustainment Management System (SMS), and then use the data collected to demonstrate to you how to identify, plan and prioritize potential work requirements to develop short- and long-term work plans.
- Methodology:
 - All Inventory and Assessment findings based on the following criteria:
 - Latest version of BUILDER™ SMS User Manual
 - Latest version of BUILDER™ Condition Assessment Manual for Building Component-Sections
 - Army BUILDER™ SMS Inventory and Assessment Implementation Guide

6. Activities Performed

- Jeremy Simmons identified all activities performed in accordance with the statement of work for the FCA at the WPMR. The topics of discussion were;
 - Assessment schedule
 - Team Calibration
 - Inventory and Assessment
 - QC/QA processes
 - BRED
- The FCA was conducted from 1 October 2018 to 17 January 2019. The team assessed 223 facilities totaling 7,260,307 SF. All data was collected and inventory input into BUILDER™ in compliance with ASTM UNIFORMAT II, Level 2 utilizing the BUILDER™ Remote Entry Database (BRED) tool.
- A comprehensive and effective QC program was developed and maintained to ensure field data was accurately and consistently collected based on Installation and BUILDER™ requirements in accordance with the SOW.
- QC/QA resolution meetings were conducted regularly to coordinate and resolve any discrepancies found in data collected and uploaded into BUILDER™.

7. Safety issue identification and resolution

- Jeremy Simmons gave an overview of the safety issues identified during the FCA. They included the following general areas:

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○ Electrical	29
○ Trip/Fall Hazards	11
○ Standing Water	1
○ Sharp Object	1
○ Falling Objects	4
○ Tree down	2
○ Unsafe Equipment	7
○ Egress Restriction	3
○ Electrical Clearance	9
○ Structural Hazard	7

A detailed list including the date the safety issue was identified, the building number and building location, description of safety concern, the assessor who identified the issue and the name of the person notified, was made available.

8. Data Collection

- Jeremy Simmons and DeAllen Norris discussed the data collected during this FCA, reports generated from that data, and explained the potential impacts of the data on facility condition.
- The data collected included over 29,600 individual sections and associated photographs. All data collected as a part of the inventory was inputted into BUILDER™ in compliance with ASTM UNIFORMAT II work breakdown structure utilizing the BUILDER™ Remote Entry Database (BRED) tool.
- Assessors utilized the BUILDER™ Direct Condition Rating assessment method supplemented with specific distresses observed when the component section rating was determined to be lower than Green minus (G-) to conduct condition assessments.
- Specific 23 BUILDER™ distresses and their associated definitions are found in the BUILDER™ SMS Condition Assessment Manual.
- Specific data results included:
 - Overall facility condition by BCI rating
 - 10 facilities with the lowest Condition Index (CI)
 - Overall data results by System
 - Component CI distribution based on CRV
- The overall System CI for the facilities assessed at the WPMR was 80 on a 0 to 100 point scale.
- Of the facilities assessed during the FCA at WPMR:
 - 43 facilities representing 19-% of the inventory, totaling approximately 700K SF were RED (CI between 0 and 55).
 - 118 facilities, representing 53% of the inventory, totaling about 5M SF were AMBER (CI between 56 and 85).
 - 62 facilities, representing 28% of the inventory, totaling about 1.8M SF were GREEN (CI between 86 and 100).
- Included in this discussion and presented were reports that were generated based on the collected data. Those reports are listed below:
 - Building Condition Summary Report - Comprehensive summary of Building Condition by system. Provides a chart depicting each building's condition, aggregated by ASTM UNIFORMAT II (A10-D50) system, developed using BUILDER inventory and assessment data.

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- Building Condition Index Report - Worst to First sorting of all building systems, aggregated by building, using the Building Condition Index (BCI) score. Listing of facilities in order of the lowest to the highest BCI.
- 5-Year Work Plan - Data Analysis Report comprised of unconstrained 5-year work plan organized by site and facility using IMCOM's established BUILDER Standards, Policies, and Prioritization Schemes and the Scenario module within BUILDER.
- 10-Year Work Plan - Data Analysis Report comprised of unconstrained 10-year work plan organized by site and facility using IMCOM's established BUILDER Standards, Policies, and Prioritization Schemes and the Scenario module within BUILDER.
- Real Property Discrepancy List - Outlines any discrepancies between the provided real property data and physically validated facility data (building square footage, number of stories, etc.).
- Also discussed was a list of facilities for which no data was collected and the reasons.

9. Lessons Learned

- Jeremy Simmons reviewed the key lessons learned identified by the assessment team listed below.
 - Key Control
 - Facility POC contact information
 - Mobile Phone and Internet Service
 - BRED Package Processing
 - Floor Plans

10. Quality Control

- The Quality Control discussion included the various QC Methods and Tools used and a breakdown of the QC process based on pre-assessment, on-site, and post-assessment findings.

11. Recommendations

- Wood provided the following recommendations to assure the successful implementation of the BUILDER SMS process at WPMR.
 - Maximize participation of all functional areas with facilities-related responsibilities during the WPMR Data Review and Work Planning Charrettes.
 - If there is a significant contractor presence for facility maintenance, key personnel associated with this activity should be included as well.
 - Identify and provide training for designated key staff on the BUILDER™ SMS application and ensure they have the necessary level of continued access to monitor BUILDER™ trends and provide information to decision makers
 - Provide a brief overview of the BUILDER fundamentals at your next Facility and/or Planning Board. You can access the US Army Corps of Engineers BUILDER Training Modules via SMS Support Site.

12. Issues/Concerns

- There were no other issues or concerns identified. The meeting was concluded at 0930hrs.

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END OF MEETING NOTES

If there are any questions or corrections regarding the above, please notify our office within 5 working days. Otherwise, the information herein will be assumed as correct and accurate.

Appendix E: USAG—West Point Equipment Inventory

Below is the FDW with an example of the Equipment Inventory collected at West Point (Table E-1). The entire list of equipment that was inventoried in Spellman Hall is reproduced below.

Table E-1. Example of BUILDER equipment inventory.

Equipment Category	Enter a number specifying the category of equipment: 1 - Conveying Systems 2 - Plumbing 3 - HVAC 4 - Fire Protection 5 - Electrical 6 - Kitchen 7 - Storage System 8 - Mechanical 9 - Vehicle Maintenance A - Grounds B - Overhead Doors C - Other D - Physical Security E - Utility Dist Electrical F - Utility Dist Water G - Utility Dist Waste Water H - Utility Dist Htg/Cooling I - Utility Dist Pwr Gen J - Utility Dist Gas	**EXAMPLE** 3
Description	Enter a description for the piece of equipment. (40 CHAR MAX)	Boiler- Gas Fired- 220MBH
Valid From	Enter the date on which the equipment became or will become the property of the government. Report in MM/DD/YYYY format.	4/1/2015
Manufacturer	Enter the Manufacturer.	York Solution XT
Manufacturing Country	Enter Manufacturing Country US, MX, etc.	US
Model Number	Enter Model Number.	XTI063X069
Manufacturer Part No.	Enter Manufacturer Part Number.	200-60-10-V2-D2-INP100S-P01S
Manufacturer Serial No.	Enter Manufacturer Serial Number.	AGVM XT0107
Weight	Weight of the piece of equipment in lb (NUMBER ONLY—NO TEXT)	2

Size/Dimension/Capacity		Include units of measurement. (18 CHAR MAX)	H32.83 in. L23 in.
Location	Building No.	Floor/room numbers are optional, but building numbers are mandatory. If the equipment is outside, input the number of the building nearest to it.	667
	Floor No.		3
	Room No.		201
Life Expectancy		How long is the piece of equipment expected to operate effectively? Report in years.	20
Warranty Begin Date (MM/DD/YY)		If there is an active warranty on the item, enter the beginning and end dates in MM/DD/YYYY format.	4/1/2015
Warranty End Date (MM/DD/YY)			4/1/2025
Replacement		Is this piece of equipment replacing an existing piece of equipment? Enter Y or N.	N
If Yes, describe.		Describe the old piece of equipment with as much detail as possible - location, make, model, capacity, etc.	
Additional Notes		Insert any additional, necessary information. This may include the equipment tag number (local numbering system) or a characterizing feature.	HEX-2
		Title/volume number of where to locate information on this specific piece of equipment in the Operations and Maintenance manuals.	230000-28.1
		If there are printed Specifications associated with the piece of equipment, enter the name and contact number of the Gov POC (USACE COR, DPW PM) who accepted the documents.	Jane Doe, x1234
		If the piece of equipment is related to EMCS Building Automation Systems, enter the name and contact number of the Gov POC who has Administrative Privileges (DPW employee that manages the BAS/EMCS system and has system login info/passwords).	John Doe, x5678
Preventative Maintenance - Optional	PM Tasks	If extensive, attach separate MS Word document.	Clean lube oil sump
	PM Task Frequency	Annual, Quarterly, Monthly, etc.	Annual

USAG West Point

New Equipment Inventory

Equipment Category	Description	Valid From	Manufacturer	Manufacturing Country	Model Number	Manufacturer Part No.	Manufacturer Serial No.	Weight	Size/Dimension/Capacity	Location			Life Expectancy	Warranty Begin Date	Warranty End Date	Replacement	If Yes, describe.	Equipment Tag
										Building No.	Floor No.	Room No.						
Enter a number specifying the category of equipment: 1 - Conveying Systems 2 - Plumbing 3 - HVAC 4 - Fire Protection	Enter a description for the piece of equipment. (40 CHAR MAX)	Enter the date on which the equipment became or will become the property of the government. Report in MM/DD/YYYY	Enter the Manufacturer	Enter Manufacturing Country US, MX, etc.	Enter Model Number	Enter Manufacturer Part Number	Enter Manufacturer Serial Number	Weight of the piece of equipment in lbs	Include units of measurement.	Describe the location of this piece of equipment with the most detail possible. In some instances, floor and/or room numbers will not be appropriate.			How long is the piece of equipment expected to operate effectively? Report in years.	If there is an active warranty on the item, enter the beginning and end dates in MM/DD/YYYY format.	Is this piece of equipment replacing an existing piece of equipment? Enter Y or N	Describe the old piece of equipment with as much detail as possible - location, make, model, capacity.	Include information located on equipment tag (local numbering system)	
3	Heat Recovery Unit 1	7/1/2018	Daikin	US	DAHA11A	DAHA09AHw/w2D	FBOU170300	1831	11"X57.3"X56.8H",	Spellman	Roof	High Roof		7/1/2018	7/1/2019	Y		HRU-1
3	Heat Recovery Unit 2		Daikin	US	DAHA09A	DAHA09AHw/w2D	FBOU170300	1805	11"X57.3"X56.8H",	Spellman	Roof	High Roof			12/30/1900	Y		HRU-2
3	Heat Recovery Unit 3		Daikin	US	EN450IN			200	47.5"X24.75"X34"H,	Spellman	Data	006			12/30/1900	N		HRU-3
3	Air Handling Unit 1		Daikin	US	QAH010GDAC	E02708310100	FBOU170703	2384	118"X64"X38"H,	Spellman	Roof	Low Roof			12/30/1900	Y		AHU-1
3	FCU-H		Enviro-Tec	US	HLP50	FCU171012-17	6MEM000618	152	60"X26"X10"H, 500CFM	Spellman	Basement	B07			12/30/1900	N		FCU-H
3	FCU-M		Enviro-Tec	US	HLP60	AHU171012-15	6MEM00067	183	26"X70"X10"H, 300CFM	Spellman	Data	008			12/30/1900	N		FCU-M
3	FCU-G		Enviro-Tec	US	HLP30	FCU171012-17	6MEM00067	94	40"X26"X10"H, 385CFM	Spellman	Data	003			12/30/1900	N		FCU-G
3	FCU-J		Enviro-Tec	US	H16	AHU171012-15	6MEM001218	290	10"X44"X21"H,	Spellman	Data	002			12/30/1900	N		FCU-J
3	FCU-C		Enviro-Tec	US	VLE-04	FCU171012-17	6MEM00067	164	54"X11.25"X12"H,	Spellman	Lobby	0001			12/30/1900	Y		FCU-C
3	FCU-A		Enviro-Tec	US	VFC-C12	FCU171012-17	6MEM00067	203	66.75"X3.25"X25"H,	Spellman	Lobby	0001			12/30/1900	Y		FCU-A
3	FCU-J		Enviro-Tec	US	H16	AHU171012-15	6MEM001215	290	10"X44"X21"H,	Spellman	1st Floor	114			12/30/1900	Y		FCU-J
3	FCU-G		Enviro-Tec	US	HLP30	FCU171012-17	6MEM00067	94	40"X26"X10"H, 385CFM	Spellman	1st Floor	1002			12/30/1900	Y		FCU-G
3	FCU-J		Enviro-Tec	US	H16	AHU171012-15	6MEM001214	290	10"X44"X21"H,	Spellman	1st Floor	117			12/30/1900	Y		FCU-J
3	FCU-L		Enviro-Tec	US	HLP60	FCU171012-17	6MEM000681	180	26"X70"X10"H, 720CFM	Spellman	1st Floor	118			12/30/1900	Y		FCU-L
3	FCU-M		Enviro-Tec	US	HLP60	FCU171012-17	6MEM00068	183	26"X70"X10"H, 900CFM	Spellman	1st Floor	1000			12/30/1900	Y		FCU-M
3	FCU-J		Enviro-Tec	US	H16	FCU171012-17	6MEM001217	290	10"X44"X21"H,	Spellman	1st Floor	112			12/30/1900	Y		FCU-J
3	FCU-L		Enviro-Tec	US	HLP60	FCU171012-17	6MEM00067	180	26"X70"X10"H, 720CFM	Spellman	1st Floor	109			12/30/1900	Y		FCU-L
3	FCU-M		Enviro-Tec	US	HLP60	FCU171012-17	6MEM00067	183	26"X70"X10"H, 900CFM	Spellman	1st Floor	108			12/30/1900	Y		FCU-M
3	FCU-J		Enviro-Tec	US	H16	AHU171012-15	6MEM001213	290	10"X44"X21"H,	Spellman	1st Floor	102			12/30/1900	Y		FCU-J
3	FCU-J		Enviro-Tec	US	H16	AHU171012-15	6MEM001216	290	10"X44"X21"H,	Spellman	1st Floor	102			12/30/1900	Y		FCU-J
3	FCU-H		Enviro-Tec	US	HLP50	FCU171012-17	6MEM00067	152	60"X26"X10"H, 500CFM	Spellman	1st Floor	106			12/30/1900	Y		FCU-H
3	FCU-G		Enviro-Tec	US	HLP30	FCU171012-17	6MEM000671	94	40"X26"X10"H, 385CFM	Spellman	1st Floor	103			12/30/1900	Y		FCU-G
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	233			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	233			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	234			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	234			12/30/1900	Y		FCU-D
3	FCU-B		Enviro-Tec	US	VLE03	FCU180216-08	6CFM00554	146	46"X11.25"X12"H,	Spellman	2nd Floor	235			12/30/1900	Y		FCU-B
3	FCU-B		Enviro-Tec	US	VLE03	FCU180216-08	6CFM00554	146	46"X11.25"X12"H,	Spellman	2nd Floor	236			12/30/1900	Y		FCU-B
3	FCU-B		Enviro-Tec	US	VLE03	FCU180216-08	6CFM00554	146	46"X11.25"X12"H,	Spellman	2nd Floor	220			12/30/1900	Y		FCU-B
3	FCU-B		Enviro-Tec	US	VLE03	FCU180216-08	6CFM00554	146	46"X11.25"X12"H,	Spellman	2nd Floor	221			12/30/1900	Y		FCU-B
3	FCU-B		Enviro-Tec	US	VLE03	FCU180216-08	6CFM00555	146	46"X11.25"X12"H,	Spellman	2nd Floor	223			12/30/1900	Y		FCU-B
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	224			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00555	200	68"X11.25"X12"H,	Spellman	2nd Floor	224			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00555	200	68"X11.25"X12"H,	Spellman	2nd Floor	224			12/30/1900	Y		FCU-D
3	FCU-C		Enviro-Tec	US	VLE-04	FCU180216-08	6CFM005551	164	54"X11.25"X12"H,	Spellman	2nd Floor	225			12/30/1900	Y		FCU-C
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	226			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	226			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00555	200	68"X11.25"X12"H,	Spellman	2nd Floor	226			12/30/1900	Y		FCU-D
3	FCU-C		Enviro-Tec	US	VLE-04	FCU180216-08	6CFM00555	164	54"X11.25"X12"H,	Spellman	2nd Floor	227			12/30/1900	Y		FCU-C
3	FCU-C		Enviro-Tec	US	VLE-04	FCU180216-08	6CFM00555	164	54"X11.25"X12"H,	Spellman	2nd Floor	228			12/30/1900	Y		FCU-C
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	229			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM00556	200	68"X11.25"X12"H,	Spellman	2nd Floor	230			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-08	6CFM005561	200	68"X11.25"X12"H,	Spellman	2nd Floor	230			12/30/1900	Y		FCU-D
3	FCU-C		Enviro-Tec	US	VLE-04	FCU180216-08	6CFM00555	164	54"X11.25"X12"H,	Spellman	2nd Floor	231			12/30/1900	Y		FCU-C
3	FCU-C		Enviro-Tec	US	VLE-04	FCU180216-08	6CFM00555	164	54"X11.25"X12"H,	Spellman	2nd Floor	232			12/30/1900	Y		FCU-C
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-07	6CFM00504	200	68"X11.25"X12"H,	Spellman	3rd Floor	343			12/30/1900	Y		FCU-D
3	FCU-D		Enviro-Tec	US	VLE06	FCU180216-07	6CFM00504	200	68"X11.25"X12"H,	Spellman	3rd Floor	343			12/30/1900	Y		FCU-D

138	Equipment Category	Description	Valid From	Manufacturer	Manufacturing Country	Model Number	Manufacturer Part No.	Manufacturer Serial No.	Weight	Size/Dimension/Capacity	Location	Life Expectancy	Warranty Begin Date	Warranty End Date	Replacement	If Yes, describe.	Equipment Tag
	Enter a number specifying the category of equipment: 1 - Conveying Systems 2 - Plumbing 3 - HVAC 4 - Fire Protection	Enter a description for the piece of equipment. (40 CHAR MAX)	Enter the date on which the equipment became or will become the property of the government. Report in MM/DD/YYYY	Enter the Manufacturer	Enter Manufacturing Country US, MX, etc.	Enter Model Number	Enter Manufacturer Part Number	Enter Manufacturer Serial Number	Weight of the piece of equipment in lbs	Include units of measurement.	Describe the location of this piece of equipment with the most detail possible. In some instances, floor and/or room numbers will not be appropriate.	How long is the piece of equipment expected to operate effectively? Report in years.	If there is an active warranty on the item, enter the beginning and end dates in MM/DD/YYYY format.	Is this piece of equipment replacing an existing piece of equipment? Enter Y or N	Describe the old piece of equipment with as much detail as possible - location, make, model, capacity.	Include information located on equipment tag (local numbering system)	
139	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005184	148	46"X11.25"X12"H	Spellman 5th Floor	545		12/30/1900	Y		FCU-B
140	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005185	148	46"X11.25"X12"H	Spellman 5th Floor	546		12/30/1900	Y		FCU-B
141	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005186	146	46"X11.25"X12"H	Spellman 5th Floor	547		12/30/1900	Y		FCU-B
142	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005187	146	46"X11.25"X12"H	Spellman 5th Floor	548		12/30/1900	Y		FCU-B
143	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005188	146	46"X11.25"X12"H	Spellman 5th Floor	549		12/30/1900	Y		FCU-B
144	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005189	146	46"X11.25"X12"H	Spellman 5th Floor	550		12/30/1900	Y		FCU-B
145	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005190	146	46"X11.25"X12"H	Spellman 5th Floor	551		12/30/1900	Y		FCU-B
146	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005191	146	46"X11.25"X12"H	Spellman 5th Floor	552		12/30/1900	Y		FCU-B
147	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005192	146	46"X11.25"X12"H	Spellman 5th Floor	553		12/30/1900	Y		FCU-B
148	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005193	146	46"X11.25"X12"H	Spellman 5th Floor	554		12/30/1900	Y		FCU-B
149	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005194	146	46"X11.25"X12"H	Spellman 5th Floor	555		12/30/1900	Y		FCU-B
150	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005210	200	68"X11.25"X12"H	Spellman 5th Floor	526		12/30/1900	Y		FCU-D
151	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005190	148	46"X11.25"X12"H	Spellman 5th Floor	5001		12/30/1900	Y		FCU-B
152	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005182	146	46"X11.25"X12"H	Spellman 5th Floor	5001		12/30/1900	Y		FCU-B
153	3	FCU-C		Enviro-Tec	US	VLE-04	FCU170629-13	6GEM005020	164	54"X11.25"X12"H	Spellman 5th Floor	527		12/30/1900	Y		FCU-C
154	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005191	146	46"X11.25"X12"H	Spellman 5th Floor	5002		12/30/1900	Y		FCU-B
155	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005183	146	46"X11.25"X12"H	Spellman 5th Floor	5002		12/30/1900	Y		FCU-B
156	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005212	200	68"X11.25"X12"H	Spellman 5th Floor	528		12/30/1900	Y		FCU-D
157	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005213	200	68"X11.25"X12"H	Spellman 5th Floor	529		12/30/1900	Y		FCU-D
158	3	FCU-C		Enviro-Tec	US	VLE-04	FCU170629-13	6GEM005020	164	54"X11.25"X12"H	Spellman 5th Floor	530		12/30/1900	Y		FCU-C
159	3	FCU-C		Enviro-Tec	US	VLE-04	FCU170629-13	6GEM005201	164	54"X11.25"X12"H	Spellman 5th Floor	531		12/30/1900	Y		FCU-C
160	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005020	200	68"X11.25"X12"H	Spellman 5th Floor	532		12/30/1900	Y		FCU-D
161	3	FCU-B		Enviro-Tec	US	VLE03	FCU170629-13	6GEM005192	148	46"X11.25"X12"H	Spellman 5th Floor	533		12/30/1900	Y		FCU-B
162	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005211	200	68"X11.25"X12"H	Spellman 5th Floor	534		12/30/1900	Y		FCU-D
163	3	FCU-C		Enviro-Tec	US	VLE-04	FCU170629-13	6GEM005020	164	54"X11.25"X12"H	Spellman 5th Floor	535		12/30/1900	Y		FCU-C
164	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005020	200	68"X11.25"X12"H	Spellman 5th Floor	536		12/30/1900	Y		FCU-D
165	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005020	200	68"X11.25"X12"H	Spellman 5th Floor	537		12/30/1900	Y		FCU-D
166	3	FCU-D		Enviro-Tec	US	VLE06	FCU170629-13	6GEM005214	200	68"X11.25"X12"H	Spellman 5th Floor	538		12/30/1900	Y		FCU-D
167	3	FCU-C		Enviro-Tec	US	VLE-04	FCU170629-13	6GEM005020	164	54"X11.25"X12"H	Spellman 5th Floor	539		12/30/1900	Y		FCU-C
168	3	CRAC Unit 1		Liebert	US	CW076	CW076DC1A3A28	N1TH150067	1320	39"X35.6"X72"H	Spellman Data	004		12/30/1900	Y		CRAC-1
169	3	CRAC Unit 2		Liebert	US	CW076	CW076DC1A3A28	N1TH150068	1320	39"X35.6"X72"H	Spellman Data	007		12/30/1900	Y		CRAC-2
170	3	CRAC Unit 3		Liebert	US	CW076	CW076DC1A3A28	N1TH150069	1320	39"X35.6"X72"H	Spellman Data	004		12/30/1900	Y		CRAC-3
171	3	CRAC Unit 4		Liebert	US	CW076	CW076DC1A3A28	N1TH150070	1320	39"X35.6"X72"H	Spellman Data	004		12/30/1900	Y		CRAC-4
172	3	Chiller 1		Daikin	US	WG1300	WG21300W12-	STNU120800	4737	143.4"X35"X85.5"H	Spellman Chiller Rm	B01		12/30/1900	Y		CH-1
173	3	Chiller 2		Daikin	US	WG1300	WG21300W12-	STNU120800	4737	143.4"X35"X85.5"H	Spellman Chiller Rm	B01		12/30/1900	Y		CH-2
174	3	Chiller 3		Daikin	US	WG1300	WG21300W12-	STNU120800	4737	143.4"X35"X85.5"H	Spellman Chiller Rm	B01		12/30/1900	Y		CH-3
175	3	Cooling Tower 1		Evapco	US	AT 19-2H8	AT 19-2H8	17-088441	5910	90"X101.5"X128.25"H	Spellman Outside	NA		12/30/1900	Y		CT-1
176	3	Cooling Tower 2		Evapco	US	AT 19-2H8	AT 19-2H8	17-088442	5910	90"X101.5"X128.25"H	Spellman Outside	NA		12/30/1900	Y		CT-2
177	3	Cooling Tower 3		Evapco	US	AT 19-2H8	AT 19-2H8	17-088443	5910	90"X101.5"X128.25"H	Spellman Outside	NA		12/30/1900	Y		CT-3
178	3	Heat Exchanger		Alfa Laval	US	AC08FG	AC08F-FG	30117-51878	3382	57.3"X25.6"X74.2"H	Spellman Chiller Rm	B01		12/30/1900	N		HX-1
179	3	Air Separator 1		Taco	US	AC08F-125	AC08F-125	RD553.5C	216	20"X37"H	Spellman Chiller Rm	B01		12/30/1900	N		AS-1
180	3	Air Separator 2		Taco	US	AC08F-125	AC08F-125	RD553.5C	216	20"X37"H	Spellman Boiler Rm	018		12/30/1900	N		AS-2
181	3	Condenser Water Pump 1		Taco	US	KV4009	KV4009AE2KCD9	NONE	355	382GPM, 10HP	Spellman Chiller Rm	B01		12/30/1900	Y		CWP-1
182	3	Condenser Water Pump 2		Taco	US	KV4009	KV4009AE2KCD9	NONE	355	382GPM, 10HP	Spellman Chiller Rm	B01		12/30/1900	Y		CWP-2
183	3	Condenser Water Pump 3		Taco	US	KV4009	KV4009AE2KCD9	NONE	355	382GPM, 10HP	Spellman Chiller Rm	B01		12/30/1900	Y		CWP-3
184	3	HW Circ Pump AHU-1		Taco	US	1911	1911E11	501573	30	23GPM, 13HP	Spellman Shop	010		12/30/1900	N		CP-1
185	3	HW Pump 1		Taco	US	KV2508	KV2508AE2KCD9	NONE	282	258GPM, 10HP	Spellman Boiler Rm	018		12/30/1900	Y		HWP-1
186	3	HW Pump 2		Taco	US	KV2508	KV2508AE2KCD9	NONE	282	258GPM, 10HP	Spellman Boiler Rm	018		12/30/1900	Y		HWP-2
187	3	Primary Chilled Water Pump 1		Taco	US	KV4007	KV4007AE2JC06	NONE	237	255GPM, 5HP	Spellman Basement	B04		12/30/1900	Y		PCHWP-1
188	3	Primary Chilled Water Pump 2		Taco	US	KV4007	KV4007AE2JC06	NONE	237	255GPM, 5HP	Spellman Basement	B04		12/30/1900	Y		PCHWP-2
189	3	Primary Chilled Water Pump 3		Taco	US	KV4007	KV4007AE2JC06	NONE	237	255GPM, 5HP	Spellman Basement	B04		12/30/1900	Y		PCHWP-3
190	3	Secondary Chilled Water Pump 1		Taco	US	KV3009	KV3009AE2JC06	NONE	228	130GPM, 5HP	Spellman Basement	B04		12/30/1900	Y		SCHWP-1
191	3	Secondary Chilled Water Pump 2		Taco	US	KV3009	KV3009AE2JC06	NONE	228	130GPM, 5HP	Spellman Basement	B04		12/30/1900	Y		SCHWP-2
192	3	Secondary Chilled Water Pump 3		Taco	US	KV4009	KV4009AE2KCD9	NONE	355	380GPM, 10HP	Spellman Basement	B04		12/30/1900	Y		SCHWP-3
193	3	Secondary Chilled Water Pump 4		Taco	US	KV4009	KV4009AE2KCD9	NONE	355	380GPM, 10HP	Spellman Basement	B04		12/30/1900	Y		SCHWP-4
194	3	Cabinet Heater 1		Sterling	US	W-1070-04	W-1070-04	NONE	128	47"X17.5"X25"H	Spellman 1st Floor	ST1-1		12/30/1900	N		CH-1
195	3	Cabinet Heater 2		Sterling	US	W-1070-04	W-1070-04	NONE	128	47"X17.5"X25"H	Spellman 1st Floor	ST2-1		12/30/1900	N		CH-2
196	3	Cabinet Heater 3		Sterling	US	W-1070-06	W-1070-06	NONE	167	53"X17.5"X25"H	Spellman 1st Floor	101		12/30/1900	N		CH-3
197	3	Unit Heater 1		Daikin	US	UHH-86	663010500	707048998	52	25.75"X8.5"X19"H	Spellman Boiler Rm	018		12/30/1900	Y		UH-1
198	3	Unit Heater 2		Daikin	US	UHH-86	663010500	707048997	52	25.75"X8.5"X19"H	Spellman Fire Pump	023		12/30/1900	Y		UH-2

Appendix G: Real Property Project Acceptance Checklist

The Real Property Project Acceptance Checklist shows the required documents that must be completed by DPW, the contractor, the tenant, or the Environmental personnel.

Real Property Project Acceptance Checklist

Building Number: _____

IJO/Contract Number: _____

Required Documentation

DD Form 1354	DPW/Contractor	☐	
DA Form 4283/ IJO (In House Work)	DPW	☐	☐ N/A
DD 1391	DPW/Tenant	☐	☐ N/A
Statement of Work	DPW	☐	
Contract (all pages)	DPW	☐	
Contract modification(s) (all pages)	DPW	☐	
List of IBE w/model and serial number (1 hard copy and 1 CD)	Contractor	☐	
List of EIF w/model and serial number (1 hard copy and 1 CD)	Contractor	☐	
Warranty Plan w/ Table of Contents (3 hard copy and 1 CD)	Contractor	☐	
O&M Manuals w/ Table of Contents (2 hard copy and 1 CD)	Contractor	☐	
Keys labeled with an inventory sheet (as needed)	Contractor	☐	☐ N/A
As-Builts (2 hard copy and 1 CD with AutoCad or MicroStation file)	Contractor	☐	
List of User Training conducted with the BASOPS Contractor	Contractor Fire	☐	
Occupancy Permit	Dept/DPW	☐	
Construction Deficiencies (punch list)	DPW/Contractor	☐	
Photo(s) of final construction, each line item listed on the DD1354	Contractor	☐	
Facility Hand Receipt Holder Appointment Orders	Tenant	☐	
Construction General Permit Notice of Termination (NOT)	Contractor	☐	
As-Builts for storm water management facilities to Environmental	Contractor	☐	☐ N/A
BMP Final Inspection/Acceptance Form	Environmental	☐	☐ N/A

Appendix H: Sample of BUILDER Custom Reports: Final 1 through 5

Appendix H has a sample of BUILDER Custom Report Final 1 through 5. Figure H-1–Figure H-5 show the different reports available in BUILDER and the information in each.

Figure H-1. Facility summary report.

 Final 1 - Facility Summary Report Generated From BUILDER SMS on: 6/17/2019 1:34:53 PM VS20150911												
Inst Code	Installation Name	RPUID	Bldg Num	Bldg Name	Category Code [English UoM / Metric UoM]	Floors	Area	Const Year	PRV	BCI	CRV	Component
36993	West Point Military Reservation	370135	00500	YOUTH ACTV CTR	74066 - YOUTH CENTER - [SF / SM]	1	16,011	1996	\$4,245,085	86	\$3,970,106	85
36993	West Point Military Reservation	359574	00603	WP COMMUNITY CLUB	74046 - CONSOL OPEN DIN - [SF / SM]	4	38,866	1902	\$11,876,284	72	\$12,420,198	321
36993	West Point Military Reservation	359869	00913	WASHINGTON RD STHS	44220 - STORAGE GP INST - [SF / SM]	1	4,155	1976	\$798,251	80	\$990,473	54
36993	West Point Military Reservation	359535	00917	WASHINGTON RD STHS	44220 - STORAGE GP INST - [SF / SM]	1	34,490	1977	\$6,619,167	79	\$6,508,332	141
36993	West Point Military Reservation	1152476	00951	USMAPS PHYS FIT CTR (B951)	17125 - PE TNG BUILDING - [SF / SM]	1	20,640	2012	\$7,206,941	91	\$3,937,816	43
36993	West Point Military Reservation	358516	01379	USMA RECLYCLE FAC	89133 - REFUSE/GARB BLD - [SF / SM]	1	6,942	2001	\$857,191	78	\$1,755,613	61
36993	West Point Military Reservation	358513	00600	USMA HQ BLDG	14182 - BDE HQ BLDG - [SF / SM]	11	81,747	1909	\$33,577,000	87	\$26,098,416	526
36993	West Point Military Reservation	360042	00721	USMA CENTRAL FIREHOUSE	73010 - FIRE STATION - [SF / SM]	2	7,815	1939	\$3,629,276	76	\$2,327,429	130
36993	West Point Military Reservation	360040	00702	USCC STHS/MEDICAL WAREHOUSE	44220 - STORAGE GP INST - [SF / SM]	1	9,600	1962	\$1,859,000	86	\$2,266,641	115
36993	West Point Military Reservation	360038	00654	UPH ENL BKS W/O MESS	61050 - ADMIN GEN PURP - [SF / SM]	1	8,729	1943	\$3,267,143	72	\$2,259,685	123
36993	West Point Military Reservation	360036	00662	UPH ENL BKS	72114 - TT ENL BARRACKS - [SF / SM]	3	8,765	1943	\$3,914,541	74	\$3,141,899	118
36993	West Point Military Reservation	360034	00624	UPH BKS	72111 - ENLISTED UPH - [SF / SM]	3	60,243	1908	\$27,180,637	65	\$17,440,761	362
36993	West Point Military Reservation	360026	00717	TRUXTON HALL LACROSSE BLDG	17125 - PE TNG BUILDING - [SF / SM]	1	7,100	1987	\$2,479,132	69	\$1,582,417	89
36993	West Point Military Reservation	360025	00148	TROPHY PT DIA QTRS	74022 - SKILL DEV (NA) - [SF / SM]	3	2,999	1890	\$631,157	67	\$1,027,436	93
36993	West Point Military Reservation	1064969	01946	TMP ADMINISTRATION	21885 - MNT GEN PURPOSE - [SF / SM]	1	12,588	2010	\$5,208,032	90	\$3,349,602	124
36993	West Point Military Reservation	360009	00601	THAYER HALL	17120 - GEN INST BLDG - [SF / SM]	4	443,282	1909	\$154,113,000	74	\$67,945,207	636
36993	West Point Military Reservation	359804	00618	THAYER GATE PUBLIC RESTRM	73075 - SEP TOIL/SHOWER - [SF / SM]	1	2,450	1954	\$683,107	73	\$998,446	54
36993	West Point Military Reservation	358977	01203	STONEY SATELLITE FIRE STA 2	73010 - FIRE STATION - [SF / SM]	1	11,609	2001	\$5,134,481	90	\$7,194,940	156
36993	West Point Military Reservation	375745	01204	STONEY LONESOME PX	74053 - EXCH MAIN STORE - [SF / SM]	2	87,365	2000	\$15,261,695	88	\$15,702,012	254
36993	West Point Military Reservation	600372	00616	STEM LAW ENFORCE CTR	73016 - POLICE/MP STA - [SF / SM]	1	12,345	1994	\$4,057,599	84	\$4,776,338	121
36993	West Point Military Reservation	375500	00656	SR ENL BKS	73028 - DRUG/ALC ABUSE - [SF / SM]	3	9,048	1943	\$2,895,404	76	\$3,337,803	137
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	13131 - INFO PROC CTR - [SF / SM]	5	94,048	1984	\$45,815,346	89	\$27,239,592	429
36993	West Point Military Reservation	375681	00738	SHERMAN BKS	72111 - ENLISTED UPH - [SF / SM]	6	110,834	1960	\$33,168,000	74	\$26,055,177	301
36993	West Point Military Reservation	375678	0623A	SHEA STADIUM PE STOR BLDG	74075 - REC SPT FAC - [SF / SM]	1	3,792	2000	\$445,998	91	\$804,545	53

Figure H-2. System summary report.

 Final 2 - System Summary Report Generated From BUILDER SMS on: 6/17/2019 1:36:14 PM VS20150702										
Installation Code	Installation Name	Special Area	RPUID	Bldg Num	Const Year	BCI	System	System C.I.	System C.I.	System C.I.
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	A10 FOUNDATIONS	87		\$397,593
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	A20 BASEMENT CONSTRUCTION	88		\$259,514
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	B10 SUPERSTRUCTURE	84		\$6,320,393
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	B20 EXTERIOR ENCLOSURE	84		\$1,943,473
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	B30 ROOFING	93		\$275,644
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	C10 INTERIOR CONSTRUCTION	89		\$2,185,853
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	C20 STAIRS	95		\$341,886
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	C30 INTERIOR FINISHES	93		\$1,397,161
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	D10 CONVEYING	90		\$359,671
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	D20 PLUMBING	89		\$1,043,635
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	D30 HVAC	95		\$8,477,348
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	D40 FIRE PROTECTION	72		\$2,137,868
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	D50 ELECTRICAL	95		\$2,091,433
36993	West Point Military Reservation	West Point Military Reservation	375498	02101	1984	89	E10 EQUIPMENT	87		\$8,120

Figure H-3. Component details report.

 Final 3 - Component Details Report Generated From BUILDER SMS on: 6/17/2019 1:39:09 PM VS20150702																
Installation Code	Installation Name	RP/UD	Bldg Num	Bldg Name	Area	System	Component	Mat/Equip Type	Comp Type	Section Name	Section Year	Section Year Source	Quantity	UM	CRV	CI
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Strip Footing	N/A	1965	Input	552	LF	\$70,378	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Spread Footing	N/A	1965	Input	49	EA	\$36,790	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A10 FOUNDATIONS	A1030 SLAB ON GRADE	A103002 STRUCTURAL SLAB ON GRADE	General	EAST	1965	Input	13,115	SF	\$179,539	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A10 FOUNDATIONS	A1030 SLAB ON GRADE	A103002 STRUCTURAL SLAB ON GRADE	General	WEST	1965	Input	8,100	SF	\$110,886	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A20 BASEMENT CONSTRUCTION	A2020 BASEMENT WALLS	A202001 BASEMENT WALL CONSTRUCTION	General	EAST-GROUND FLOOR	1965	Input	2,484	SF	\$114,785	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	A20 BASEMENT CONSTRUCTION	A2020 BASEMENT WALLS	A202001 BASEMENT WALL CONSTRUCTION	General	WEST	1965	Input	3,132	SF	\$144,729	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	EAST FL1	1965	Input	13,115	SF	\$209,070	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	EAST FL2	1965	Input	13,115	SF	\$209,070	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	EAST FL3	1965	Input	13,115	SF	\$209,070	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	EAST FL4	1965	Input	13,115	SF	\$209,070	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	EAST GF	1965	Input	13,115	SF	\$209,070	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	WEST FL1	1965	Input	8,100	SF	\$129,124	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST FL1	1965	Input	13,115	SF	\$479,842	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST FL2	1965	Input	13,115	SF	\$479,842	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST FL3	1965	Input	13,115	SF	\$479,842	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST FL4	1965	Input	13,115	SF	\$479,842	83
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST GF	1965	Input	13,115	SF	\$479,842	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	WEST FL1	1965	Input	8,100	SF	\$296,357	88
36993	West Point Military Reservation	375498	02101	SPELLMAN HALL	94,048	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101006 RAMPS	General	EAST	2018	Input	80	SF	\$22,318	96

Figure H-4. Equipment details report.

Final 4 - Equipment Details Report															
Generated From BUILDER SMS on: 6/17/2019 1:49:31 PM															
V320150702															
Installation Name	RPUID	Bldg Num	Mat / Equip Type	Component Type	Section Name	Section Year	Section Year Source	Quantity	UM	CRV	CI	RSL ID Number	Equipment Type	Equipment Make	Model
West Point Military Reservation	375498	02101	D101002 PASSENGER ELEVATORS	Traction Geared Elevators - 2500 lb., 5 floors, 200 FPM	N/A	2017	Input	1	EA	\$318,224	94	19 NA	NA	NA	54 OD
West Point Military Reservation	375498	02101	D101005 DUMBWAITERS	Electric	N/A	1965	Input	1	EA	\$41,447	61	2 NA	NA	NA	NA
West Point Military Reservation	375498	02101	D202002 VALVES & HYDRANTS	Backflow Preventer - 1" pipe	GROUND - ROOM 010	2000	Input	1	EA	\$1,789	59	5 NA	DOMESTIC BACKFLOW PREVENTER	WATTS	909
West Point Military Reservation	375498	02101	D202003 DOMESTIC WATER EQUIPMENT	Water Heaters, Commercial, Gas - 500 MBH input, 480 GPH	GROUND - ROOM 018 - DWH-1	2018	Input	1	EA	\$43,240	100	9 NA	DOMESTIC WATER HEATER	LOCHINVAR	SNA5011
West Point Military Reservation	375498	02101	D202003 DOMESTIC WATER EQUIPMENT	Water Heaters, Commercial, Gas - 500 MBH input, 480 GPH	GROUND - ROOM 018 - DWH-2	2018	Input	1	EA	\$43,240	100	9 NA	DOMESTIC WATER HEATER	LOCHINVAR	SNA5011
West Point Military Reservation	375498	02101	D301002 GAS SUPPLY SYSTEM	Fuel Storage Tank - Fuel Storage Tank, 1000 GAL	GROUND LEVEL FIRE PUMP ROOM TANK 1	2018	Input	1	EA	\$6,974	97	41 NA	DIESEL		MH5086-
West Point Military Reservation	375498	02101	D301002 GAS SUPPLY SYSTEM	Fuel Storage Tank - Fuel Storage Tank, 1000 GAL	GROUND LEVEL FIRE PUMP ROOM TANK 2	2018	Input	1	EA	\$6,974	97	41 NA	DIESEL		MH5086-
West Point Military Reservation	375498	02101	D302001 BOILERS	Gas, Hot Water - 1200-1800 MBH	BOILER 1	2009	Input	1	EA	\$92,566	87	17 NA	GAS-FIRED CONDENSING	HARSCO THERMIFIC	N-1500-2
West Point Military Reservation	375498	02101	D302001 BOILERS	Gas, Hot Water - 1200-1800 MBH	BOILER 2	2009	Input	1	EA	\$92,566	87	17 NA	GAS-FIRED CONDENSING	HARSCO THERMIFIC	N-1500-2
West Point Military Reservation	375498	02101	D302001 BOILERS	Gas, Hot Water - 1200-1800 MBH	BOILER 3	2009	Input	1	EA	\$92,566	87	17 NA	GAS-FIRED CONDENSING	HARSCO THERMIFIC	N-1500-2
West Point Military Reservation	375498	02101	D302004 AUXILIARY EQUIPMENT	Chemical Feedwater - 175 PSIG, 5 gallon	BASEMENT CF-CHW	2018	Input	1	EA	\$2,075	93	16 NA	CHILLED WATER LOOP		BF-050X
West Point Military Reservation	375498	02101	D302004 AUXILIARY EQUIPMENT	Chemical Feedwater - 175 PSIG, 5 gallon	BOILER ROOM CF-HHW	2018	Input	1	EA	\$2,075	93	16 NA	FLOOR MOUNT		BF-050X
West Point Military Reservation	375498	02101	D302004 AUXILIARY EQUIPMENT	Expansion Tank - 135 gal	BOILER ROOM HW-ET-1	2018	Input	1	EA	\$4,427	95	24 NA	NA		CA450-1
West Point Military Reservation	375498	02101	D302004 AUXILIARY EQUIPMENT	Expansion Tank - 60 gal	BASEMENT CHW-ET-1	2018	Input	1	EA	\$2,614	95	24 NA	CHILLED WATER LOOP		CA215-1
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-1	2018	Input	1	EA	\$206,897	93	16 NA	SCROLL R410A		WGZ130
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-2	2018	Input	1	EA	\$206,897	93	16 NA	SCROLL R410A		WGZ130
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled - 150 TN	BASEMENT CHILLER-3	2018	Input	1	EA	\$206,897	93	16 NA	SCROLL R410A		WGZ130
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-1	2018	Input	1	EA	\$68,203	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 19-2h
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-2	2018	Input	1	EA	\$68,203	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 19-2h
West Point Military Reservation	375498	02101	D303001 CHILLED WATER SYSTEMS	Cooling Tower, Stainless Steel - 110 TN	SOUTHWEST PAD CT-3	2018	Input	1	EA	\$68,203	93	12 NA	AXIAL PROPELLER INDUCED DRAFT COUNTER FLOW		AT 19-2h
West Point Military Reservation	375498	02101	D303002 DIRECT EXPANSION SYSTEMS	Condenser, DX, Air Cooled - Direct Drive, 14 ton	HIGH ROOF ACCU-1	2018	Input	1	EA	\$8,270	93	12 NA	ACCU TELCOM RMS R410A DUCTLESS VRF 9 WALL	CITY MULTI	PUHY-P
West Point Military Reservation	375498	02101	D304001 AIR DISTRIBUTION, HEATING & COOLING	Air Separator - Air control, air separator, 12" diameter, includes strainer	BOILER ROOM HHW-AS	2018	Input	1	EA	\$2,264	96	28 NA	NA		AC06F-1
West Point Military Reservation	375498	02101	D304001 AIR DISTRIBUTION, HEATING & COOLING	Air Separator - Air control, air separator, 12" diameter, includes strainer	CHILLER ROOM CHW-AS	2018	Input	1	EA	\$2,264	96	28 NA	NA		AC06-12
West Point Military Reservation	375498	02101	D304003 HOT WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BOILER ROOM HWP-1	2018	Input	1	EA	\$36,305	93	16 NA	IN-LINE WITH VFD		KV2508# M
West Point Military Reservation	375498	02101	D304003 HOT WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 5" size, 15 HP, to 1000 GPM	BOILER ROOM HWP-2	2018	Input	1	EA	\$36,305	93	16 NA	IN-LINE WITH VFD		KV2508# M
West Point Military Reservation	375498	02101	D304003 HOT WATER DISTRIBUTION SYSTEMS	Heat Exchanger, Plate Type - 1200 GPM	BASEMENT HE-1	2018	Input	1	EA	\$169,261	93	16 NA	NA		A06-FG
West Point Military Reservation	375498	02101	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 3" size, 5 HP, to 225 GPM	BASEMENT PCHWP-1	2018	Input	1	EA	\$23,701	93	16 NA	IN-LINE PRIMARY CHW WITH VFD		NA

Figure H-5. Inspection summary report.

 Final 5 - Inspection Summary Report Generated From BUILDER SMS on: 6/17/2019 1:43:51 PM VS20150702																
Inst Code	Installation Name	RPUID	Bldg Num	Bldg Name	Component	Mat / Equip	Component Type	Section Name	Quantity	UM	Section Year	Section Year Source	Inspection Date	Inspection Type	Inspection Rating	Inspector
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	A1030 SLAB ON GRADE	A103002 STRUCTURAL SLAB ON GRADE	General	EAST	13.115	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	A1030 SLAB ON GRADE	A103002 STRUCTURAL SLAB ON GRADE	General	WEST	8.100	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	A2020 BASEMENT WALLS	A202001 BASEMENT WALL CONSTRUCTION	General	EAST-GROUND FLOOR	2.484	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	A2020 BASEMENT WALLS	A202001 BASEMENT WALL CONSTRUCTION	General	WEST	3.132	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	EAST GF	13.115	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Slab - CIP Concrete	WEST FL1	8.100	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B1010 FLOOR CONSTRUCTION	B101006 RAMPS	General	EAST	80	SF	2018	Input	1/14/2019	Direct	95	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Brick Veneer w/CMU Backup	EAST-EAST	6.064	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Brick Veneer w/CMU Backup	EAST-NORTH	1.952	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Brick Veneer w/CMU Backup	EAST-SOUTH	1.952	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Brick Veneer w/CMU Backup	EAST-WEST	6.064	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	EAST-EAST	2.305	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	EAST-NORTH	1.045	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	EAST-SOUTH	746	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	EAST-WEST	1.675	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	WEST-EAST	350	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	WEST-NORTH	1.455	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	WEST-SOUTH	1.634	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	CIP Concrete	WEST-WEST	2.366	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201005 EXTERIOR LOUVERS & SCREENS	General	NORTH	38	SF	1965	Input	1/15/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201005 EXTERIOR LOUVERS & SCREENS	General	SOUTH	99	SF	1965	Input	1/15/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201005 EXTERIOR LOUVERS & SCREENS	General	WEST	77	SF	1965	Input	1/15/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201006 BALCONY WALLS & HANDRAILS	Ladder	N/A	25	LF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201007 EXTERIOR SOFFITS	General	NORTH	840	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2010 EXTERIOR WALLS	B201007 EXTERIOR SOFFITS	General	SOUTH	840	SF	1965	Input	1/14/2019	Direct	88	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2020 EXTERIOR WINDOWS	B202001 WINDOWS	General	EAST-ALUMINUM-75	1.930	SF	1965	Input	1/14/2019	Direct	71	Patroni, Jose
56993	West Point Military Reservation	375498	02101	SPELLMAN HALL	B2020 EXTERIOR WINDOWS	B202001 WINDOWS	General	NORTH-ALUMINUM-15	896	SF	1965	Input	1/14/2019	Direct	71	Patroni, Jose

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14. ABSTRACT The Army has many enterprise Operation and Maintenance (O&M) systems that require manual input of the same facility data collected throughout the facility life cycle. This manual input of data costs Army installations valuable time and labor. A standardized approach to deliver the O&M information in a consistent, accurate, timely, and digital method for expedited input into the numerous systems is needed. A United States Army Corps of Engineers (USACE)-led team consisting of O&M subject matter experts within USACE and industry developed a standardized process for collecting and exchanging facility data for downstream applications. The process is defined in the Engineering and Construction Bulletin (ECB) 2018-6 and includes utilization of Unified Facilities Guide Specification (UFGS) 01 78 24.00 10. An initial pilot study verified that asset data collected during facility construction could effectively be imported into the Army General Fund Enterprise Business System (GFEBS). This second pilot study focused on facilitating the import of facility asset and equipment data collected during construction into the BUILDER Sustainment Management System (SMS) web-based software application. The project scope included investigation of current Army installations' processes as they relate to BUILD-ER SMS as well as initial testing of information transfer approaches.					
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