Updated 01.22.2018

Air Force Civil Engineer Sustainment Management Systems Playbook

SMS – Overview

Introduction

We are at the forefront of establishing a DoD-wide Built Infrastructure Assessment (BIA) process that institutes standard processes throughout the Air Force for all built infrastructure. The ability to anticipate built infrastructure weaknesses, thereby minimizing deterioration and failure as part of daily operations, is on the horizon and will significantly change how we budget, plan, and prioritize built infrastructure requirements. Bases that embrace this paradigm shift will reap the benefits much earlier than those that do not.

The Air Force Civil Engineer Center (AFCEC) Operations Directorate (AFCEC/CO) is actively managing the Air Force-wide implementation of the Sustainment Management System (SMS), a suite of web-based software applications developed by the Army Corps of Engineers to help leadership, facility engineers, technicians, and AMP and sub-AMP managers decide when, where, and how to best maintain Civil Engineer's (CE) built infrastructure. The figure below details the different SMS systems and their corresponding applications.

Sustainment Management System Applications

SMS	Background	Current Deployment	How to use in FY17	End State
PAVER™ 	1970s • Airfield Pavements, Pavements • Pavement Condition Index (PCI™)	AF wide implementation	Likelihood of Failure factor from SMS Condition index & Engineering Assessment	Combination of SMS generated requirements and TRIRIGA programmed requirements will… Replace FSM & 2% PRV as our primary budget drivers
ROOFER™	1980s • Roof Condition Index	Limited AF use	Integrated with SMS BUILDER System	
RAILER™ 	1980s • AF Rail System	DLA funds railroad inspections for rails used by DLA on AF bases, others inspected in-house or by contract		
BUILDER™ 	1990s • Bldg Envelope, Water System, Mech System, Fire Protection, Electric / Lighting • Vertical Facility Condition Index (FCI)	AF wide implementation	Likelihood of Failure factor from SMS Condition Index	
FUELER™ 	TBD • Fuel Systems	New module, under development with DLA funding		
UTILITIES 	TBD • Utility Distro Sys	New module, under development by CERL		

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Base-Level Application

At the installation level, SMS provides scenario, trend, and cost analysis capabilities. SMS automates the means of exploring different action plans under various budget scenarios. SMS's Work Item Cost Analysis tool determines the return and return-on-investment (ROI) for each work activity type (i.e., do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a given item. This makes multi-year work plans easier to formulate and funding requests easier to justify. Further, a base can analyze the total dollar amount attributed to an asset (e.g., heating, ventilation, & air conditioning [HVAC] unit) over its lifespan against its relative condition, perform root cause analysis, and determine if a project exists to remedy the problem.

SMS's condition index trend analysis can search through base inventory to estimate the best time to initiate maintenance or repairs several years in advance, helping bases prepare out-year budgets and lower the total asset lifecycle cost of ownership. Bases can anticipate the optimum time (i.e., the "sweet spot") to repair specific components and minimize the penalty costs incurred from deferring maintenance and later determine if work performed did in fact reduce the number of issues recorded against a given asset, resulting in lifecycle cost savings. Work items not completed in one year will be generated the following year at a higher cost due to inflation. Repair work types are increased by the cost of additional deterioration. Constrained scenario analysis provides insight into what parts of the inventory will suffer at a given funding level. As a result, bases will see optimal facility performance out of the dollars invested.

Real Benefits

Even in its early stages, users of SMS are realizing the benefits of this powerful tool. To realize the benefits of SMS and implement proactive asset management principles, bases must establish an updated inventory. With the help of AFCEC's Asset Visibility Team (AVT), the 721 Civil Engineering Squadron (CES) at Cheyenne Mountain Air Force Station (CMAFS) inventoried and assessed nearly 400,000 square feet, or 98 percent, of the installation in only four days, noting the condition according to predefined standards in SMS. CMAFS's Deputy Mission Support Group Commander Steven Rose, stated that implementing BUILDER with the help of AFCEC secured $8M in funding for issues previously unidentified. Before BUILDER implementation, facility assets only gained attention if something broke, while other unidentified issues existed and were left to fester. This drives to the basic principle of SMS: proactive condition assessments avoid reactive service calls.

On a larger scale, the 97 CES at Altus Air Force Base inventoried and assessed four million square feet of base facilities in four months, a rate of 100,000 square feet per day. Altus designed its own Microsoft Access database to cross-reference failing facilities in SMS to projects scheduled in the Automated Civil Engineer System – Project Management (ACES-PM) and the resources expended against the asset. To support commanders' ability to make data-driven decisions, Altus visually illustrated facilities in need of project funding and articulated root causes of recurring issues. Thus, at Altus, SMS served as an advocacy tool; SMS ensured needed resources were allocated appropriately.

Good Data Rolls Up

SMS provides enterprise-wide asset visibility of condition and geographic data, enabling higher levels of CE leadership to project long-term built infrastructure requirements. CE can also supplement or validate requirements models for the development of Activity Management Plans (AMP) that feed the Program Objectives Memorandum (POM) budgeting process and assist in the development of projects for inclusion in the Comprehensive Asset Management Plan (CAMP). The Air Force can apply asset management principles to its real property portfolio based on current data, which is essential in a highly resource-constrained environment.

OSD Requirements

In addition to the urgency in managing CE's built infrastructure portfolio, the Department of Defense (DoD) mandated that all facilities and components in the Real Property Asset Database (RPAD) be inspected and rated using SMS or alternate data system which generates Facility Condition Index (FCI) by September 2017 to coincide with concurrent Financial Improvement and Audit Readiness (FIAR) requirements. Currently, the Air Force uses different methodologies (e.g., E-Comet) for assessing the condition of its assets. Disparate condition assessment systems result in an inability to accurately plan, program, and budget work for facilities. Further, it blurs the connection between asset management best practices and benefits, such as reduced workloads and project funding based on more refined future year requirements. There is an immediate need to provide guidance (i.e., a standard assessment

process) to the field to achieve the mission of standardizing, collecting, analyzing, validating, and maintaining accurate horizontal and vertical infrastructure data to support resource allocation and operational decisions.

Implementation Support

To deploy and optimize the use of SMS and comply with the DoD mandate, AFCEC/CO developed this SMS Playbook to publish the SMS Implementation Plan and provide standardized, base-level guidance for conducting BIA. The Playbook incorporates input (e.g., successes, best practices, lessons learned) from Operations Engineering elements at several bases. Sections on SMS-specific guidance (e.g., SMS – Facilities Guidance: BUILDER) describe roles and responsibilities, desired outcomes, data sources, references, prioritization criteria, and practical examples for leveraging SMS outputs to inform requirements. This Playbook consumes the information currently contained in the FCA and Linear Infrastructure Playbooks, which will be retired.

More Than a Mandate

As another element of CE Transformation and CE's asset management philosophy, SMS represents a shift toward a proactive versus reactive asset management strategy. Instead of keeping assets operational throughout their lifecycle by relying primarily on corrective repairs, this strategy focuses on condition-based repairs, which can be planned prior to an asset's failure with the support of SMS. This results in higher performing assets at lower lifecycle costs. When fully developed, base-level users will experience a powerful, user-friendly tool to support daily operations. AFCEC and Headquarters AF/A4C will achieve enterprise-wide asset visibility to inform wide-scale resource allocation and strategic planning. SMS establishes a knowledge base that makes built infrastructure data more complete, consistent, reliable, and accessible.

Policy Adherence

The table below highlights the primary policy drivers of the SMS process. For a more detailed explanation, see the DoD Memorandum, *Standardizing Facility Condition Assessments*, in the References section of this Playbook.

POLICY	APPLICABILITY
Executive Order (EO) 13327, Federal Real Property Asset Management (2004)	• Requires all DoD Components to adopt a common process for conducting BIA • Requires a Facility Condition Index (FCI) to be recorded for all real property assets. Per Real Property Inventory (RPI) Reporting guidelines, Condition Index (CI) is a required data element for all real property assets and is defined as, "a general measure of the constructed asset's condition at a specific point in time. CI (also referred to as (FCI), is calculated as the ratio of Repair (and Maintenance) Needs to Plant Replacement Value (PRV)"
National Defense Authorization Act (NDAA) 2010	• Identifies September 30, 2017 as the date for when financial statements of the DoD shall be audit ready (i.e., FCIs for every asset in the RPAD are a necessary metric for audit readiness)
DoD Memorandum, Standardizing Facility Condition Assessments (2013)	• Requires all DoD Components to adopt a common process that incorporates the SMS modules developed by the United States Army Corps of Engineers' (USACE) Engineering Research & Development Center's (ERDC) Construction Engineering Research Laboratory (CERL) • Requires all DoD components to properly record an FCI for each Real Property asset on their installations in their respective real property databases

Playbook Purpose

The purpose of this Playbook is to provide standardized and centralized base-level guidance to conduct BIA, record BIA data into the appropriate SMS or comparable system repository, and utilize the SMS outputs to analyze, plan, and forecast future work requirements. By adhering to this guidance, base-level civil engineers will comply with EO 13327, NDAA 2010, and the DoD Memo: *Standardizing Facility Condition Assessments*. Further, following SMS guidance supports the foundations for doing asset management for the CE Enterprise, which is contained in Program Area Directive (PAD) 07-02 and PAD 12-03. Executing this process will enable the DoD to optimize the service life of all facilities across its entire asset portfolio, thus enabling a better ability for the DoD to achieve its mission even in the midst of tightening Congressional budgets

Note: SMS implementation across the Air Force will be an on-going effort for years to come. Portions of the SMS Playbook are still under development as implementation and guidance for several of the systems (e.g., U.SMS and RAILER) are defined. This "living" Playbook will incorporate updates as both SMS Implementation and corresponding SMS modules mature, and it will serve as a prime repository for the latest information on implementation strategy and SMS/asset-specific best practices.

Operations Flight Labor Reporting for SMS Activities

Shop craftsmen that are assigned to actual time accounting (ATA) cost centers and are performing BIA (e.g., as members of an installation Built Infrastructure Assessment team [BIAT]) function in an overhead role. In keeping with the Requirements and Optimization (R&O) section and Operations Engineering flight classification as an exception time accounting (ETA) work section, ATA personnel should be loaned to the Operations Support/R&O 435 ETA cost center. More information is available on the Operations Work Force Management portal site.

Frequency of SMS Assessments

Installations will sustain and accurately maintain the SMS database on a regular, recurring, and routine basis. Sub-AMP Managers and working groups (at AFCEC and base) will work with their units to include timely and responsive Real Property Capitalization updates to SMS data as a standard process of Work Order closeouts and new equipment installations.

SMS data should be updated each time recurring, preventive, and corrective work has been completed. As craftsmen visit a facility to perform corrective or preventive maintenance, management should establish a standard process and allow time for craftsmen to annotate any discrepancies with the asset and either update the data base or provide that data to R&O to update. After meeting the September 2017 deadline for completing initial assessments, Office of the Secretary of Defense (OSD) guidance mandates that installations complete approximately 20% of their SMS re-assessment cycle per year (i.e., 20% of total square footage).

Sub-AMP Managers and working groups must ensure that BIAs occur as automatically scheduled within SMS and/or at least once every five years.

SMS – Implementation Plan: Overview

Purpose

Provide guidance and coordinate efforts related to implementing SMS across the Air Force CE enterprise. This plan addresses those issues common to all SMS component systems. Individual implementation plans are being developed to address the specific tasks associated with implementing each of the specific SMS component systems (e.g., BUILDER, PAVER, and those in development). The overall purpose of this plan is to coordinate all SMS efforts with the outcome being standardized processes as an integral part of day-to-day business practices resulting in accurate and consistent asset data across the Air Force portfolio.

Data Sources and Data Exchanges

- **Real Property Data:** Real property accountability information required for SMS modules will be sourced only from an authoritative system (e.g., GFEBS, DRRS-A, iNFADs, DRRS-N, TRIRIGA, and DRRS-AF). All real property information must be Real Property Information Model (RPIM) compliant

- **Geospatial Data:** When GIS data is used to represent DoD real property assets, the SMS community/users will use GIS data from the component's designated authoritative source. In most cases, this should be the component Installation Geospatial Information & Services (IGI&S) program of record. DoDI 4165.14 will clarify the requirement for GIS data representing the location and extent of real property assets, and references the applicable DoD standards for developing and maintaining such data. All geospatial data shall be compliant with the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) in its most current version

- **Real Property Facility Quality Rate:** SMS modules will become the only authoritative data sources to populate the FCI into the real property inventory system's "Real Property Facility Quality Rate" data field

- **System Reconciliations:** Before October of each year, DoD Components shall reconcile data between SMS modules and their real property database

Condition Index Reporting

SMS-computed FCI will be entered in the "Facility Physical Quality Rate" data field for all assets on an installation's real property database. This includes the CIs for facilities occupied/used by tenant organizations per DoDI 4165.70, "*Real Property Management*." CI data validation is to be annotated by the Real Property Office (RPO) who codes an "Asset Review Type Code" with "INSP" and entering the corresponding review date into the real property asset's record. No recorded inspection data shall be older than five years.

Real Property Assets Not Supported by a SMS Tool: Currently, there are SMS modules for Transportation Networks and Airfield Pavements; buildings; roofs; and railways. Modules for other built infrastructure (e.g., utilities and liquid fuel systems) are under various phases of investigation and development by CERL. For assets not presently supported with a SMS module, assessments shall be conducted with qualified personnel to determine existing physical deficiencies, estimate the cost of maintenance and repairs, and/or restore the assets to dependable operation using established industry cost guides to derive the FCI (e.g., Defense Logistics Agency [DLA]) use of the American Petroleum institute's standard or assessing liquid fuels systems).

Inspection and Data Update Frequency: Installations will follow the user manual for each SMS tool to perform BIA. The SMS tools are designed to allow facility maintenance technicians the ability to update facility data as they are performing their normal preventive maintenance rounds or responding to service calls. However, the condition data of each asset shall undergo a comprehensive validation on no less than a five-year cycle at minimum (an average of 20% of installation assets should be re-assessed annually). It is recommended that condition validation coincides with the real property physical inventory requirement described in DoDI 4165.14, *Real Property Inventory and Forecasting*, Enclosure 3, para. 6.

Key Milestones

SMS implementation begins now. All real property assets shall have a validated FCI by September 2017. Implementation of SMS across Air Force assets will be an on-going effort for years to come since the various SMS components are at differing levels of maturity and it will take some time to fully work through the process changes.

- By March 2016:
    - SMS Facilities data will be adequately populated to enable generation of infrastructure requirements to support development of the FY 17 Integrated Priority List (IPL), the FY 18 – 22 POM submission, the FY 17 – 19 Air Force Comprehensive Asset Management Plan (AFCAMP) and the FY 20 – 26 Air Force Activity Management Plan (AFAMP)

- By September 2017:
    - Linear segmentation will be completed for horizontal systems in accordance with the guidance provided in the AF/A7C memo dated 1 Apr 13, Subject: *Air Force Linear Segmentation Implementation Guidance*
    - Each asset in the Air Force built infrastructure portfolio (i.e., Facilities, Utilities, and Transportation Networks & Airfield Pavements (TNAP)) will have a facility condition index properly recorded in the real property data base based on inspections conducted using the SMS standard process completed for all facilities and facility components as required by the Office of the Under Secretary of Defense, Acquisition, Technology and Logistics (OUSD[AT&L]) memo dated 10 Sep 13, Subject: *Standardizing Facility Condition Assessment*
    - Sustaining, managing, and refining of SMS data will be fully incorporated into daily facility maintenance and repair activities. R&O normally does sustainment, management and refining of SMS data; which includes feedback from the facility maintenance and repair activities (known as Actual Time Accounting (ATA) Workgroups) as issues are identified and/or warranted during the corrective or preventive maintenance visits. Visit the AFCEC/COO series of Playbooks for further information.

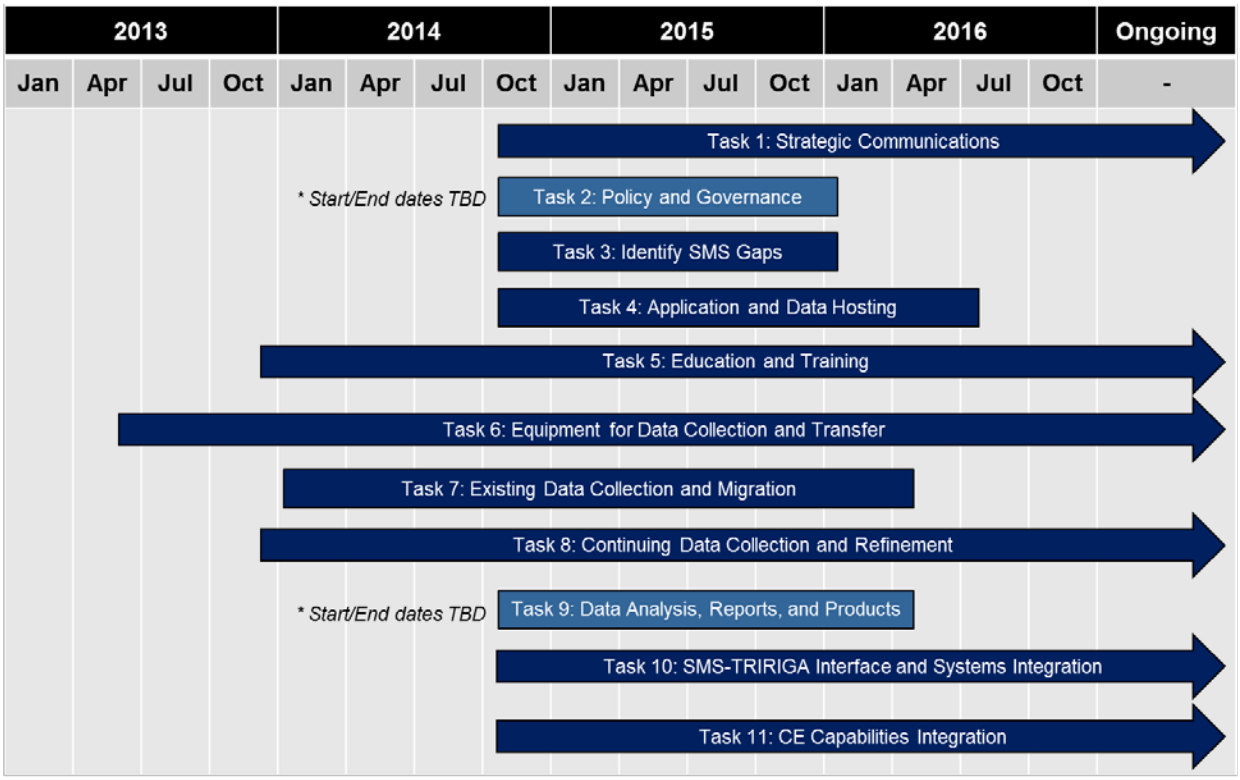
Roles and Responsibilities

ROLES	RESPONSIBILITIES
AF/A4C	AF/A4C will provide policy and guidance and advocate for resources as appropriate. Additionally, AF/A4C will provide: • Provide Sustainment Management System program oversight • Provide Geographic Information System (GIS) program oversight • Provide Real Property program oversight • Integrated information technology solutions

AFCEC	AFCEC will ensure that the standard operating procedures contained in this Playbook are compliant with procedures put forth by OSD in addition to the following: • Review all proposed changes to the Playbook • Propose revision to existing AFIs to incorporate SMS • Propose substantive Playbook updates affecting resourcing to the CE Corporate Structure for approval • Provide GIS expertise • Provide Real Property expertise • Track status of program implementation within AFIMSC • Advocate for centralized contract funding • Review and submit proposed changes to business rules and Playbook guidance and directives • Manage centralized contracts as needed • Assist the bases in executing BIA evaluations of real property assets and input data into SMS • Track status of program implementation & compliance with this implementation plan • Manage the centralized pavement evaluation program including programming and budgeting for pavement evaluations and pavement condition index (PCI) surveys • Incorporate language in MILCON project contracts to provide BIA information in the appropriate SMS format at the time of turnover • Obtain, where possible, enterprise-wide authority to operate (ATO) for IT systems associated with SMS
Base Civil Engineer Organizations	• Populate and maintain, with support and assistance of AFCEC, SMS with complete, current, and accurate asset data needed to generate sustainment, maintenance and repair requirements for the installation's built infrastructure • Incorporate ongoing built infrastructure asset data collection, validation, and management into day-to-day operations and maintenance activities • Assist AFCEC and MAJCOM with verifying/addressing SMS data issues • Use requirements identified by SMS to develop and program projects per AFCEC-provided business rules based on gap analysis and risk assessment efforts • Ensure vendors accomplishing maintenance/repair work by contract provide the needed updates to asset inventory/condition, including equipment/components, in the appropriate SMS format • Ensure that Base Maintenance Contracts have the necessary provision to perform BIA and maintain current and accurate data in the SMS database

Tasks

The following tasks outline the plan by which SMS will be implemented across the CE enterprise:



SMS Implementation Tasks

SMS – Implementation Plan, Task 1: Strategic Communications

Description

SMS represents a fundamental change in how business is conducted from installation level through to the Air Staff. Additionally, SMS implementation will be a very dynamic process. A strategic communication plan is needed to consistently provide current and accurate information to all levels of the CE enterprise to continually emphasize the purpose for SMS and to advise on developments.

Major Tasks

Completion of this task includes:

- Determine the various communities to be reached, the appropriate methods of communications for each community, and the appropriate schedule/frequency of communications for each community
- Develop templates for each communication outreach
- Task appropriate entities to provide communications per the established schedule

Estimated Completion Date

Ongoing

Reporting

- Monthly to the Sustainment Management System Implementation Working Group (SMSIWG)
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

Communications Plan

Scheduled Activities

TBD

Incorporating Feedback

Ongoing feedback is critical to ensuring guidance is clear and detailed for the bases. The Operations community has full access to the SMS Playbook on the CE Portal, which is the preeminent medium for communicating the latest information. On the CE Portal, there is the “Submit CE Portal Request” button in the upper right-hand corner of every page that readers can use to submit a question or feedback. These requests will be routed to AFCEC/CO for response. Additionally, the AFCEC Reachback Center collects calls and requests from across the CE enterprise and ensures that they are directed to the appropriate AFCEC office for a prompt response.

SMS – Implementation Plan, Task 2: Policy and Governance

Description

Given the value of SMS to managing the Air Force built infrastructure and the DoD mandate to use SMS to determine the FCI for every asset in the Real Property Assets Database, appropriate policy needs to be formulated and promulgated to ensure compliance with a standardized method of entering asset data and appropriate controls placed on who has what type of access to the system. Current Air Force Instructions (AFIs), Management Internal Control Toolsets (MICTs), Playbooks, and other guidance will require review and revision to institutionalize the use of SMS while ensuring that SMS implementation is being performed the same way.

Major Tasks

Completion of this task includes:

- Determine and implement SMS access controls
- Incorporate SMS usage in annual business rules development
- Review and adjust playbooks to incorporate SMS
- Review and revise AFIs/MICTs

Estimated Completion Date

31 Dec 15

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Group
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 3: Identify SMS Gaps

Description

There are a number of systems that are not currently addressed by a SMS (e.g., water treatment/distribution systems, wastewater collection/treatment systems, electrical generation/distribution systems, mechanical plant/distribution systems, bridges, dams, vehicle barriers, aircraft arresting systems, airfield lighting systems, and airfield markings). The purpose of this task is to identify what systems are not currently addressed by a SMS and task the appropriate team to find or develop SMS solutions for these systems.

Major Tasks

Completion of this task includes:

- Identify assets that are not currently addressed by a SMS
- Determine which systems need an SMS solution
- Estimate cost(s) to develop additional SMS tools
- Recommend approach for developing SMS solutions

Estimated Completion Date

31 Dec 15

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 4: Application and Data Hosting

Description

Current SMS applications and data are maintained on different servers (e.g., BUILDER and BUILDER data is hosted on servers at CERL, whereas PAVER and PAVER data is hosted at AFCEC-East). Having different SMS tools hosted by different entities complicates access issues and limits opportunities for efficient data storage. Alternative approaches to the hosting of SMS applications and data need to be considered and assessed so that highly reliable access and management of SMS can be as efficient as possible.

Major Tasks

- Identify alternatives for SMS hosting and estimate costs for each alternative
- Evaluate the alternatives
- Recommend SMS data hosting solution(s)

Estimated Completion Date

31 May 16

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 5: Education and Training

Description

Integrating the use of SMS into how Air Force CE does business will require initial training for those who will be using SMS. With some SMS components still in development, the training available will need to adjust as new systems are brought into being. Thus, this effort will likely require a series of alterations until all SMS systems have been developed, fielded, matured, and are fully functioning. Training for new personnel will also be required, either by establishing a stand-alone course, and/or by revising existing continuing education courses at the Air Force Institute of Technology (AFIT) and possibly other training venues.

Major Tasks

Completion of this task includes:

- Develop a schedule of training for each target audience (e.g., installation users, MAJCOM users and HAF/AFCEC users)
- Task appropriate teams to develop courses to be presented per the established schedule, keeping in mind revisions will be needed as SMS implementation matures
- Review and adjust AFIT/CE continuing education course curricula to incorporate SMS (may require a series of adjustments as SMS implementation matures)

Estimated Completion Date

Ongoing

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 6: Equipment for Data Collection and Transfer

Description

To fully exploit the capability of SMS, base-level personnel will need basic equipment that will allow them to capture facility condition data, whether as part of a scheduled BIA, routine periodic preventive maintenance, or service calls. In this task, alternatives to meet this need will be investigated and evaluated, and the process for procuring, distributing, and accounting for the equipment will be developed.

Major Tasks

Completion of this task includes:

- Assess equipment requirements to facilitate uploading/updating/refining SMS data
- Research alternative options and estimate their costs
- Evaluate alternatives and recommend solution
- Develop acquisition, distribution, training, and accountability strategies for equipment

Estimated Completion Date

Ongoing

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 7: Existing Data Collection and Migration

Description

MAJCOMs and installations have developed tools to provide SMS-like functionality and have collected a significant amount of data to support these systems. Data collected and residing in these systems, which can be used to populate SMS, needs to be identified and migrated into the SMS.

Major Tasks

Completion of this task includes:

- Find built infrastructure data (i.e., research where it resides), which should be migrated to SMS
- Research methods for migrating built infrastructure data and associated costs, both initially and on a recurring basis, where appropriate
- Evaluate costs/benefits of migrating built infrastructure data against the costs associated with re-collecting and inputting the data
- Recommend migration/collection approach
- Execute approved migration/collection decision

Estimated Completion Date

31 March 16

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 8: Continuing Data Collection and Refinement

Description

The data necessary to completely populate the SMS far exceeds what can be accumulated and uploaded in a year or two. Protocols are required to determine the frequency and intensity of inspections, plus what data needs to be entered/updated in a SMS to meet asset visibility needs.

Major Tasks

Completion of this task includes:

- Determine method(s) for initially populating SMS
- Develop methodology for continual data updating/refinement
- Complete linear segmentation for horizontal systems
- Develop methodology for standardizing and auditing data
- Determine if the right amount of data is being collected; request base input
- Estimate costs associated with collecting and maintaining data
- Develop standard contract language and tools to capture data from work performed by contract into SMS

Estimated Completion Date

Ongoing

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 9: Data Analysis, Reports, and Products

Description

The strength of SMS is in the analysis of the assessment data to determine investment or divestiture decisions**.** Budget constraints and reduced resources are driving the need for defendable investment choices. Protocols, detailed below, are necessary to identify the essential reports and analysis required to support investment decisions at the base level and provide visibility into enterprise-level asset management.

Base Level:

- Identify why the data important (i.e., how is it used to produce tangible results)
- Identify where SMS can create efficiencies in workload and resource allocation
- Incentivize bases to maintain the dataset and focus work

Air Force Level:

- Provide enterprise perspective on the health of systems
- Articulate benefits/risks of investment vs. non-investment decisions
- Support POM planning
- Create dashboards (for all levels) to provide visibility of Key Performance Indicators (KPI)

Applicable Reports

The table below lists applicable data analysis reports and products for each SMS component.

SMS	REPORT
BUILDER	Final 9 Report – Facility System Quick Review
	Final 4 - Equipment Details
	Final 7 - Work Action Summary
	QC3- Component Report
	QC5- Section Details
	QC6- Inspection Report
FUELER	TBD
PAVER	TBD
RAILER	TBD
ROOFER	TBD
Utilities	TBD

Major Tasks

Completion of this task includes:

- Populate a complete dataset that is actively maintained; (Tasks 1 – 9)
- Develop appropriate reports/products (e.g., installation prospectus) to capture tangible results (i.e., feed into asset management)

Estimated Completion Date

31 Mar 16

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

SMS – Implementation Plan, Task 10: SMS-TRIRIGA Interface & Systems Integration

Description

SMS represents a fundamental change in how business is conducted from the installation level through to the Air Staff. Additionally, SMS implementation will be a very dynamic process. A strategic communication plan is necessary to consistently provide information to all levels of the CE community to continually emphasize the purpose for SMS and to advise on developments.

Regarding TRIRIGA and SMS interfaces, a BUILDER-TRIRIGA interface is currently being developed and is scheduled for release in TRIRIGA version 2.1. The resulting interface will automate some of the tasks that, at this stage, need to be performed manually in each system. Guidance will be distributed as it becomes available.

Major Tasks

Completion of this task includes:

- Determine the various communities to be reached, the appropriate methods of communications for each community, and the appropriate schedule/frequency of communications for each community
- Develop templates for each communication outreach
- Task appropriate entities to provide communications per the established schedule

Estimated Completion Date

Ongoing

Reporting

- Monthly to the SMSIWG
- Quarterly to the Operations Program and Integration Program Groups
- Semi-annually to the Civil Engineer Council

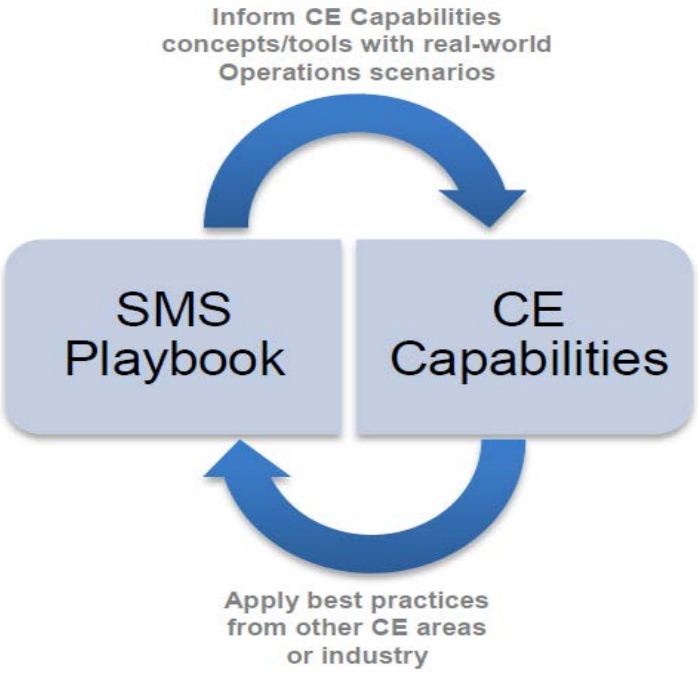
SMS – Implementation Plan, Task 11: CE Capabilities Integration

Description

The Directorate of Civil Engineers, Installation Strategy and Plans Division (A4CI) is conducting a business process reengineering (BPR) effort on an enterprise scale to improve and implement standardized CE processes. This Civil Engineering Capabilities process reengineering initiative, referred to as "CE Capabilities," will apply to all functional communities in CE (e.g., Operations, Environmental, Energy, Real Estate) and provide guidance in obtaining and maintaining total asset visibility, identifying requirements, and developing plans to address gaps and meet mission requirements. The vision is that everyone, on a fundamental level, will be performing core tasks the same way. For example, the way the Operations community conducts inventory and condition assessments on buildings will be, in essence, the same way that the Readiness community will conduct inventory and condition assessments on expeditionary equipment. The best practices identified and instituted in one part of CE have the opportunity of exporting themselves to other areas of CE. During implementation, CE will operationalize the changes using a range of updates to doctrine, organization, training, materiel, leadership and education, or policy (DOTMLP-P). Visit the CE Transformation page on the CE Portal for detailed information.

There is a natural partnership opportunity between the CE Capabilities and SMS efforts. Many CE Capabilities' concepts are founded in the SMS processes and principles, such as the enablement of total asset visibility to make informed decisions, develop justifiable requirements, and plan more reliably. The processes in this Playbook – assessing asset attributes, recording data in the system of record, and using that data for current and future needs – can serve as a real-world scenario to test CE Capabilities' processes and tools as they mature. Both efforts can benefit from this two-way communication and mutual learning.

Leadership is keenly aware of the costs associated with collecting data, and it has taken steps to outline future processes to be used for deriving, receiving, validating, and collecting CE asset data. Once published, changes to how data is derived, received, validated, and collected will need to follow these procedures.



SMS – CE Capabilities Relationship

Major Tasks

Completion of this task includes:

- Integrate CE Capabilities standardized terminology into SMS processes and guidance (e.g., “built infrastructure” in place of the general term, “facility”)
- Ensure periodic CE Capabilities representation at SMSIWG
- Coordinate real-world scenario testing of CE Capabilities’ concepts and tools, such as the Data Management Plan, Data Needs Request, Built Infrastructure Standards, etc.

Estimated Completion Date

Ongoing

Roles and Responsibilities

ROLES	RESPONSIBILITIES
CE Capabilities Initiative Oversight (AF/A4CI)	• Identify concepts and tools that would benefit from SMS input • Work with AFCEC/CO to coordinate testing with appropriate personnel • Participate in the SMSIWG, as appropriate
SMS Playbook Owner (AFCEC/CO)	• Remain aware of general CE Capabilities concepts and strategic intent • Inform evolution of SMS-related guidance and process standardization • Participate in testing of CE Capabilities concepts and tools to benefit broader CE community before implementation

Reporting

- Monthly to the SMSIWG
- Regular reporting to CE Capabilities Program Manager (OPR: CE Capabilities Team)

SMS – High Level

Introduction

This narrative describes the standardized and recurring process of conducting built infrastructure assessments, recording assessment data into a SMS tool or comparable information repository, and utilizing the system outputs to analyze, plan, and forecast future work requirements at the base and for Air Force Real Property Assets. The corresponding process map depicts an ongoing process. This process provides an initial framework for installations to comply with the DoD Facility Condition Assessment mandate. It also provides a framework to ensure a sustained data set beyond initial assessments.

Note 1: This process assumes that installations have a current and accurate inventory of each of their real property assets, and the base is currently addressing the DoD mandate requiring all real property assets to have a validated Facility Condition Index (FCI) by September 2017. As the Air Force implements the full suite of SMS, the SMS-derived FCIs will become the authoritative source in the real property records. Updates to real property records are made, as needed, while performing assessments.

Note 2: The CE asset class for built infrastructure includes buildings, structures, linear facilities (e.g., runways, roads, sidewalks, utilities, and railways), and Real Property Installed Equipment (RPIE). References to BIAs include the Facilities, Utilities, and TNAP AMPs. Terms are defined as:

- **Building**: A roofed and floored facility enclosed by exterior walls and consisting of one or more levels that is suitable for single or multiple functions
- **Structure**: A real property facility that is classified as other than a building, linear asset, or land
- **Linear Structure**: Infrastructure whose function requires that it traverse land (such as roads, rail, pipeline, utilities, fences, or pavement)
- **RPIE**: Government-owned or leased equipment that is permanently attached to and made part of buildings and structures (such as heating systems) but not movable equipment (such as plant equipment)

Measures of Success

AFCEC/CO defined the measures below as indicators of progress towards meeting the DoD mandate and overall data integrity across the SMSs. AFCEC/CO will conduct quarterly base data pulls to ascertain these measures.

MEASURES	CALCULATION	TARGET	BENEFIT
Inventory / assessment completion (as a measure of the initial assessment required to meet the DoD mandate); all assessments are considered "current" if performed within five years of the Sept 2017 mandate	**Prerequisite**: A facility is complete when all seven of the applicable key building systems are inventoried/assessed and recorded. If an applicable system is not assessed, then the facility is marked incomplete. If a facility does not have all seven key building systems, Data managers will remove the absent system(s) record from the facility and make corresponding comments within the SMS. **Facilities**: % of the installation's total square footage (as opposed to # of buildings) **Utilities**: % of total unit of measure (e.g., linear feet)	100% by September 2017	Compliance with DoD mandate to standardize Facility Condition Assessments, status tracking/troubleshooting

	TNAP: % of total unit of measure (e.g., linear feet, square yards for pavement)		
Data integrity (quality/accuracy)	Percent of quality/accurate data collected as measured through QC reports/data checks from SMS, Sub-AMP Manager validation, and field surveys. **Quality/Accuracy is comprised of**: 1. Current within five years 2. Validity of ratings (percent of ratings within a given set of parameters a. QC5 Report (inventoried but not assessed) b. Major leaps in CI from year to year c. MDI-based spot checks 3. Correlation between SMS data and RPAD data (as an indicator of alignment) a. Percent assets recorded in RPAD vs SMS b. Percent of assets that match CIs		Identify data manipulation, anomalies; audit readiness

Roles and Responsibilities

The roles and responsibilities defined here apply to all processes in this Playbook. Descriptions with more specificity are provided in the respective SMS process narratives.

ROLES	RESPONSIBILITIES
AMP Manager	• Determines number of data managers, assessors, and read-only users at their installation • Ensures accuracy of SMS data inputs for the installation **Note**: These responsibilities correspond to the AMP Manager role and responsibilities delineated in P-Plan, Vol 2, Sec 1.1; it is the base prerogative in determining how best to fulfill this role.
Sub-AMP Manager	• Serves as first line of defense in ensuring data quality data for each SMS • Manages the BIAT, ensuring data inputs are accurate, consistent, and understandable • Performs quality assurance after the BIAT's quality control efforts **Note**: these responsibilities correspond to the sub-AMP Manager role and responsibilities delineated in P-Plan, Vol 2, Sec 1.2; BCE can determine how best to fulfill this role
BIAT	• Conducts condition assessments • Initiates updates of RPI, as required • Updates asset work history • Inputs data into the SMS • Performs initial quality control prior to uploading to the SMS

Narrative

Entry from New Construction, Replacement, or Major Repair.
Entry from Initial Assessment Requirement.

Entry from Established Battle Rhythm or Recurring Requirement.

Process 1.0 – Conduct Built Infrastructure Assessment

This process provides guidance and instruction for base-level civil engineers to BIAs, record assessment data into the appropriate SMS, and, as required, update the RPI. The following triggers initiate this process:

- Facility changes, to include New Construction, Replacement, or Major Repair yielding a change in condition
- Initial Assessment to comply with the September 2013 DoD BUILDER mandate to standardize Facility Condition Assessments
- Established battle rhythm or recurring requirement, as determined by each base to maintain compliance (i.e., follow DoD mandate)

The BIAT coordinates assessment logistics with the base Asset Manager and conducts the assessment. After conducting the assessment, the BIAT performs quality control on the assessment data before uploading it into the appropriate SMS tool or comparable information repository. If required, the BIAT coordinates completion of the Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property,* or Air Force Form 123, *Request for Changed Use of Real Property,* with the base RPO to initiate the update of facility inventory data in ACES-RP. For example, updates to facility inventory data would be required following Capital Improvement, acquisition, or improvement to Real Property that increases an asset's or RPIE unit of measure.

Proceed to Process 2.0 Analyze and Plan Work.

Process 2.0 – Develop Current-Year Requirements

Once the BIAT uploads assessment data into the SMS, the SMS generates various reports to document FCI, work items, raw score lists, and consequence analysis models. The sub-AMP Manager conducts a quality check of the SMS outputs and works with the AMP Manager to coalesce those requirements into actionable tasks or into projects that meet the Work Requirements Review Board (WRRB) or Facilities Utilization Board (FUB) packages. The AMP Manager presents the prioritized list of requirements to the WRRB. The WRRB determines approval on projects and assigns execution responsibility (e.g., Operations or Engineering). In-house projects are executed via the Work Management Playbook, while Engineering projects are programmed for year of execution and sent to the FUB for approval and prioritization. When a project is approved and funded, it is executed via the Project Execution Playbook. Approved requirements that are not funded remain in the system as "deferred" requirements and are used to inform the Forecast process. Any requirements deemed invalid will be removed from the system.

Proceed to Work Management Playbook, Process 2.0 Create Service Request.

Forecast Out-Year Requirements

The Forecast process outlines how the Air Force will forecast future budget requirements, leveraging long-term projections enabled by SMS. Each SMS will also provide a consequence analysis of investment decisions, which will consider impacts of not funding or deferring funding of requirements, particularly with respect to impact to remaining service life and total cost of ownership of the assets. Additionally, SMS will consider the effects to probability of failure, consequence of failure, and resulting mission impacts. Forecasting provides visibility of needed work at the right time BEFORE costly and irreversible deterioration occurs. In addition, forecasting provides visibility into the scale of future requirements, which is integral to the process of developing procurement strategies and budgets.

End.

SMS – 1.0 Conduct Built Infrastructure Assessment

Introduction

The built infrastructure CE asset class includes Facilities, Utilities, TNAP (e.g., roads, sidewalks, and railways), and RPIE (i.e., equipment attached to and made part of buildings and structures). This process standardizes the collection and assessment of built infrastructure data, which informs a variety of asset management and investment planning work products (e.g., AMP). Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding within AFCAMP development and IPL execution.

Prior to conducting assessments, base AMP Managers generate reports from various systems of record to aid in the evaluation and prioritization of assets according to their value to the mission (i.e., MDI) and current condition. From there, they identify, train, and equip a BIAT, staffed either internally, or by contract, to perform the assessment. However, regarding the assessments of bridges, airfield pavements, and rails, AFCEC Teams/AFCEC Consultants form BIAT due to AFCEC's central management of these assets. The BIAT is comprised of different roles and experts depending on the asset(s) in need of assessment. The BIAT coordinates their approach with the applicable base Asset Manager(s) and performs the assessments, collecting and cleaning data prior to uploading to the applicable SMS. If at any time, a new asset is identified (e.g., found-on-base or requires a change in use), the sub-AMP Manager provides the RPO with Real Property data from the assessments, as doing so will directly affect the base's ability to leverage assessment data to make informed decisions in subsequent processes.

Roles and Responsibilities

Each of the following roles applies to the installation:

ROLES	RESPONSIBILITIES
AMP Manager	• Prioritizes the built infrastructure to be assessed based on data provided by the base sub-AMP Manager • Ensures on-base BIATs are formed, adequately resourced, and trained to perform assessments • Coordinates support for centrally-managed assessments
Sub-AMP Manager	• Drafts Air Force Form 123 or DD Form 1354 • Uploads data to SMS • Performs quality control analysis of SMS data
BIAT	• Coordinates with the AMP Manager and Asset Manager to arrange logistics and acquire pertinent facility data • Conducts inventory, assessments, and facility mapping • Updates work history • Performs initial calibration quality control of the data • Records data in the SMS • Performs a gap analysis of the SMS data and rectifies any issues following data entry. **Note:** BIATs may be in-house or contracted personnel/consultants. In the case of pavement assessments, this team is comprised of AFCEC or AFCEC Consultants

Narrative

Entry from Initial Assessment Requirement.
Entry from Recurring Assessment.

Step 1.1 – Generate prioritized list of built infrastructure to assess
Role: AMP Manager

The AMP Manager pulls reports from the applicable SMS component, Integrated Work Information Management System (IWIMS), and Automated Civil Engineering System (ACES) to identify the assets on the installation that are in greatest need for investment. Section 4.0, Reports and Tools, of the Operations Engineering Playbook provides instructions for accessing these systems and generating reports.

The AMP Manager creates separate, prioritized assessment lists for each type of built infrastructure based on MDI, FCI, work order history, leadership feedback (e.g., facilities on the flight-line are the first priority), etc. Refer to the SMS-specific supplements for additional guidance regarding leveraging existing, canned data reports to aid in the prioritization of built infrastructure types (e.g., Final 9, Facility System Quick View for BUILDER). The output of this process is a prioritized assessment list. In accordance with the AMP, it is recommended that AMP Managers provide asset visibility across the Future Years Defense Program (FYDP) +2.

Tips/Reminders:

- To support assessment training, the AMP Manager may suggest the BIAT assess a Facility, perhaps one with a low MDI rating (i.e., a library), to test the assessment process and allow opportunities for practice, feedback, and baselining.

Proceed to Step 1.2.

Step 1.2 – Form assessment team(s)
Role: AMP Manager

After prioritizing, the built infrastructure needing assessment, and identifying the resources required to conduct them, the installation AMP Manager (or designee) will form the BIAT. If the assets to be assessed are centrally managed, the BIAT is formed by AFCEC. In all cases, the team will reflect the composition of the installation (e.g., military, contractor, civilian, mix) and should be selected according to a required skill level (e.g., five level or better), craft, and experience (e.g., minimum of two years). As needed, the AMP Manager or designee will contact the AFCEC Reachback Center (850-283-6995) with requests for support needed to perform the assessments in-house. At the end of this process, the AMP Manager will have identified, trained, and equipped a team necessary to conduct the assessments.

Tips/Reminders:

- Specific guidance related to identifying, training, and equipping assessment teams is located in the guidance sections of this Playbook (e.g., BIATs for pavements are formed at the AFCEC level, while BIATs for facilities are formed at the installation level)

Proceed to Step 1.3.

Step 1.3 – Pull inventory and assessment data
Role: BIAT

The BIAT pulls all current data to gather knowledge of the asset prior to conducting the assessments. For initial assessments, the team pulls as-built drawings (from electronic or flat files), GIS information (GeoBase), built infrastructure projects (ACES-PM), 7115 inventory report (ACES-Real Property [RP]), or work performed on or scheduled for the asset (IWIMS). For recurring assessments, the team uses the SMS to gather information generated since the last assessment.

Tips/Reminders:

- Standard Assessment Preparation Checklists are currently under development and will be organized according to asset type and discipline

Proceed to Step 1.4.

Step 1.4 – Coordinate with Asset Managers
Role: BIAT

The BIAT, or in the case of pavement assessments, AFCEC Team/AFCEC Consultants, works with the Asset Manager to discuss the current condition of facilities to be assessed, time of last maintenance, and any special considerations (e.g., security requirements, permits requirements, safety issues, photographic restrictions, entry authorizations, or flight line driver's licenses). The BIAT also provides an agreed upon schedule of assessments and locations prior to arrival. Installation-based (i.e., non-contracted) BIATs will likely already have access to necessary equipment. After reviewing the detailed information of the BIA needs and coordinating with the Asset Manager, the BIAT adds any missing inventory to the execution schedule to ensure full coverage of assessment needs.

IMPORTANT: Data must to be migrated to the most current version of Spatial Data Standard for Facilities, Infrastructure, and Environment (SDSFIE) (currently SDSFIE 3.1) prior to assessing and segmenting linear built infrastructure. Esri conversion tools, crosswalk software, and implementation videos are accessible on the CE Portal. Refer to the SMS – Utilities Guidance section of this Playbook for more information. Once data migration is complete, continue to Playbook Processes 1.6 for TNAP assessments or 1.9 for Utilities assessments.

Tips/Reminders:

- Asset Managers may include Facility Manager, Airfield Manager, Operations Superintendent, Operations Engineering, etc.

- A standard questionnaire may be used to retrieve required information from the Asset Manager

If 'Vertical built infrastructure,' proceed to Step 1.5.
If 'Linear built infrastructure,' proceed to Out-of-Scope Process, Migrate Data to GIS 3.1 Standard (MANDATORY).

Step 1.5 – Perform Facilities Condition Assessment
Role: BIAT

The BIAT conducts a physical assessment of the vertical assets and records data using standard assessment worksheets and data capture tools/software. See the SMS-specific guidance sections of this Playbook for specific assessment instructions and recommendations for data capture support.

If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPO.
If 'RP updates not necessary,' proceed to Step 1.13.

Process 1.6 – Perform TNAP Facility Mapping
Role: N/A

Once the RPO, GeoBase Office, Pavement Engineer, and Airfield Manager have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the pavements facility map created by the GeoBase Office. The team updates the map as required to ensure they account for 100% of the pavements assets in the RP database. The team allocates unassigned assets to a new or existing facility and creates separate pavement facility maps for the airfield, roads and parking networks. Linear assets are assigned according to usage, or category code (CATCODE); the Real Property Unique Identifier (RPUID) serves as the linkage between RP and GeoBase records, as opposed to facility identification (FACID).

Proceed to Process 1.7, Implement TNAP Segmentation Rules.

Process 1.7 – Implement TNAP Segmentation Rules
Role: BIAT

This process describes the method of assigning segments to a facility number on the GeoBase map and in the pavement management system. In order to ensure the entire pavement inventory is mapped consistently and accurately, pavement evaluation teams and contractors use this process when conducting a structural pavement evaluation or PCI survey. For pavements, bridges, and, in some cases, rails, this process is typically performed by centrally-managed AFCEC teams or consultants. Processes for other non-pavement assets are under development.

Proceed to Step 1.8.

Step 1.8 – Perform TNAP Condition Assessment
Role: BIAT

The AFCEC Team/AFCEC Consultant imports a shape file of the pavement facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/Consultant generates field inspection datasheets and conducts the field evaluation. Once the evaluation is complete, the AFCEC Team/Consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the pavement facility map using either AutoCAD or Esri software.

If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPO.
If 'RP updates not necessary,' proceed to Step 1.13.

Step 1.9 – Perform Utilities Facility Mapping
Role: BIAT

Once team has accumulated relevant data from their respective informational sources, they conduct a facility-by-facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% of the linear utilities assets in the RP database are accounted for. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or CATCODE; the RPUID serves as the linkage between RP and GeoBase records, as opposed to FACID.

Proceed to Process 1.10, Implement Utilities Segmentation Rules.

Process 1.10 – Implement Utilities Segmentation Rules
Role: N/A

After identifying and mapping utility facilities, the BIAT assigns segments to utility assets on the GeoBase map.

Proceed to Step 1.11.

Step 1.11 – Perform Utilities Condition Assessment
Role: BIAT

The BIAT collects data by physical examination of assets and, if applicable, determines what discrepancies exist in the current inventory or assessment data. The GeoBase Office incorporates any changes found by the Evaluation Team on the facility map.

Tips/Reminders:

- CE Operations provides support to the Evaluation Team in identifying linear segments and identifying essential non-linear components associated with linear assets

If 'RP updates necessary,' proceed to Process 1.12, Draft AF Form 123 or DD Form 1354 and submit to RPO.
If 'RP updates not necessary,' proceed to Step 1.13.

Step 1.12 Draft AF Form 123 or DD Form 1354 and submit to RPO
Role: BIAT/Sub-AMP Manager

If the BIAT identifies a change in use (i.e., change in CATCODE) for a built infrastructure asset, the sub-AMP Manager completes an Air Force Form 123, *Request for Changed Use of Real Property* and submits to the RPO to initiate an inspection to confirm that observation. Refer to the Appendix Form Guide of the Real Estate Transactions, Accountability, and Inventory Playbook for instructions for completing the AF Form 123.

A Department of Defense (DD) Form 1354, *Transfer and Acceptance of DoD Real Property* form is required to document an inventory adjustment (e.g., Found on Site) in the RPI. The sub-AMP Manager drafts the DD Form 1354 and submits to the Operations Flight Chief for review, who reviews and submits to the RPO to initiate an inspection to confirm the observation. The DD Form 1354 is then finalized through this collaborative review process until it is acceptable to make changes within the RPI. Newly found assets, are capitalized into the base RPI by the base RPO, in a timely manner.

Note: Roles and responsibilities for completing the various types of the DD Form 1354 are found in Chapter 3 of the Unified Facilities Criteria (UFC) 1-300-08, *the Criteria for Transfer and Acceptance of DoD Real Property*, whereas instructions for completing the form are found in Chapter 4.

Proceed to RETAI Playbook, Process 11.1 Prepare for Inventory, Step 11.1.3.

Real Estate Transactions, Accountability, and Inventory Playbook
Process 11.1 Prepare for Inventory, Step 11.1.3

This process illustrates the Installation RPO preparing the inventory requirements for a given year. The Installation RPO first ensures that all updates to TRIRIGA have taken place before retrieving a five-year inventory plan (three years for cultural/historical sites). The Installation RPO reviews the plan and identifies the RP that requires an inspection given a prescribed timeframe. The Installation RPO identifies who conducts the actual inspection and coordinates with CE partners, as applicable. The outcome of this process is a scheduled inspection visit with a designated inspector.

Proceed to Step 1.14.

Step 1.13 – Perform QC of Data
Role: BIAT

The BIAT performs a quality check of the samples according to the process and confidence levels recommended in the corresponding SMS-specific guidance. If using a remote data collection process, (e.g., BRED) this calculation can be determined by running a quality control report (refer to SMS-specific sections for additional guidance). Otherwise, additional, successive collection and analysis processes may be required to reach the level of confidence required to produce consistent quality in the data. The BIAT corrects any inaccuracies in the data prior to uploading into the SMS.

Proceed to Step 1.14.

Step 1.14 – Upload data
Role: BIAT

For initial or recurring assessments, the BIAT inputs data into the SMS or current system, either through remote or manual uploads. The sub-AMP Manager conducts quality checks of the data uploaded to the SMS. Refer to the SMS-specific guidance for specific instructions regarding uploading data and performing quality checks.

For New Construction, Major Repair, or Preventive Maintenance, the sub-AMP uploads inventory information into the appropriate SMS or current system using the as-built drawings, closeout paperwork, and information derived from available sources.

Tips/Reminders:

- BIAT members should input the data given their familiarity of the assets and knowledge of system. However, installations may perform data entry in a manner more suitable to the makeup of their team (e.g., use engineering assistants [EA] to support data entry)
- Available sources include Interim/Final DD Form 1354 or AF Form 332, and Shop records
- For replacement by contract, the 1354 is required; if performed in-house, the need for a 1354 will depend on the nature of the work performed. A field visit may be necessary to confirm the inventory data. The Data Manager updates the condition assessment data as necessary

Proceed to Process 2.0, Develop Current-Year Requirements.

SMS – 1.6 Perform TNAP Facility Mapping

Introduction

The objective of the TNAP infrastructure segmentation effort is to ensure we have an accurate accounting of the quantity, location, use, and condition of all TNAP assets. This objective is accomplished in three phases:

1. Creation of a TNAP facility map showing the location of each, airfield, road, and parking pavement facility in the RP record. The creation of a TNAP facility map must be a joint effort between the RPO, GeoBase Office, Transportation AMP Manager, Pavement Engineer/sub-AMP Manager, and Airfield Manager. The effort requires relevant data from each of these respective sources. In many cases, available information will be ambiguous or inadequate, which will require the team to make decisions that only the base personnel can make.

2. The second is segmentation of these TNAP facilities into branches and sections. This phase is accomplished by the AFCEC Team/AFCEC Consultants for airfields, roads, and parking.

3. The third is creation and processing of 1354s to document any changes or updates to the RP record. The base completes this phase of the process by using data generated by the AFCEC Team/AFCEC Consultants.

   Note: The RPO has final authority to change the facility numbers.

To initiate the mapping process, the GeoBase Office will create a map for all paved and unpaved airfield surfaces, and one for all paved and unpaved road, parking, and driveway surfaces. The RPO will provide a listing of all TNAP facilities in the RP record from ACES-RP. Other team members will provide additional information, including past pavement evaluation reports or other historical records such as construction drawings. The Facility Map Development Team will meet and conduct a facility-by-facility review of the TNAP assets in the RP record, assigning those facilities to their specific areas on the draft map created by the GeoBase Office. The team updates the map as required to ensure 100% of the TNAP assets in the RP database are accounted for.

When the team encounters unassigned assets or must make changes to the TNAP facilities documented in the RP record, it will follow the recommended standards outlined in this Playbook. If one does not already exist, each TNAP facility will be assigned a FACID by the base RPO. Air Force RP rules require that each of these facilities may only have one CATCODE associated with it. Once a new FACID is entered into ACES, it will ultimately be assigned a RPUID by OSD. The RPUID serves as the linkage between RP records and PAVER and GIS records in GeoBase.

Note: This Process serves as the Standard Operating Procedure (SOP) for Task 1*: Complete Pavement Facility Maps*, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

Roles and Responsibilities

Each of the following roles applies to the installation:

ROLES	RESPONSIBILITIES
AFCEC/COAP	• Provides support to the base facility mapping teams • Available as requested by the base for teleconferences or DCSs to assist the base in the facility mapping effort

Facility Map Development Team	• Assigned by the Base Civil Engineer (BCE) • Consists of participants from RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager. The Airfield Manager participates on an as-needed basis, specifically when airfield assets are involved **Note:** Ideally, the team described above is led by the RPO since it is ultimately responsible for the RP records. However, manpower or other considerations may dictate that the BCE appoint another person to lead the effort, with the understanding that all offices listed above will need to participate in the activity.

Narrative

Entry from Process 1.0, Step 1.4.

Step 1.6.1 – Review facility assignments
Role: Facility Map Development Team

The team will go down the tabular list of TNAP facilities sequentially, identifying the geospatial extents of each on the map based on the description of the facility in the RP record. For instance, if the description of the facility describes a transient apron, the team will mark the current area of the transient apron on the map. The team may discover a discrepancy between the area described in the RP record and the area identified on the map. In these cases, the team will look at other sources such as the old RP record cards (if they still exist), past pavement evaluation reports, previous imagery, or any other sources available to verify the geospatial extents shown on the map are correct. When determining the authoritative source of information, explicit descriptions in the RP record, as-built drawings, or documented surveys will take precedence. If these are not available, past pavement evaluations or old master plan tabs (e.g., E7) are the next best source of information. In other words, use the most authoritative, time-relevant document available.

There may be cases where the team does not have enough information to clearly define where a facility is located on the map. In these cases, the team will follow the standards outlined in this Playbook for designating TNAP facilities and use its best judgment to determine the geospatial extents of the facilities on the map. The team makes recommendations, but the RPO, as the process owner, makes the final decision in the event of competing recommendations.

Below are the specific tasks, by role, to be completed during the review of facility assignments:

- **RPO:** Recommends facility assignments based on a complete list of TNAP facility numbers and descriptions generated by ACES-RP, historical RP cards, and any other relevant records
- **GeoBase Office:** Provides a draft TNAP facility map, imagery (if the TNAP facility map does not already have imagery in the background), and old master plan tabs (especially E7 Tab for airfields)
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Provides branch and section maps, as well as construction history from current pavement evaluation reports and old reports that may help provide historical context for the team's decisions on the geospatial extents of each facility
- **Airfield Manager:** Provides recommendations to the team regarding geospatial extents of each airfield pavement facility and information on current use of airfield facilities

Proceed to Step 1.6.2.

Step 1.6.2 – Apply TNAP facility numbers to map
Role: Facility Map Development Team

The GeoBase Office representative makes any required adjustments to the map polygons and enters the correct TNAP facility numbers and RPUIDs into the appropriate feature classes (Note: this was the Section feature class in

Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) 3.0 and will be Linear_Structure_A in SDSFIE 3.1). An example of a TNAP facility map is provided in the Advice and Tips section of this narrative.

Proceed to Step 1.6.3.

Step 1.6.3 – Identify unassigned TNAP
Role: Facility Map Development Team

The GeoBase Office representative identifies any TNAP that do not have an assigned facility number and brings the updated map to the Facility Map Development Team to make facility assignment decisions. The team will follow the standards outlined in this playbook for designating TNAP facilities and use its best judgment to determine the geospatial extents of the facilities on the map. The GeoBase Office representative tracks any changes, updates the appropriate polygons and feature classes, and provides updated maps to the team for review.

Proceed to Step 1.6.4.

Step 1.6.4 – Verify current RP Inventory data
Role: Facility Map Development Team

The team verifies the CATCODEs for each TNAP facility are accurate based on current use. The team should refer to AFMAN 32-1084, *Facility Requirements for CATCODE* guidance. RPO guidance is to use the closest six-digit CATCODE available.

This final TNAP facility map will be provided to the AFCEC Team/AFCEC Consultants to perform the next step in the effort, which is linear segmentation. They will adjust and/or create branch and section polygons and assign these segments to their respective facilities. Note that substantiating documentation for any facility changes will not be completed until after segments are assigned to the facilities and the map is validated with a TNAP condition survey as outlined in Process 1.0. Once Step 1.8 is completed, supporting documentation is generated and the RP records are updated in Step 1.12.

Below are the specific tasks, by role, to be completed during the verification of current use and CATCODE assignment:

- **RPO:** Verifies that the CATCODEs are correct according to the RP records and designated current use
- **GeoBase Office:** Ensures that the mapping complies with SDSFIE 3.1
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Identifies any conflicts between the PCI survey/pavement evaluation records and the TNAP facility map. Additionally, the Base POC and/or Operations Engineer/TNAP AMP Manager provides information on current designation/use of TNAP
- **Airfield Manager:** Provides information on current designation/use of TNAP

Once the CATCODEs are verified, and the team has no more changes to the TNAP facility map, the team posts the draft TNAP facility map to the GeoBase system of record and sends to AFCEC/COAP (George.vansteenburg.1@us.af.mil) in PDF format.

Proceed to Step 1.6.4.

Step 1.6.5 – Review facility map and provide feedback
Role: AFCEC/COAP

AFCEC/COAP reviews draft TNAP facility map, provides feedback to the base, and meets with the base via teleconference or DCS to adjudicate any issues before the TNAP facility map goes final.

Proceed to Step 1.6.5.

Step 1.6.6 – Finalize facility map
Role: Facility Map Development Team

Once the CATCODEs are verified, and the Team has no more changes to the TNAP facility map, the Team finalizes the map in the GeoBase system of record and sends it to AFCEC/COAP (George.vansteenburg.1@us.af.mil) in PDF format.

Proceed to Process 1.7 Implement TNAP Segmentation Rules.

TNAP Facility Designation Process and Standards

- The GeoBase Office will typically use the common installation picture for the base as the starting point for developing the TNAP facility maps for airfield and roads and parking respectively. The map should show all load bearing pavement, as well as shoulders and any roads or parking areas. Showing all pavements on each respective map provides good reference points and helps the team ensure that they do not double count any pavements. Including any known TNAP facility numbers, as well as any information such as apron, taxiway, and runway names as well as buildings with building numbers can be beneficial as RP record cards often reference this information. Ideally, the draft map should be created such that it is laid over imagery for the base. If this is not possible, the team should at least have a hard copy of the most current imagery available

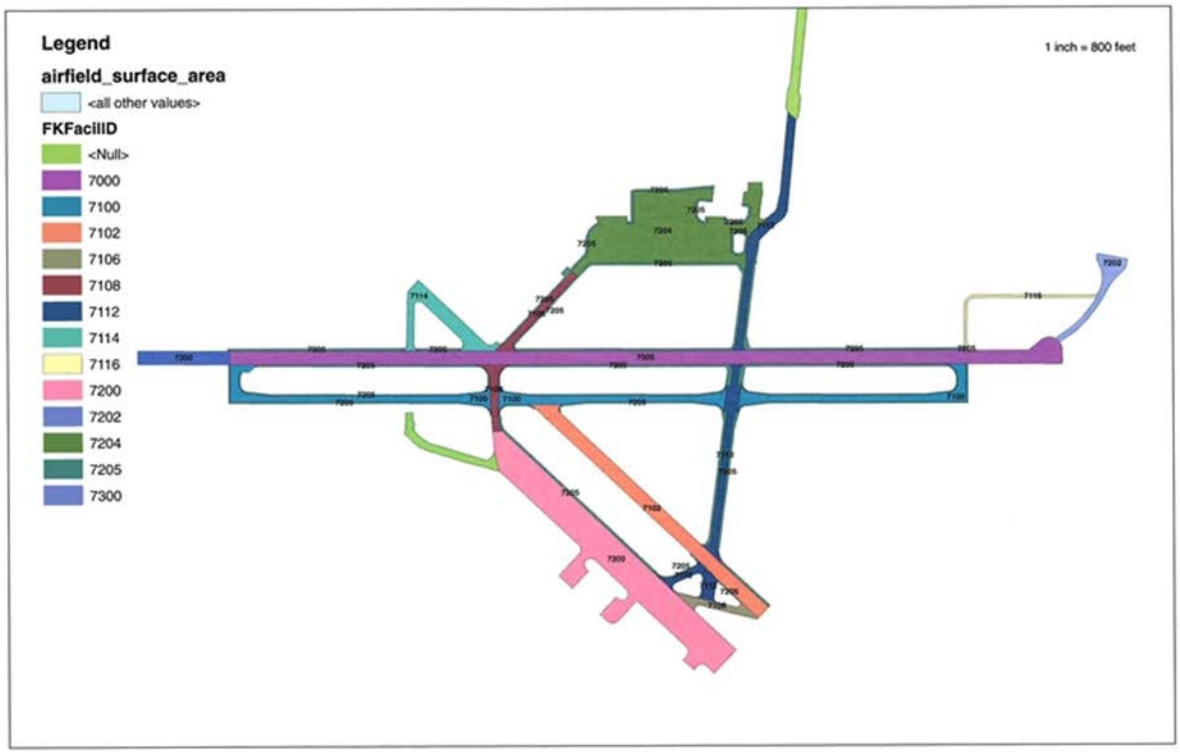
- Other essential information includes a RP report listing all of the TNAP facilities sorted by facility number with the CATCODE, category name, area, and any descriptions or notes that may be included in the RP database. The team should include a complete list of TNAP CATCODEs with the definition for each category as well as maps and construction history from the last PCI and structural evaluations

- Note that rules for determining TNAP facilities have been interpreted differently at each base, so there is a lot of variation from location to location. The primary constraint for creating a linear facility is that facilities can only be assigned a single CATCODE. For example, overruns (CATCODE 111115) cannot be combined in a facility with the main load-bearing surface of the runway (CATCODE 111111). The facility may also be created based on other criteria such as construction date as outlined in AFI 32-9005

- **Runway and Overrun Standard:** Create a facility number for the load-bearing surface of each runway. The two overruns for each runway will have one facility number. At a minimum, the shoulders for all runways will have a facility number. Do not create separate facilities for the concrete portions and asphalt portions of the runway, overruns, or shoulders

- **Taxiway Standard:** At a minimum create a facility number for all taxiways on the airfield and create a facility for all taxiway shoulders. Do not create separate facilities for the concrete portions and asphalt portions of the taxiways or taxiway shoulders. Note that the only pavements that should be included in a taxiway facility are those on a “named” taxiway such as Taxiway A, B, C, etc. Taxi lanes on aprons, pavements that provide access to aprons, or pavements that provide access to other pads or ramps will be included in the associated apron facility. If the base opts to create a multiple taxiway facilities, they should create one for each named taxiway while following the other guidance outlined above.

- **Apron Standard:** Create a facility for the load-bearing pavement of each large contiguous apron. Warm-up aprons and arm-de-arm pads with similar CATCODEs will be consolidated in a single facility even though they are not contiguous. Dispersed parking aprons (pads) along a named taxiway will be included in a single facility. Ata a minimum, include the shoulders for all aprons in a single facility. Do not create separate facilities for the concrete portions and asphalt portions of an apron or pad or the shoulders associated with these facilities



Langley Air Force Base FACIDs

- **Roads, Streets and Access Road Standard:** Create a facility for all contiguous roads under the same FAC on a site except where specific Real Property Information Model (RPIM) data element values necessitate a separate RPUID. For example, if a site has all contiguous roads but these roads have RPA Interest Type Code values of FEE, LEAS, and GVPV, there will be three separate asset records established. In addition, any access road not associated with a parking area that provides access to a building (for example, the road that goes to the front entrance of the Wing Headquarters building) should be considered part of the road facility. Unsurfaced roads are handled in a manner similar to paved roads. Do not create separate facilities for asphalt and concrete roads

- **Driveway Standard:** Driveways have been a particular issue in linear segmentation efforts to date. UFC 3-250-01FA, *Design of Roads Streets, Walks, and Open Storage Areas* clearly intend for the term driveway to be associated with a residence in housing areas. Bases will modify and existing TNAP facility designations to ensure that the driveway CATCODE 851145 will only be used only to refer to “driveway” pavements in housing. TNAP that access parking areas will be included in the associated parking area facility. Any other TNAP such as those that provide access to dumpsters, loading docks or buildings will be included in the associated road facility. Do not create separate facilities for concrete driveways and asphalt driveways. If warranted, the base can create a separate facility for all driveways in each housing area

- **Parking Area Standard**: Current OSD guidance states that each non-contiguous parking lot or open area storage area is a separate RP asset and is assigned its own RPUID. This mandate may cause issues and require significant manpower requirements in order to successfully implement. At a minimum, each base should create a facility for each given parking category code. There are currently six different category codes for surfaced and unsurfaced parking areas, which would equate to six facilities. As mentioned previously, parking areas include both the parking area itself and the access roads that serve it. Do not create separate facilities for concrete parking areas and asphalt parking areas. Note that AFCEC intends to pursue a request to OSD that would modify the RPIR data model to incorporate TNAP branches and possibly sections into the model. This would give OSD the level of fidelity they want without creating a separate facility for each non-contiguous parking area

Railway Facility Designation Process and Standards

Section under development

Bridge Facility Designation Process and Standards

Section under development

Signage Facility Designation Process and Standards

Section under development

SMS – 1.7 Implement TNAP Segmentation Rules

Introduction

This section of the SMS Playbook outlines general business rules for the linear segmentation of TNAP and provides visual examples of network component identification. Air Force Instruction (AFI) 32-1041, *Pavement Evaluation Program - Chapter 3, Linear Segmentation of Pavements* provides more detailed guidance for segmentation of road, parking, and airfield pavements. This portion of the playbook will be used primarily by the AFCEC Team/AFCEC Consultants, but is also provided here to provide a source of information for the bases.

Once the TNAP facility map is generated, the evaluation team or one of its consultants can begin the process of assigning pavement management system segments to the facilities. To ensure the entire TNAP inventory is mapped consistently and accurately, TNAP evaluation teams and contractors will use the process described herein when conducting a structural pavement evaluation or pavement condition index (PCI) survey. The AFCEC Team with consultation of the base POC retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process.

Note: This Process serves as the Standard Operating Procedure (SOP) for Task 2: Assign engineering pavement segmentation to real property pavement facilities, in the memorandum, *Air Force Linear Segmentation Implementation Guidance*, dated 1 April 2013.

Roles and Responsibilities

Each of the following roles applies to the installation:

ROLES	RESPONSIBILITIES
Real Property Office (RPO)	• Works with the GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team/AFCEC Consultants to conduct a review of the segment assignments on the Pavement Real Property Report and mapping portion of the PCI Reports • Retains final authority regarding any changes to the facilities/facility map resulting from this process
GeoBase Office	• Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants to ensure mapping meets Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) requirements
Base POC and/or Operations Engineer/TNAP AMP Manager	• Participates in reviews of segment assignments and PCI Reports provided by the AFCEC Team/AFCEC Consultants prior to publication of the final PCI Report • Retains final authority in accepting segmentation assignments
Airfield Manager	• Works with the Base POC and/or Operations Engineer/TNAP AMP Manager to review segment and TNAP rank assignments as well as PCI Reports provided by the AFCEC Team/AFCEC Consultants
AFCEC Team/ AFCEC Consultants	• Collects the data needed to properly assign the segments by performing a field evaluation. • Retrieves the latest TNAP facility map, and update the PAVER database to reflect those changes • Participates in the review of the segment assignments and draft the PCI Report • Retains final authority in accepting segmentation assignments

Narrative

Entry from Process 1.6 Perform TNAP Facility Mapping.

Step 1.7.1 – Retrieve latest facility maps for respective TNAP assets from GeoBase
Role: AFCEC Team/AFCEC Consultants

Pavements:

The AFCEC Team/AFCEC Consultant requests the latest TNAP facility map from the GeoBase Office.

Railways:

ERDC/AFCEC Team will request latest rail maps from GeoBase office

Bridges:

ERDC/AFCEC Team will request latest rail maps from GeoBase office

Proceed to Step 1.7.2.

Step 1.7.2 – Modify PAVER segments to follow segmentation rules
Role: AFCEC Team/AFCEC Consultants

The AFCEC Team/AFCEC Consultant updates segment assignments in PAVER to follow the rules described in AFI 32-1041, *Airfield Pavement Evaluation Program*.

Proceed to Step 1.7.3.

Step 1.7.3 – Assign segments to facilities
Role: AFCEC Team/AFCEC Consultants

The AFCEC Team/AFCEC Consultant categorizes the segments into branches/sections according to AFI 32-1041 and the Business Rules for TNAP Segmentation sand then assigns these segments to their respective facility in the mapping and PAVER database.

Proceed to Step 1.7.4.

Step 1.7.4 – Conduct segment assignment review
Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager collectively review the segment assignments and update any changes required to the TNAP facility mapping identified by the AFCEC Team/AFCEC Consultant. The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultants on any issues that may need correction prior to any fieldwork.

- **RPO:** Confirms that RP data is assigned correctly and obtains Pavement Real Property Report from AFCEC Team/AFCEC Consultant to determine if assignments affect facility areas on the map
- **GeoBase Office:** Provides input during the review
- **Base POC and/or Operations Engineer/TNAP AMP Manager:** Provides input during the review
- **Airfield Manager:** Provides input during review

- **AFCEC Team/AFCEC Consultants:** Identifies issues with the pavement facility map that must be resolved by Base

The RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager provide feedback to the AFCEC Team/AFCEC Consultant, who makes modifications to the segmentation plan prior to the field survey. The process of assigning segments to facilities may prompt a change in the facility map. In this case, the AFCEC Team/AFCEC Consultant will coordinate with the Facility Map Development team prior to conducting a PCI Survey or Structural Evaluation. In particular, any major mapping changes to the TNAP facility map will be sent back to the base for update.

If 'No Discrepancies,' proceed to Step 1.7.5.
If 'Discrepancies,' proceed to Step 1.7.3.

Step 1.7.5 – Update GIS mapping
Role: GeoBase Office

The GeoBase Office updates Geographic Information System (GIS) mapping to address any issues with the TNAP facility map identified by the AFCEC Team/AFCEC Consultant. Once updated, the GeoBase Office provides the updated materials to the AFCEC Team/AFCEC Consultant. The RPO, Base POC and/or Operations Engineer/TNAP AMP Manager, and Airfield Manager may be asked to provide input according to Process 1.6 Perform TNAP Facility Mapping.

Proceed to Step 1.7.6.

Step 1.7.6 – Review GIS mapping and conduct field evaluation
Role: AFCEC Team/AFCEC Consultants

The AFCEC Team/AFCEC Consultant imports a shape file of the TNAP facility map provided by the GeoBase Office into PAVER and makes branch and section assignments on the map from within PAVER. Next, the AFCEC Team/AFCEC Consultant generates field inspection datasheets and conducts the field evaluation.

Proceed to Step 1.7.7.

Step 1.7.7 – Update PAVER
Role: AFCEC Team/AFCEC Consultants

Once the fieldwork is complete, the AFCEC Team/AFCEC Consultant updates the PAVER database with the field data, including any updated branch and section information, and incorporates any changes to the TNAP facility map using either AutoCAD or Esri software.

Proceed to Step 1.7.8.

Step 1.7.8 – Perform analysis and write draft PCI Report
Role: AFCEC Team/AFCEC Consultants

The AFCEC Team/AFCEC Consultants runs PCI computations and generates a TNAP Real Property Report summarizing the area of each TNAP facility. The AFCEC Team/AFCEC Consultant provides the computations, TNAP Real Property Report, and updated TNAP facility map to the RPO, GeoBase Office, and Base POC and/or Operations Engineer/TNAP AMP Manager for the draft PCI Report. These documents include the AFCEC Team/AFCEC Consultant's recommended mapping changes.

A standard report layout is provided in the statement of work (SOW) for each PCI Survey contract. The AFCEC Team/AFCEC Consultant has standard report templates.

Proceed to Step 1.7.9.

Step 1.7.9 – Review draft PCI Report
Role: RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, Airfield Manager, AFCEC Team/AFCEC Consultant

The RPO, GeoBase Office, Base POC and/or Operations Engineer/TNAP AMP Manager, and AFCEC Team (without the AFCEC Survey Consultant) determine if any issues exist in the PCI Report regarding correctness and adherence to guidance described in Process 1.6 Perform TNAP Facility Mapping. If any issues exist in the PCI Report, the RPO, Base POC and/or Operations Engineer/TNAP AMP Manager and the GeoBase Office provide recommended corrections to the AFCEC Team/AFCEC Consultant, who incorporates feedback via Step 1.7.8. At this point, changes should be minimal, but the RPO still maintains responsibility to approve facility assignments/facility map changes.

If 'No changes,' proceed to Step 1.7.10.
If 'Changes,' proceed to Step 1.7.8.

Step 1.7.10 – Finalize and publish Structural Evaluation / PCI Report
Role: AFCEC Team/AFCEC Consultants

Once issues with the draft PCI Report are resolved, the AFCEC Team/AFCEC Consultant finalizes the Structural Evaluation/PCI Report and sends the final version to the base points of contact (POCs) and other stakeholders. The AFCEC Team/AFCEC Consultant will also post the report on the Air Force (AF) Pavement Evaluation Website.

Proceed to Step 1.8 Perform TNAP Condition Assessment

Additional Directions for AFCEC Teams/AFCEC Consultants

- **Runway:** Create a branch for the load-bearing surface of each runway at a base and assign the facility number and RPUID to that branch. At a minimum, create separate sections for the first 1000 feet on each end of the runway and the interior. These sections will have shredouts where the keel (center 75 feet of the runway) and the outers are further segmented. For example, the keel of section R01A will be designated R01A1 and the outers will be designated R01A2. Ensure that any taxi routes at the end of the runway are included in the keel section segment. Additional sections will be create based on pavement construction as required. In addition, create a branch for the overruns on each runway. Do not break out the keel and outers of the overrun, as done the load-bearing surface of the runway, but do create sections based on construction. Create a branch for the shoulders on each runway and segment the branch according to changes in construction. Do not assign a traffic area to shoulder pavements as done with load bearing pavements.

- **Taxiway:** Create a branch for the load-bearing surface of each named taxiway and a branch for the shoulders associated with each named taxiway. Create sections for each as appropriate based on construction. If a section crosses over multiple branches or facilities, use shredouts to distinguish between the segments of the section. For example, the portion of section T01A associated with Taxiway B would be designated T01A1 and the portion of the section associated with Taxiway C would be designated T01A2. Ensure that section boundaries align with branch boundaries and that both section and branch boundaries align with facility boundaries. In short, ensure there are no topology errors. If the base has divided a given named taxiway into multiple facilities, work with them to resolve this issue ensuring each named taxiway has no more than one facility associated with it. Every effort should be made to maintain the segmentation hierarchy. Note that taxi lanes on aprons and pavements that provide access to aprons or pads may have been given a 'T' section designation in past evaluations. Do not include these pavements in taxiway branches or facilities. These pavements sections should be included in the associated apron branch. Current plans are to allow the 'T' designation to remain on these pavements to maintain continuity with past evaluations.

- **Apron:** At a minimum, create a branch for each contiguous main apron. If a main apron is divided into multiple facilities, create a separate branch to align with each of these facilities. Create sections for each branch as appropriate based on construction. If a section crosses over multiple branches or facilities, use shredouts to distinguish between the segments of the section. For example, the portion of section A01A associated with the main apron would be designated A01A1 and the portion of the section associated with the transient apron would be designated A01A2. At a minimum, create a branch for non-contiguous aprons with

the same CATCODE combined in a single facility. For example, dispersed parking pads along Taxiway C are all in one facility. Create a branch to align with that facility. Once again, ensure alignment of facility, branch, and section boundaries to eliminate topology errors.

SMS – Process 1.9 Perform Utilities Facility Mapping

Introduction

Once the Real Property Office (RPO), GeoBase Office, and Civil Engineer (CE) Operations have accumulated relevant data from their respective informational sources, the representatives from these offices meet to form the Facility Map Development Team. The Facility Map Development Team conducts a facility-by-facility review of the utilities facility map created by the GeoBase Office. The team updates the map as required to ensure 100% of the linear utilities assets in the Real Property (RP) database are accounted for. Any unassigned linear assets will be assigned to either a new or an existing facility. Linear assets are assigned according to usage, or category code (CATCODE); the Real Property Unique Identifier (RPUID) serves as the linkage between RP and Geographic Information System (GIS) records, as opposed to facility identification (FACID). For a complete listing of CATCODEs, refer to the Air Force Category Codes document. Reference the following sections of this Playbook for specific guidance related to performing Utilities Facility Mapping:

- SMS Utilities Guidance
- SMS Utilities Guidance: FUELER
- SMS Utilities Guidance: U.SMS
- SMS Utilities Guidance: Linear Segmentation Rules for Utilities

Note: This Process serves as the Standard Operating Procedure (SOP) for Task 6: Complete utility maps at installations, in the memorandum, "Air Force Linear Segmentation Implementation Guidance," dated 1 April 2013.

Roles and Responsibilities

ROLES	RESPONSIBILITIES
Facility Map Development Team	• Supplies all relevant material for the facility map development meeting and assigning facilities on the map • Comprised of the RPO, the GeoBase Office, and CE Operations (including Operations Engineering, Shop, the relevant Activity Management Planning (AMP) Managers, and utility engineers). **Note**: As CE Transformation continues, the role of the AMP Manager and Sub-AMP Manager will increasingly focus on total system operations and accountability and will therefore become a more substantial role in this process. • **RPO**: Provides information pertaining to RPUID data elements, including the total amount of linear feet (LF) reported in RP records and facility number by CATCODE. • **GeoBase Office**: Examines existing documentation and assigns RP data to the GIS features. • **CE Operations:** Provides insight on actual data accumulated in the field and recorded in survey records

Narrative

Entry from Out-of-Scope Process Migrate to Data to GIS 3.1 Standard

Step 1.9.1 – Review facility assignments
Role: Facility Map Development Team

The team may complete this step by sequentially going down the tabular list of utilities CATCODEs provided by the RPO and identifying the geospatial extents of each facility on the map. Alternatively, the team may use the map as a guide, going from top to bottom, left to right, and checking off the CATCODEs as each are identified on the map.

Below are the specific tasks by role to be completed during the review of facility assignments:

- **RPO**: Provides information pertaining to RPUID data elements, including the total amount of LF reported in RP records and facility number by CATCODE

- **GeoBase Office**: Examines existing documentation and assigns RP data to the GIS features

- **CE Operations:** Recommends appropriate facility assignments for each utility plotted on GeoBase map

The team should refer to the Linear Segmentation Rules for Utilities section of this Playbook when making and evaluating recommendations. The team may need to determine if the utility asset described on the RP records is greater than or less than the data on the map. To investigate discrepancies, the team should examine old RP records, maintenance records, GeoBase data, surveys, or any other sources available to verify the geospatial extents. When making these decisions, explicit descriptions, such as as-built drawings or documented surveys, take precedence. If these are not available, the team should use the most authoritative document available.

Proceed to Step 1.9.2.

Step 1.9.2 – Apply utility facility numbers to map
Role: Facility Map Development Team

The team associates RP data by CATCODE with the geospatial data elements on the map. The GeoBase Office ensures that points, lines, and polygons exist for the utilities on the installation, and that the points, lines, and polygons can be linked to RP data (i.e., the correct RPUID is associated with the correct point, line, or polygon for that segment of the utility and is reflected in the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) 3.1 attribute table). In the event of competing recommendations, the RPO will make an executive decision.

Proceed to Step 1.9.3.

Step 1.9.3 – Identify unassigned utilities
Role: Facility Map Development Team

The team identifies any utilities that do not have an assigned facility number using the same procedure outlined in Step 9.2 to assign these areas to an existing facility or to make the determination that they should create a new facility. A new facility will only be created if no facility exists with a given CATCODE. Guidance on making these decisions can be found in AFI 32-9005, Real Property Accountability and Reporting.

Proceed to Step 1.9.4.

Step 1.9.4 – Verify current use and CATCODE
Role: Facility Map Development Team

The team verifies the CATCODEs for unassigned utilities from Step 9.3.

- **RPO:** Verifies that the CATCODEs are correct according to RP records. Additionally, the RPO should verify with the rest of the team to verify that the assigned CATCODEs correspond to current use

- **GeoBase Office:** Ensures that the mapping complies with current version of SDSFIE

- **CE Operations:** Provides information on current use of the asset

For further guidance on current use, the team should reference AFMAN 32-1084, *Facility Requirements*.

Proceed to Process 1.10 Implement Utilities Segmentation Rules.

SMS – Process 1.10 Implement Utilities Segmentation Rules

Introduction

This process describes how a base utilities linear segmentation team, composed of the GeoBase Office and Civil Engineer (CE) Operations (Shop and Operations Engineering), assigns segments to Air Force (AF)-owned facilities on the GeoBase map to ensure that all water and electric utilities are mapped consistently and accurately. The segmentation rules for utilities serve to provide a standardized method in attributing segments to utility facilities to be used across all bases. The Utilities Activity Management Plan (AMP) Manager retains final authority in accepting segmentation assignments; the Real Property Office (RPO) has final authority regarding any changes to the facilities/facility map resulting from this process. Reference the following sections of this Playbook for specific guidance related to implementing Utilities segmentation rules:

- SMS Utilities Guidance
- SMS Utilities Guidance: FUELER
- SMS Utilities Guidance: U.SMS
- SMS Utilities Guidance: Linear Segmentation Rules for Utilities

Roles and Responsibilities

ROLES	RESPONSIBILITIES
Real Property Office (RPO)	• Determines AF-owned assets and distinguishes between linear and non-linear assets • Has final authority regarding any changes to the facilities/facility map resulting from this process
GeoBase Office	• Identifies geographical/functional area of the linear utilities assets as well as the segment assignments • Creates a geometric network of segment groupings if the necessary technology capabilities are available • Supports in-house field evaluations • Incorporates necessary changes to the facility map following linear utilities assets evaluations
Civil Engineer (CE) Operations	• Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities assets based on maintenance records, and any other knowledge • Supports in-house field evaluations • Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments • Responsible for designing and/or managing the design of new utilities by ensuring designs meet linear segmentation guidelines and providing as-builts of existing utilities (where available) and new facilities upon completion. • The Shop assists in the identification of geographical / functional areas and segment grouping based on the linear segmentation rules for utilities
Evaluation Team	• Comprises of an in-house team of experts or a team of contractors with the necessary expertise • Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies

Narrative

Entry from Process 1.9 Perform Utilities Facility Mapping.

Step 1.10.1 – Determine if asset owned/maintained by AF
Role: RPO, CE Operations

The RPO examines the real property (RP) records, and CE Operations examines maintenance records to determine which assets are owned by the AF or are their responsibility to maintain.

Some overseas facilities are occupied by the AF but are maintained by the Army or Navy, in which case, these assets will be identified but not further segmented according to this process. Privatized assets, or assets owned by a host nation and not maintained by the AF, are not recorded in the Geographic Information System (GIS), or the system of record.

If 'Yes,' proceed to Step 1.10.3.
If 'No,' proceed to Step 1.10.2.

Step 1.10.2 – Identify utility system as a segment using acquired geometric data to identify boundaries
Role: GeoBase Office, CE Operations

An entity outside CE that owns the asset in question provides GeoBase data to establish the boundaries of maintenance/construction. These assets are identified on the GeoBase map but are not further segmented at this point. However, the asset's existence in the RP inventory is acknowledged.

- **GeoBase Office:** Determines the relevant boundaries and identifies which facilities may affect AF assets
- **CE Operations:** Identifies each system as a separate segment

If there are multiple utility systems that are not owned or maintained by the AF, each system is identified as a separate network. This method of identification and documentation will serve to clarify which facilities (e.g., valves, connection points, or backflow assemblies) can affect CE systems, for instance, in maintenance or emergency cases necessitating isolation. These systems identified in this step will not be further segmented at this point.

End.

Step 1.10.3 – Distinguish linear and non-linear assets based on RPUID, CATCODE, or FACID
Role: RPO, CE Operations

The RPO, Operations Engineering, and Shop identify all linear and non-linear assets based on the Real Property Unique Identifier (RPUID), category code (CATCODE), or facility identification (FACID). Linear assets are measured in linear feet (LF). Non-linear assets are measured in various units of measurement and for the most part are not segmented according to this process. If a non-linear component does not have an RPUID, it is accounted for as a non-linear component of an associated linear asset.

Proceed to Step 1.10.4.

Step 1.10.4 – Identify geographical/functional areas in GIS
Role: GeoBase Office, CE Operations

This step is recommended, but not required, and adds value by standardizing communication for referencing segments. Each base may address this in separate ways, as not all bases have established naming conventions.

The utilities linear segmentation team should identify the geographical/functional area for each utility asset on the facility map. The GeoBase Office records this information in the GIS, or system of record. Geographical/functional areas are defined by the base and can be different from base to base. Common naming of areas on base is Flight line, Cantonment, or Housing. However, the base may have other naming systems to aid its management of the segments, such as North-side, Sound-side, Campus, etc. The base areas may already be defined at any particular base, and the geographical/functional area naming serves as a management tool to breakup these base areas.

The geographical/functional area can also be identified by utility. The team should refer to the narrative for Linear Segmentation Rules for Utilities for further guidance on naming.

Proceed to Step 1.10.5.

Step 1.10.5 – Identify segments for each asset based on utilities segmentation rules
Role: GeoBase Office, CE Operations

The utilities linear segmentation team assigns/modifies/creates segments according to the linear segmentation naming and numbering rules. Non-linear assets associated with a linear utility RPUID will also be mapped by GeoBase. The team should refer to Linear Segmentation Rules for Utilities for further guidance.

Proceed to Step 1.10.6

Step 1.10.6 – Identify segment grouping
Role: GeoBase Office, CE Operations

A grouping is defined as the smallest amount of linear segment that can be isolated. This identification helps the base isolate and repair areas affected by outages or other emergencies.

- **GeoBase Office:** Identifies the grouping and marks the facility map accordingly. The GeoBase Office also creates a geometric network based on logical groups identified by the team

- **CE Operations:** Supports the identification of segment grouping

Not all bases may have the software capabilities to perform this analysis. Most GeoBase offices are working to obtain this functionality. The team should refer to Linear Segmentation Rules for Utilities for grouping details.

Proceed to Step 1.10.7.

Step 1.10.7 – Measure and validate total length of RPUID/CATCODE/FACID assets
Role: GeoBase Office, CE Operations

The GeoBase Office calculates summary statistics of the linear assets comprising a facility and verifies the data with CE Operations.

The GeoBase Office and CE Operations collectively determine if all segment areas have been plotted on the facility map. Non-linear assets associated with a linear utility asset will be included in this discrepancy analysis. If all segments have been identified, the team produces the required documentation to initiate updates to RP records.

If 'No issues,' proceed to Process 1.12 Coordinate RP Inventory Updates.
If 'Issues,' proceed to Step 1.10.8.

Step 1.10.8 – Identify scope of discrepancy resolution effort
Role: GeoBase Office, CE Operations

The team compares the total LF documented during the implementation of linear segmentation rules and identifies discrepancies against RP data. The team determines if a discrepancy exists in the quality of the LF data collected or in the accuracy of the RP records. Corrective action may require resurveying the segments if LF data is inaccurate or incomplete or submitting substantiating documentation to adjust the RP records to reflect the actual LF.

Based on manpower, resources, and leadership support, the base determines if an in-house evaluation is feasible. Additionally, the base may not have the expertise to complete an evaluation. If an in-house evaluation is not feasible, a team of contractors performs the evaluation.

If 'In-House,' proceed to Step 1.10.9.
If 'Requires contract work,' proceed to Out-of-Scope Process Program and Fund Contracted Project.

Step 1.10.9 – Conduct training or kick-off meeting for Evaluation Team
Role: GeoBase Office, CE Operations

A kick-off meeting is always conducted before the evaluation team begins work. Training is conducted, as needed, in conjunction with the kick-off meeting when substantial base manpower is included in the evaluation effort or when the evaluation team does not have the knowledge necessary to conduct an evaluation.

If dealing with a contracted team for the evaluation, the relevant Project Manager should be asked to train the evaluation team on the specific methodology and format employed for capturing data. Additionally, the following actors will provide support in the case of a contracted evaluation team:

- **GeoBase Office:** Provides necessary information, including existing geometric data, and maps
- **Operations Engineering:** Demonstrates to the Evaluation Team how to properly employ the specific naming conventions for geographical / functional segments
- **Shop:** Attends kick-off meeting and training as necessary to provide support for Operations Engineering

Proceed to Step 1.10.10.

Step 1.10.10 – Collect data based on linear segmentation rules
Role: GeoBase Office, CE Operations, Evaluation Team

The data collection effort involves the following roles:

- **GeoBase:** Provides evaluation team personnel in the case of in-house evaluations
- **CE Operations:** Provides support to the Evaluation Team in identifying linear segments and identifying essential non-linear components associated with linear assets
- **Evaluation Team:** Collects data by physical examination of assets to determine what discrepancies exist. If in-house, the evaluation team members are provided by GeoBase and CE Operations

Proceed to Step 1.10.11.

Step 1.10.11 – Verify segmentation data collected
Role: RPO, GeoBase Office, CE Operations, Evaluation Team

Once the evaluation is complete, the utilities linear segmentation team and RPO meet with the Evaluation Team to verify the changes discovered. The GeoBase Office incorporates any changes found by the Evaluation Team on the facility map.

The RPO, GeoBase Office, and CE Operations determine whether issues exist with the segmentation data, such as a mismatch of database information and physical features of assets (differences in square yards [SY]/LF) utilities appearing in GeoBase data but not on RP data, assets with incorrect CATCODEs or unassigned RPUIDs, etc.

If 'No issues,' proceed to Process 1.12 Coordinate RP Inventory Updates.
If 'Issues,' proceed to Step 1.10.10.

SMS – 2.0 Develop Current-Year Requirements

Introduction

Based on the data uploaded by the installation's Built Infrastructure Assessment Team (BIAT) following an assessment, the sub-Activity Management Plan (sub-AMP) Manager, or equivalent role, evaluates the quality of the Sustainment Management System (SMS) reports to understand maintenance and repair (M&R) requirements within the current-year and submits work requests to the Work Requests Review Board (WRRB).

Roles and Responsibilities

ROLES	RESPONSIBILITIES
AMP Manager	• Coordinates with Air Force Civil Engineer Center (AFCEC) and higher authorities for SMS-related matters (e.g., data calls) • Performs analysis using the facility condition index (FCI), remaining service life (RSL), Mission Dependency Index (MDI), Building Condition Index (BCI), PM/corrective maintenance, and defined condition standards and other factors (non-condition based) to identify requirements that need sustainment, restoration, and modernization (SRM) funding • Validates built assets FCI and lifecycle requirements generated by SMS **Note**: Although these responsibilities correspond to the AMP Manager role and responsibilities delineated in Programming Plan (P-Plan), Vol 2, Sec 1.1; it is the base's prerogative in determining how to best fulfill this role
Sub-AMP Manager	• Serves as first line of defense in ensuring quality data for each SMS • Manages BIAT • Ensures data inputs are consistent and understandable • Performs quality assurance after the BIAT's quality control efforts **Note**: Although these responsibilities correspond to the sub-AMP Manager role and responsibilities delineated in P-Plan, Vol 2, Sec 1.2; it is the base's prerogative in determining how best to fulfill this role. This role could be filled by the AMP manger, Pavement engineer, Builder POC, Utility POC, Environmental Engineer, or Superintendent

Narrative

Entry from Process 1.0 Conduct Built Infrastructure Assessment.

Step 2.1 – Generate reports
Role: sub-AMP Manager

The sub-AMP Manager runs the custom SMS reports (e.g., condition indices, remaining service life, and work items) to understand PM work for the next year. These reports produce lists of unconstrained requirements, or repairs based on an asset's condition and lifecycle expectancy independent of the cost to repair.

Proceed to Step 2.2.

Step 2.2 – QC SMS reports
Role: Sub-AMP Manager

The sub-AMP Manager evaluates the quality of SMS outputs to ensure that there are no anomalies within condition data, the data corresponds with field observations, and SMS is presenting legitimate work requirements. The sub-AMP Manager works with the BIAT to resolve discrepancies, as needed. For example, a sub-AMP Manager can identify a discrepancy when an asset only has a five-year service life but knows major repair was just performed on that asset; the sub-AMP Manager can then check to see if the repair was loaded into the system.

Proceed to Step 2.3.

Step 2.3 – Analyze and prioritize requirements and submit work request
Role: Sub-AMP Manager

Analyzing the SMS outputs, the Requirements and Optimization (R&O) section analyzes and prioritizes the unconstrained requirements. Requirements are developed using the minimum programming requirements and standard project titles in the AMP/Comprehensive Asset Management Program (CAMP) ACES-PM Data Entry Guide, as well as the data standards and IT systems each AMP and sub-AMP specific business rules identify.

The AMP Manager discusses the R&O's prioritized requirements during the quarterly working group held with the Operations, Engineering, and Installation Management Flights to identify opportunities for in-house execution or contract mechanisms.

Per Air Force Instruction (AFI) 32-1001, *Operations Management*, Section 6.2, refer to AMP Playbook for guidance on analyzing asset data to align and de-conflict current and future investments.

Tips/Reminders:

- Consider comparing BUILDER, IWIMS, ACES data to determine and prioritize near-term requirements
- SMS Cost Analysis module will aid in determining the benefits of repair versus replacement (i.e., ROI), as well as the consequences of deferring work for a given item

Proceed to Work Management Playbook, Process 2.0 Create Service Request.

Work Management Playbook, Process 2.0 Create Service Request

This process determines whether the request becomes a Work Task or a Facility Project in TRIRIGA and proceeds to the subsequent Process 3.0, Plan Work where the need for WRRB review and scope (i.e., Operations/in-house versus Engineering opportunity).

For reference:

Work Requests

The term "Work Requests" refers to an AF Form 332, *Base Civil Engineer Work Request*, which in TRIRIGA will be termed as a "Service Request" before being routed as a Work Task (to include Service Contracts) or Facility Project.

Work Tasks

The Customer Service Unit within the Operations Flight converts Service Requests denoting small-scale work to a Work Task, similar to work previously known as Direct Scheduled Work (DSW). Work Tasks involve only one task and one shop. Work Tasks rarely require capitalization.

Facilities Projects

The Customer Service Unit converts Service Requests denoting large-scale work to a Facilities Project, similar to work previously known as Five Digit Work Order or Work Order. Facilities Projects usually involve multiple Work Tasks and shops. Facilities Projects can vary greatly in scale and may or may not result in capitalization.

SMS – 3.0 Forecast Out-Year Requirements

Introduction

While asset inventories and assessments are tasks of asset management, the strength of SMS is in analyzing assessment data to determine investment or divesture decisions. Budget constraints and reduced resources are driving the need for defendable investment choices. A key factor in determining investment decisions is forecasting requirements in the out years. This out-year analysis provides visibility of needed work at the right time before costly and unrecoverable deterioration occurs. It also anticipates when assets will approach the end of their useful life, thus requiring replacement rather than expensive repairs. It also provides the framework to create execution strategies to streamline procurement by better understanding the magnitude of future work. Lastly, forecasting provides compelling data for budget planning (e.g., POM) at the Air Force level, as it is based on field verified condition versus intuitive historical estimates.

SMS Drivers

Office of the Secretary of Defense Policy for Standardizing Facility Condition Assessments (10 SEP 2013)

OSD mandated standardizing the facility condition assessment process to contribute to a more credible DoD asset management program. This mandate supports enhanced buying power by allowing Department leadership to better target fiscal resources to those facilities most in need of investment. Further, adopting a standard process helps ensure that condition data will be audit-ready in accordance with Under Secretary of Defense (Comptroller)'s Financial Improvement and Audit Readiness (FIAR) guidance.

OSD Policy for Facility Sustainment & Recapitalization (29 APR 2014)

OSD/IE established Facility Sustainment and Recapitalization policy that in part requires the following:

- OSD Goal: a FCI of 80 or greater for all facilities
- Mitigation Plans for Facilities with a FCI less than 60

The intent of the OSD policy is to support facilities through consistent, long-term investment to keep facilities mission capable and in good working order. SMS can help identify which facilities have a FCI below 60 and can generate what work is needed in the out years. SMS can also predict what facilities are approaching end of life and should be replaced or demolished. Bases can run FCI-based reports to assist in programming needed work for facilities with an FCI less than 60. OSD requires “mitigation plans” for each facility with a FCI below 60. These plans indicate what kind of work is planned to improve FCI (repair, mothball, sell, demo, caretaker, etc.) and what year the work is expected to take place. Annually, Headquarters Air Force, Logistics, Installations, and Mission Support (HAF/A4) and AFCEC will collect and submit compiled mitigation plans from the bases in a separate tasking.

Note: Although OSD has requirements for facilities with a FCI less than 60, bases should run reports and program necessary work for all facilities. When a FCI is below 60, CERL recommends halting all investment and running a facility to failure with replacement as the end-of-the-line solution.

Program Area Directive (PAD) 12-03

PAD 12-03 implements CE Transformation and institutes Asset Management Principles across the Air Force. It specifically states that **“**As CE Transformation evolves over time, the majority of asset “life-cycle requirements” will be identified through the implementation of a sustainability management system (SMS) capability” (para 4.8.2.1, pg. 13).

SMS and the AMP/CAMP Process

SMS provides requirements to develop the AMP and assists in prioritizing projects for the CAMP. A primary tenet of Asset Management is knowing asset condition and the requirements to maintain effective service life. AMPs consider

unconstrained requirements needed to maintain assets to meet a set Level of Service and maintain asset service life. SMS can systematically produce needed requirements that can be used to forecast needed funding. These requirements are eventually packaged into projects for prioritization, funding, and execution either locally or through a centrally-funded process (Integrated Priory List [IPL]). See the CAMP Playbook for more information.

Benefits & Practical Applications: What Can You Do with SMS Data?

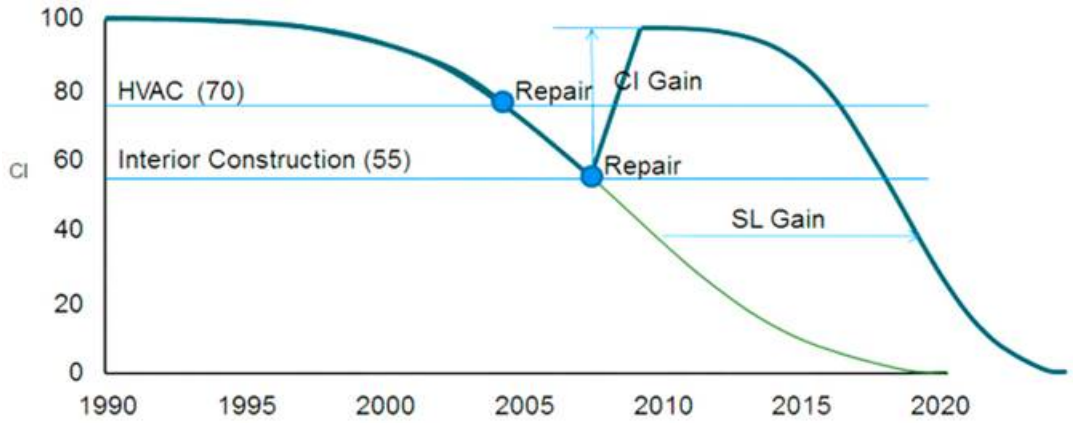
Assess risk

Risk (financial risk) in the SMS context is potential for the increasing cost of maintaining an asset when investment is not made to fulfill the expected RSL. Not investing will result in shortened service life, increased maintenance/service calls, and deteriorated performance, which ultimately increases total cost of ownership. Items not completed in the current year regenerate the following year at a higher cost due to inflation and, for repair work types, include cost for additional deterioration.

SMS data can be used to evaluate the magnitude of financial risks of asset deterioration. Using the scenarios feature, several "what if" simulations can be evaluated to select the best option to pursue execution. It can also evaluate the "do-nothing" option to model the projected effect and time of running an asset to failure. Lastly, it can assist in evaluating options in constrained and unconstrained budget scenarios.

Determining requirements to lower lifecycle cost of ownership

SMS's condition index trend analysis can search through a base's inventory to estimate the best time to initiate maintenance or repairs several years in advance. It is moving from a reactive "find and fix" strategy to a more proactive "model and predict" strategy. This helps bases prepare out-year budgets and lowers the total asset lifecycle cost of ownership. Bases can anticipate the optimum time (i.e., the "sweet spot") to repair specific components, minimize the penalty costs incurred from deferring maintenance, and later determine if work performed did in fact reduce the number of issues recorded against a given asset, resulting in lifecycle cost savings. The figure below illustrates how the SMS predicts future work requirements by analyzing condition levels along the service life of an asset. Work requirements will automatically generate when the condition drops below the enterprise policy level for that asset.



Inform resource allocation and investment decisions

SMS's Work Item Cost Analysis tool determines the ROI for each work activity type (i.e., do nothing, stop gap repair, repair, replace) to identify the most cost-effective options, showing the benefits of repair versus replacement as well as the consequences of deferring work for a given asset.

Auditing or Validating Project Proposals

Bases can use SMS outputs to evaluate project proposals and requests for funding. SMS can provide hard data and analysis to justify funding actions. Specifically, SMS can predict when an asset's condition will fall below an acceptable threshold, triggering repair actions. Base-level users can leverage data outputs such as these to validate funding needs to local leadership.

For example, the 97 Civil Engineering Squadron at Altus Air Force Base designed its own Microsoft Access database to cross-reference failing facilities in SMS to projects scheduled in the ACES-PM and resources expended against its assets. To support the Commanders' ability to make data-driven decisions, the base visually illustrated facilities in need of project funding and articulated root causes of recurring issues. Here, SMS served as an advocacy tool, ensuring allocation of adequate resources.

Local Sustainment Decisions

Sustainment includes the cyclical maintenance and scheduled repair activities required to maintain the inventory of real property assets through their expected life. It includes regularly scheduled adjustments and inspections, preventive maintenance tasks, and emergency response and service calls for minor repairs. It also includes major repairs or replacement of facility components (usually accomplished by contract), which are expected to occur periodically throughout the facility life cycle. This work includes regular roof replacement, refinishing of wall surfaces, repairing and replacement of heating and cooling systems, replacing tile carpeting, and relatable tasks.

Note: Sustainment does not include restoration, modernization, environmental compliance, historical preservation, or costs related to unexpected events, which are funded elsewhere. (See AFI 32-1032, pg. 67-68)

Out-Year Forecasting

Targeting work requirements and priorities for current year execution is the responsibility of AMP and sub-AMP managers, but they are also responsible for programming the long-term capital investment strategy of the infrastructure they manage. In developing a future-year capital investment plan, several policy decisions early in the planning process can wield a drastic influence on the overall lifecycle performance and long-term sustainment cost of facilities. The SMS process helps support these decisions by making the consequences of different investment policies clearer and more defendable.

By using scenarios-based modeling, effects of varying condition standards, prioritization schemes, and budgets, AMP managers can analyze the lifecycle results to determine the most appropriate course of action for executing infrastructure sustainment, restoration, and modernization. It also provides a more logical means of identifying and justifying long-term budget requests. Finally, it provides an execution strategy that managers can use to match long-term capital budgets with specific inventory assets.

- **Consequence analysis:** The SMS framework provides analysis tools to identify building and component level degradation. This tool allows engineers to explore different investment scenarios and evaluate the consequences over a determined amount of time. Forecasting can mitigate these negative future consequences by identifying candidate repair or replacement work items for inclusion in Preventive Maintenance programs, scheduled work prioritizations, and projects. Forecasting tools help illustrate the asset management impact of funding or not funding future work and the impact to the installation portfolio

- **Strategic requirement grouping:** Combining associated requirements leads to scheduling and work efficiencies. Forecasting can identify logically associated work items or projects to promote time and cost savings. The SMS outputs can provide the vision to overlap future requirements for cost savings and resource efficiencies. For example, a road replacement and utilities upgrade can be strategically grouped if they share: (1) the same fiscal completion year or (2) the same future schedule date, which falls into an overlapping preventive maintenance window for both assets. This information allows completion of the entire scope of work; for example, both road and underlying pipes can be repaired/replaced in an efficient and logical manner (i.e., the pipes are fixed prior to road replacement). Having the total picture eliminates the scenario of repairing the road and later tearing it back up to complete the utilities project.

- **Streamline Execution Strategies:** As SMS generates requirements, sub-AMP managers can determine trends in their Activity and can begin to evaluate procurement or strategic sourcing strategies. An example of this is SMS analysis revealing several roofs needing replacement over the next five years. In this scenario, one should ask: does a roofing IDIQ contract vehicle need to be established? Can similar work (projects) be bundled in a single contract (streamlining the contracting process)? Can a greater return on investment be realized? Leveraging this insight can relieve "reactionary" procurement risking inability to execute.

Future Prioritization and Mission Value Visibility

Bases create mitigation plans based on SMS-generated lists of worst assets in each component type. In addition, Bases can have more complete visibility on high mission value assets as well as maintain condition awareness of

lesser mission dependent assets. This visibility provides a better context for work prioritization as requirements across all facilities can be seen.

Best Practices & Success Stories

Altus Air Force Base

Utilizing Access and color-coded GIS software to perform trend analysis (i.e., identifying pain point assets where funds are consistently being spent for repair).

Sheppard Air Force Base: Base Operations Contract

Scenario: Building 1020, Technical Training Facility, is a 133K SF facility originally built as a hangar in 1941. The interior was renovated at some point to be exclusively used for training. It is not a high MDI facility, currently set at 70.

Problem: The interior classrooms are conditioned by 12 central station air-handling units that appear to have been installed in 1980. The RSL is four years. Because this facility has a low MDI, any project to replace the AHUs will not score well in the IPL.

Solution: Using BUILDER forecasting, fact-based timelines and costs can be communicated through the Wing to AFIMSC using validated field assessment data, curves, and calculations. This data will give decision makers the costs associated with repairing versus replacing the units, and the effect on the RSL that each option presents. Current BUILDER projections show that each unit will cost $48,500 to replace, while an investment of $13,000 will only extend the remaining service life by 3.8 years. Coupling this fact-based analysis along with the importance of the facility to the Wing's mission will help Sheppard AFB leadership effectively convey the importance of manually adjusting the IPL score and ideally securing replacement funds within the next three years.

Minot Air Force Base: Non-Base Operations Contract

Scenario: Minot Air Force Base has boilers that have significantly reduced service lives due to mineral deposits. The municipal water supply has high levels of Total Dissolved Solids (TDS), or hard water.

Problem: Minot had issues conveying their boilers' deteriorating conditions and future needs.

Solution: SMS is permitting Minot to show in real time how this hard water is affecting a critical building system, and SMS forecasting is projecting how long each boiler will remain in service. This knowledge will allow a broad analysis of options. For example, Minot can decide whether it is best to anticipate funding the premature replacement of boilers or if a project should be funded to pretreat the hard water before it enters the utility grid. Most importantly, any member of the Civil Engineering Enterprise with appropriate SMS permissions may log in and learn more about these boilers without ever setting foot in Ward County, North Dakota (Minot's location). SMS has allowed Minot's local knowledge to become enterprise-wide knowledge.

SMS – Facilities Guidance

Introduction

This Facilities Supplemental Guidance expounds on the standard process information in the SMS Playbook particular to buildings and vertical facilities. It also includes specific information on leveraging BUILDER™, the authoritative SMS for facilities data, to support asset management efforts. This guidance aims to ensure effective BUILDER™ inputs as well as compliance with PAD 12-03, *SMS Implementation*, and SMS OSD mandates.

ROOFER

Per AFI 32-1051, the authoritative SMS for roofs is BUILDER™, which must be utilized, updated, and maintained by the installation. However, the ROOFER SMS, or similar roofing management system, can be funded locally at the bases' discretion to serve as a convenient management tool. Hence, long-term roofing data elements/features should be incorporated into BUILDER™ after collecting the initial built infrastructure assessments in accordance with the September 2017 mandate. BUILDER™ tracks information on the type and age and assigns a condition to the roof based on a fixed set of criteria, thereby providing a RSL prediction and revealing when to execute corrective maintenance or repair actions. Eventually, the US Army Construction Engineering Research Laboratory (CERL) will configure an interface between BUILDER™ and ROOFER to ensure that ROOFER automatically pushes all inputs into to the BUILDER™ database. Until that time, however, bases will need to update BUILDER™ manually. Bases desiring to move ROOFER data into BUILDER™ will need to contact CERL to initiate that migration.

Getting Started

BUILDER™ POCs

Each installation appoints a primary and alternate BUILDER™ POC to work with AFCEC BUILDER™ POCs. It is recommended that the BUILDER™ POCs be from the Operations and Engineering Flights. These POCs will determine number of BUILDER™ data managers, assessors, and read-only users at their installation. POCs are responsible for ensuring data inputs and changes are accurate and current for all installation inputs.

DATA ACCESS AUTHORITY

- Read-Only: Permission to view and export reports of inventory and inspection data.
- Assessor: In addition to Read Only, Assessor has permission to add, view, and edit Assessor's own inventory and inspection data. This includes exporting and importing BUILDER™ Remote Entry Date (BRED™) files.
- Data Manager: In addition to above, Data Manager has permission to edit ALL inventory and inspection data in their assigned installation. Data Manager can also create/edit work plans and generate multi-year work plan scenarios. Data Manager has permission to view and edit their ENTIRE ASSIGNED INSTALLATION inventory, inspection data, and perform Work Plan execution. They can create/edit work plans and generate multi-year work plan scenarios. The Data Manager has the highest level of User privileges. Data Manager with Read Only Restriction can only GENERATE work plans and multi-year work plan scenarios.
    - It is recommended that there will be no more than four Data Managers at each installation. Too many data editors increase the difficulty of data accuracy and increase the risk of unintentional data loss.

Applicable Training

The table below lists required and recommended education and training for the BUILDER™ SMS:

REQUIRED		
Title	**Description**	**Access/Location**
BUILDER™ SMS Assessor Education and Training Program	BUILDER™ SMS 100 – BUILDER™ SMS Concepts and Capabilities BUILDER™ SMS 110 – Introduction to BUILDER™ SMS Methodology BUILDER™ SMS 120 – BUILDER™ SMS Access and References BUILDER™ SMS 130 – Creating Inventory in BUILDER™ SMS BUILDER™ SMS 140 – Facility condition Assessments in BUILDER™ SMS BUILDER™ SMS 150 – BUILDER™ SMS BRED™	**https://cs2.eis.af.mil/sites/11252/24048/facilityconditionasset/BUILDER/BUILDER%20Training%20Material/Forms/AllItems.aspx**
Data Management Education Program	Data Manager Education and Training	**Register at:** https://www.sms.erdc.dren.mil/USAF-Training

RECOMMENDED		
Module	**Description**	**Access/Location**
BUILDER™ SMS 210 – BUILDER™ SMS Calibration and Validation	Provides additional information to Assessors having completed the initial BUILDER™ Assessor Education and Training academic program. The information is geared to assist Assessors and Data Managers identify and correct errors and sub-quality data in BUILDER™.	**https://cs2.eis.af.mil/sites/11252/24048/facilityconditionasset/BUILDER/BUILDER%20Training%20Material/Forms/AllItems.aspx**
BUILDER™ SMS 220 – BUILDER™ SMS Additional Inventory and Assessment Information	Provides additional information to Assessors having completed the initial BUILDER™ Assessor Education and Training academic program. Provides general information on non-standard inventory and assessment, TRIRIGA and PM relationships to BUILDER, and available inventory and assessment guidance.	
BUILDER™ SMS 230 – BUILDER™ SMS Work Planning, budgeting, and Forecasting	Provides additional information to Assessors having completed the initial BUILDER™ Assessor Education and Training academic program. Provides a general overview of the Planning, Budgeting and Forecasting capabilities of BUILDER™.	
BUILDER™ SMS 300 – BUILDER™ SMS Concepts and Capabilities	Provides a broad overview of the SMS process and introduces participants to the BUILDER™ concepts of Inventory, Assessment, Prediction, Work Planning, and Forecasting through the analysis of the current conditions of assets as well as prediction of future asset conditions. The BUILDER™ application will also be explored providing a basic overview of the software interface.	**Education files located at:** **https://cs2.eis.af.mil/sites/11252/24048/facilityconditionasset/BUILDER/AFCEC%20DM%20Training%20Slides/Forms/AllItems.aspx**
BUILDER™ SMS 310 – BUILDER™ SMS Inventory Overview	Covers inventory basics and how BUILDER™ organizes facility assets. Describes the Real Property building hierarchy loaded into BUILDER™ as well as the system-component inventory within the buildings. Will familiarize participants with the UNIFORMAT II hierarchy and the inventory levels of BUILDER™ (Organization, Site, Building, System,	

	Component, and Section). Includes various examples of sections as the sustainment, restoration and modernization (SRM) management unit along with section examples utilizing section details as it corresponds to real property installed equipment (RPIE). Discusses the primary criteria and practical considerations when defining sections within a building to meet SRM needs.	
BUILDER™ SMS 320 – BUILDER™ SMS Assessment Overview	Discusses differences in the traditional Deficiency Based Inspection and Distress Based Inspection approaches. Introduces Distress Survey and Direct Condition Rating inspection methods used in BUILDER™. Also, covers representative and non-reprehensive sampling.	
BUILDER™ SMS 150 – BUILDER™ SMS BRED™ (Optional)	Covers the BRED™ process, key points of using BRED™.	
BUILDER™ SMS 330 – BUILDER™ SMS Facility Condition Assessment Execution	Covers how to organize, train, and equip Facility Condition Assessment (FCA) teams to conduct assessments.	
BUILDER™ SMS 340 – BUILDER™ SMS Analysis	Discusses the AFCEC/CPA role in Data Analysis and reasons why quality control of the data is critical to the larger asset management process.	
BUILDER™ SMS 350 BUILDER™ Work Planning Fundamentals	Covers how to configure Standards, Policies, Policy Sequences, Prioritizations, and Funding to generate work requirements as well as project creation to group work items as projects. Also, demonstrates how BUILDER™ generates work cost estimates; how financial calculations are performed to provide repair/replace recommendations, and how to manually alter the calculation parameters.	
BUILDER™ SMS 360 – BUILDER™ SMS Reference Books Training – USAF Specific	Covers the BUILDER™ Library of Cost Books, Inflation Books, Service Life Books, and Component Importance Indexes. Discusses default books and setup of organization or site specific references.	
BUILDER™ SMS 370 – BUILDER™ SMS Work Planning Training – USAF Specific	Covers how to configure Standards, Policies, Prioritizations, and Funding to generate work requirements and various rules for project creation when grouping work items in the projects. Also covers how BUILDER™ generates work cost estimates; how financial calculations are performed to provide repair/replace recommendation, and how to manually alter calculation parameters.	
BUILDER™ SMS 380 – BUILDER™ SMS Transferring Facilities Between BUILDER™ Complexes (Optional)	Covers process to create complexes, to remove a facility from a complex, and to add a facility to a complex.	
BUILDER™ SMS 390 – BUILDER™ SMS Assessment Exercise	Hands on exercise to reinforce the concept of the component-section in BUILDER™ and defining sections within a building. The participants will be provided an exercise, where they will define sections from example photos and add them to a building's inventory. They will also generate inventory reports from their data to check their	

	input. Hands on exercise to reinforce the participant's knowledge of entering condition assessments within BUILDER™. The participants will be provided an exercise, where they will assess the condition of sections within a building, determine to use either a direct rating or a distress survey, identify building distresses, apply severity and density levels, use BUILDER™ screens to input inspection data and generate a report from their data to check their input.	

Access Requirements

All requests for rights to BUILDER™ data (Assessor or Data Manager) must be coordinated with the base. The User Account Request form is accessible from the CERL SMS website. The form is self-explanatory. The installation's BUILDER™ POC, who validates requests, completes the majority of the form, and submits to AFCEC's Account Verifier for approval. The Verifier approves Assessor or Data Manager rights only. The form is programmed to launch Microsoft Outlook and draft a message to SMS Support once the "Submit" button is clicked. Bases should forward any questions to Mr. Bob Hill or Mr. Andrew Carmean, AFCEC.COAF.SMSBuilder@us.af.mil, AFCEC/COAF, or the AFCEC Reachback Center (850-283-6995).

Equipment Requirements

Recommended:

- Personal safety equipment
- Digital camera
- Flashlights
- Infrared thermometers
- FLIR Infrared/thermal cameras

Nice to have:

- Light intensity meter
- Laser distance meter
- Tablets for field data entry
- HVAC inspection scope (to read hidden/obstructed nameplate data safely)

The above equipment lists apply to direct visual assessment, only. It is recommended that installation personnel not invest in more extensive diagnostic equipment for the purposes of infrastructure assessments since BUILDER™ assessments are visual in nature.

Tablets

AFCEC is currently conducting field trials of tablet options to assist in field data entry in order to provide recommendations to the units. At this time, there are no plans for central purchase. Following, bases purchase tablets at their own risk. However, experience has shown that tablets are useful to confirm data in the field.

BRED™

BRED™ software is available to help facilitate the condition survey inspection process. BRED™ will help capture field data and observations onto a local computer file that can be imported to the web-based BUILDER™ database. This software is compatible with pen-based electronic clipboards, laptop computers, and desktop computers and can be used with or without internet connection. Use of this electronic method of data collection is optional, but it may offer advantageous over paper forms (e.g., time savings, error reduction, on-screen sample tracking, and on-screen condition checklists). However, there are also some challenges to this approach (e.g., equipment requirements, battery limitations, computer/software malfunctions). HQ AFSPC/A6S has certified BRED™ version 3.x software (current approved version is 3.3); however, the local Designated Approval Authority (DAA) must still update their Authority to Operate (ATO) to include it on the local system or enclave.

Assessments

Per the DoD Mandate, *Standardizing Facility Condition Assessments*, Military Departments will ensure that the SMS computed FCI for all assets on their installations are entered into the real property database. This includes the FCIs for facilities occupied/used by tenant organizations per DoDI4165.70, "*Real Property Management*." The host installation is responsible for ensuring the completion of assessments for all built infrastructure on the installation. It is recognized that other tenant units will be conducting condition assessments on their assets. The table below lists examples of AFCEC-confirmed facilities that would need to be assessed by the base Civil Engineering staff as well as agencies that will conduct their own assessments. Please contact the AFCEC Reach-Back center, DSN 523-6995, with questions regarding assessment responsibilities.

ASSED BY CIVIL ENGINEERING STAFF (NOT EXHAUSTIVE)
• All built infrastructure on the installation (exceptions below) • Army Air Force Exchange Service (AAFES) • Navy Exchange (NEX)
NOT ASSESSED BY CIVIL ENGINEERING STAFF
• Defense Commissary Agency (DeCA) • Defense Health Agency (DHA) facilities • Department of Defense Education Activity (DoDEA) facilities • Defense Logistics Agency (DLA) facilities • Privatized housing

Prioritizing Building Systems and Facilities for Assessment

Facilities to be assessed should be “Type A” (single use), “Type B” (multi-use) and any facility with an MDI of less than 60. “Type E” facilities (non-habitable) should be assessed at a lower priority unless they are in degraded condition or warrant repairs that are likely project candidates.

In order to optimize manpower efforts, assessment of these facilities should be prioritized based on value to the overall mission as listed in the below Mission Dependency Index (MDI) ranges:

Priority	MDI
High	**99 to 86**
Med	**85 to 70**
	69 to 45
Low	**44 to 26**

At a minimum, to have a complete facility assessment, the following seven Key Building Systems are to be assessed to the Component Section Level as defined in BUILDER™ every five years unless required more frequently by other guidance:

B20: Exterior Enclosure

B30: Roofing

C10: Interior Construction

D20: Plumbing

D30: HVAC

D40: Fire Protection

D50: Electrical

A facility assessment is considered complete when all seven of its Key Building systems (or as applicable to the facility) have been assessed and the data inputted into the SMS**.**

Dormitories and Military Family Housing facilities additionally require the C30: Interior Finishes system be inventoried and assessed and the data inputted into the SMS to be considered complete.

Building systems not listed above, (such as A10: Foundations) may not require initial assessments, as these systems typically have longer life cycles with minimum repairs/maintenance and degrade very slowly over their lifecycle. The specific enterprise criteria for evaluating all 13 BUILDER™ Facility Systems have been developed as system Inventory and Assessments Manuals. The Manuals are considered attachments to the SMS Playbook and are located in the FCA Toolbox Section 2.

If systems such as foundations, super structures, or other unlisted systems are found in degraded condition or warrant repairs that are likely project candidates, those systems shall have a BUILDER™ condition assessment performed.

For other regularly occurring inspection programs, such as fire protection or roofing, data from required forms (e.g., AF Form 1487, Fire Prevention Visit) should be copied into the BUILDER™ SMS.

Standardized Method of Performing Assessments

Any condition assessment executed by the installation, MAJCOM, AFCEC, or contractor working on their behalf will follow the BUILDER™ SMS methodology. Inventory collected will be entered into the USAF BUILDER™ database utilizing the American Society for Testing and Materials (ASTM) E-1557-09 UNIFORMAT-II methodology. Assessments will be carried out using the BUILDER™ SMS Facility Condition Assessment (FCA) methodology that utilizes the Direct Condition Rating and/or Distress Survey Rating criteria. Further details regarding the standardized BUILDER™ methodology can be found in the BUILDER™ User Manual and BUILDER™ Condition Assessment Manual. Additional, Air Force specific technical guidance for standardized inventory and assessment criteria is contained in system specific Inventory and Assessments Manuals contained in the FCA Toolbox and are considered attachments to the SMS Playbook.

For missing or nonexistent components or Fire Safety Deficiencies (FSD), Risk Assessment Codes (RAC), Waiver and Compliance issues:

See the BUILDER™ Direct Condition Assessment Matrix in the AF Comprehensive Asset Management Plan (AFCAMP) Playbook and Playbook Toolbox for guidance on entering data into BUILDER™. The latest Matrix may also be found at:

https://cs2.eis.af.mil/sites/11252/24048/facilityconditionasset/BUILDER/BUILDER%20Documents/Forms/AllItems.aspx

Installations with Base Maintenance Contracts (BMC) or contracted Operations Flights

These installations will have to evaluate current contract provisions for inclusion of built infrastructure assessments. Installations with BMCs can also elect to contract out initial assessments, however, the long-term desire is an organic capability integrated into the day-to-day shop level activities to complete FCAs and future reassessments on a five-year cycle. These installations are encouraged to reach out to AFCEC for a technical consultation regarding integrating standard BUILDER™ implementation capabilities into their respective contracts. Bases should contact AFCEC/COAF if they require assistance with incorporating BUILDER™-specific verbiage into their BMC contracts. AFCEC/COAF POC's are Mr. Bob Hill and Mr. Andrew Carmean, AFCEC.COAF.SMSBuilder@us.af.mil

Metrics

Calculating Assessment Completion Rates

Assessment completion metrics are calculated using the square footage of the facility. A facility assessment is considered complete when all of the seven Key Building systems measured at the Component Section Level that exist in the facility have been assessed and the data inputted into BUILDER™.

When determining the assessment completion percentage of an installation, the total square footage of facilities, as documented in the authoritative data source for real property records, will be utilized as the baseline. Thus, 50% of an installation assessment completed means 50% of the total installation square footage has been assessed (as opposed to the number of buildings or the number of assessed building systems). BUILDER™'s QA 13 Report provides the status of each of the seven assessment categories for each facility/base and shows base completion according to square feet.

Schedule of Initial Assessment Completion

The following original milestone schedule was developed and published to meet SMS Implementation Guidance timelines:

- **1 SEP 2015 GOAL:** Get every base up and running with a balanced Preventive Maintenance (PM) program using PM Task Lists within IWIMS. (**Note:** PM assets are a small sub-set of the total BUILDER inventory and cataloging effort. Therefore, FCIs of respective RPIE are encouraged to be completed at the time of the PM inventory)
- **FY17: 1 MAR 2017:** 100% of facility SF assessed (AF goal to meet POM submission deadline)
- **FY17: 1 SEP 2017:** 100% of all assets in RPAD assessed with BUILDER-generated FCIs (OSD Mandate to meet FIAR compliance)
- **FY18+:** Start 5-year reassessment cycle (approximately 20% per year); BUILDER inputs continue as day-to-day business

While the OSD mandate is to have all FCAs completed by Sep 2017 and the Air Force was originally trying to have all our FCAs completed by Mar 2017 in time for the FY POM, we are adjusting to the following timelines:

- **FY18: Sep 2018:** 75% of critical facilities (w/MDI > 60)
- **FY19: Sep 2019:** All critical facilities (w/MDI > 60)
- **FY20: Sep 2020:** All Air Force facilities
- Once your facilities are assessed they must be re-assessed every five years.

Accomplishing the Task by Manpower Alignment

Every base is different – size, composition, and mission all affect the types of built infrastructure on base and feasible methods of conducting assessments. The case studies below demonstrate various approaches, results, challenges, and best practices. As the implementation of SMS progresses, additional case studies may be included in this section.

ACCOMPLISHING TASKS BY MANPOWER ALIGNMENT		
Base Composition	**Base Size**	
	Small (<500)	**Large (>500)**
Traditional	Minot	Seymour-Johnson
Contract	Vance	Sheppard
Most Efficient Organization	Altus	Wright-Patterson
Joint Base	JB Charleston	JB Andrews

Joint Base Andrews, MD

Base type: Joint Base

Size: Large (> 500 CE Personnel)

Team Construct: (Facility Condition Assessment [FCA] Team)

- Lead – Requirements and Optimization (R&O) Non-Commissioned Officer in Charge (NCOIC)
- Electrical Systems Specialist
- Water/Fuel Systems Specialist
- Pavements Specialist
- Structures Specialist
- HVAC Systems Specialist
- Electrical Power Production Specialist

Approach:

Before the initial implementation of the BUILDER™ SMS, the Operations Flight had established the new R&O work center as a part of the CE transformation. The manpower alignment allowed the strategic capability to visualize a battle rhythm for conducting Built Infrastructure inventories and assessments based on OSD mandates. The R&O engineers and technicians were trained on BUILDER™ fundamentals to facilitate training and awareness across the squadron. The R&O section developed a BIAT utilizing craftsmen from six work centers--HVAC, Electrical, Structures, Water/Fuels, Pavements and Power Pro--for 60-day assignments to the work center. The FCA team personnel were overlapped two weeks during the transition phase for one week of training and one week of shadowing to provide continuity. This teaming concept was part of a long-range plan to train shop personnel to conduct inventories and assessments in order to integrate BUILDER™ into day-to-day operations.

Building assessment schedules and priorities were developed using a weighted system that calculated MDI, Age and M&R data to include backlog work items. The R&O technicians were responsible for oversight of all assessment scheduling and BUILDER™ management to include data quality control and upload. The FCA team conducted inventories and assessments using Real Property Inventory records (7115), building drawings, and computer tablets configured with BRED™ software. The R&O technicians were responsible for collaborating with the RPO and providing RP record updates with any Found on Base (FoB) assets or adjustments by establishing a DD Form 1354 utilizing UFC 1-300-08 guidance.

During the analysis process, the R&O sub-AMP managers continually updated BUILDER by generating work items for each assessed building to create work items analysis tools and reports. All reports from BUILDER and IWIMS were analyzed to identify degraded asset conditions, RSL schedules, and backlog work tasks to target “worst-first” systems. Once degraded and at-risk systems were identified, BUILDER™ output data was used to validate ACES-RP projects while establishing new opportunities and requirements. The R&O work center developed stand-alone or bundled requirements for either in-house or Sustainment, Restoration, and Modernization (SRM) contract project execution.

Results:

- Data collected allowed a more straightforward ranking for projects or work orders to undermine the current "I'm the most important thing on this base" issue
- Data collected allowed identification of sections within buildings that were in dire need of repair or replacement that wouldn't have been identified due to the systems still "working"
- Scores allowed direct identification of the truly worst systems in need of repair or replacement

Challenges and Lessons Learned:

- Data can be vastly effected by communication issues
- Current SMS system does not allow for linear infrastructure
- Data merger with other data currently in BUILDER™ (SIA contractor inspections prior to our FCAs) could cause duplicate building numbers to exist causing the facility inspections to end up on multiple facilities skewing scores
- Timeline used in the beginning (calculated "worst first") made it difficult to keep track of facilities that had been inspected as well as having the FCA team driving all over the base wasting time.
- Leave/TDY/Deployments/Appointments make it difficult to keep a coherent FCA team functional and productive
- Personnel transitions within the R&O section coupled with the amount of knowledge needed in these positions makes for a steep learning curve in an environment that does not slow down
- Having tablets that cannot connect to either the network or a Wi-Fi signal make getting information from BUILDER and loading the BRED™ files back into BUILDER™ a hassle with several steps (download to local computer, move to external hard drive, connect hard drive to tablet, move file to tablet and reverse for getting the file back to BUILDER™)

Best Practices:

- Keeping a list of all shop personnel who have been on the FCA team provides the capability to backfill positions for a short time without having to train a new person
- Teaching the FCA team members what R&O's mission is provides a keen insight to CE transformation and the importance of SMS. The team understands how the inspection process relates to future requirements and allows communication from the technicians in the field. This collaborating provides key information about Built Infrastructure systems that might have degraded since previous inspections and potentially require re-inspection
- Using tablets with BRED™ allowed for more accurate data collection and detailed inspections
- Having all the positions filled (AMPs and SUB AMPs) is the only way to truly move forward through CE Transformation and allow for the most efficient use of people and materials

Sheppard Air Force Base, TX

Base type: BOS Contract

Size: Small (< 500 CE Personnel)

Completion:

- **Facilities Completion (% of total square footage):** As of 1 Aug 2015, ~85% (On track for 1 Oct 2015 completion)
- **TNAP Completion (% of total linear feet):** 100%
- **Utilities Completion (% of total linear feet):** 100% for Water and Sewer; 0% for Natural Gas, Storm, and Electrical as we use utility studies

Team construct: (Facility Condition Assessment (FCA) Team)

- Facilities AMP Manager

- Shop Supervisors (Reach back)
- Shop Leads (Reach back)
- CE Engineers (Reach back)

Approach:

The Facilities AMP Manager, who conducted the initial assessments using as-built drawings, led the Facility Assessment Team. If a component was not straight forward in terms of its direct rating deficiency, the AMP Manager consulted with the shop supervisors and shop leads (retired Air Force craftsman) to complete the assessment. If the shop supervisors were unsure, the AMP Manager would defer to the organizations' engineers as a final reach back resource. The AMP Manager reviewed as-built drawings and entered data into BUILDER. Tablets were purchased through the Air Force Way (AFWAY) IT system and they are strongly recommended to be the best way to document all the data. However, the tablets purchased did not have all the functionality required and were repurposed elsewhere.

Using the different sections of the CE organization as reach back teams allowed the craftsmen and engineers to continue their primary job responsibilities and maximized their value to the team. In this situation, the team was under the Asset Optimization construct for the assessment process. Having to utilize personnel from different departments was challenging at first, but it was soon realized that the new Asset Optimization team was an integral part of the process and the entire team began to work together. This developed cross-departmental relationships that benefitted the process immensely.

As the inventories and initial assessments were completed, the ratings were submitted to the shop supervisors for their input and review. This process was successful and, after a few rounds, the shop supervisors began asking for inventories and would assist in the assessment process as they performed their day-to-day operations. The team grew as time progressed and relationships developed. The monthly AMP meetings where the assessment process was discussed quickly turned into many spirited debates about how the creation of the ratings, the quality of BUILDER inputs from previous AF initiated assessments performed by contractors, and how Sheppard AFB could move forward.

Results:

- Revealed that the current process for identifying projects and opportunities was not sufficient to meet AFCAMP requirements
- Data-driven model demonstrated to leadership what was common knowledge at the shop: the facility infrastructure was degrading as soon as replacements were completed
- Using the new SMS model allowed to plan development and funding for future large projects in the most mission critical facilities. The SMS system allowed the team to allocate funding where it was truly needed

Challenges/Lessons Learned:

- Getting started is the hardest part of the process, but once the ball is rolling it seems easier
- Keeping momentum is difficult as the facility assessments can become tedious and repetitive
- Trying to expand the assessments into getting more data or more information than required only serves to complicate and lengthen an already long and at times complicated process
- Trying to change the process midstream can hurt data. Have a dedicated team where their only task is to complete the assessments because replacing personnel during the process can change the flow of the team and skew the data. Spend some extra time planning the assessment process and stick to it through the first round of assessments

Best Practices:

- Institutional knowledge of the craftsmen that have been on base for a while is extremely valuable.

- Shift the assessment process to maintain the database and have the follow on assessments completed by the shops as part of their PMTLs. Train the craftsmen on how to assess the components and then "calibrate" the craftsmen so everyone's assessment will be as close to the standard as possible and minimize personal bias.

- Tablets or at least an electronic handheld system has value in this process. It would be best if TRIRIGA is the tool that allows a tie-in between BUILDER™ to the PMTLs to the RP data automatically

- The AMP meetings at the start of the process did not seem to have a lot of benefit because everyone was learning the process, but allowing the team to muddle through the process at the beginning will yield better and more interactive results

- Allow all team members to voice their opinions or they may become disenchanted and disengage from the process making completion almost impossible

- Determination and perseverance are essential especially when starting the process. The shops may hesitate to give all the information needed but upon realization that the program is permanent, they will give the R&O team a wealth of information and data

Altus Air Force Base, OK

Base type: Blended Civilian/Military

Size: Small (< 500 CE Personnel)

Completion:

- **Facilities Completion (% of total square footage):** 100%

- **TNAP Completion (% of total linear feet):** 100%

- **Utilities Completion (% of total linear feet):** 0%

    - **Note:** Currently using utility studies to build out-year project requirements

Team construct:

- **Leader:** Johnson, Raymond D TSgt USAF AETC 97 CES/CEOER – Non-Commissioned Officer in Charge: Requirements & Optimization Flight
    - **Responsibilities:**
        - Led facilities inspections
        - Developed timelines
        - Coordinated with facility managers
        - Produced schedules
        - Managed the BIAT
- **BIAT:**
    - Dirtboy
    - Structures Specialist
    - Alarms Specialist
    - Electrician
    - HVAC Specialists (2)
    - Water and Fuels Systems Maintenance (WFSM) Specialist
    - Engineering Assistants (EA) (2)

Data Entry Approach EAs entered data into BUILDER™ using manual (online) and BRED™ techniques. EAs also provided as-built drawings for facilities. The two Engineering Assistants accomplished all data entry.

Approach:

Before the initial implementation of BUILDER™, the Operations Flight had established the new R&O work center as a part of the CE transformation. The manpower alignment allowed the strategic capability to visualize a battle rhythm

for conducting Built Infrastructure inventories and assessments based on OSD mandates. The R&O engineers and technicians were trained on BUILDER™ fundamentals to facilitate training and awareness across the squadron. The R&O section developed a Built Infrastructure Assessment Team (BIAT) utilizing craftsmen from five sections--HVAC, Electrical, Structures, Water/Fuels and Power Pro--for 60-day assignments to the work center. This teaming concept was part of a long-range plan to train shop personnel to conduct inventories and assessments in order to integrate BUILDER into day-to-day operations.

Building assessment schedules and priorities were developed using a weighted system that calculated MDI, Age, and M&R data. The R&O technicians were responsible for oversight of all assessment scheduling and BUILDER™ management to include data quality control and upload. The BIAT conducted inventories and assessments using RPI records (7115), building drawings, and computer tablets configured with BRED™ software.

Without tablets to pair with the BRED™ software, and the need to accomplish this task as efficiently as possible to eliminate Operations Flight staffing constraints, Altus AFB designed a separate Microsoft Excel spreadsheet to conduct assessments. These spreadsheets had sections for all the information required by BUILDER™. This method allowed the BIAT to stay in the field and accomplish inspections, while a team of two military Engineering Assistants input the completed spreadsheets. The Engineering Assistants provided upcoming facility as-built and other drawings to the BUILDER™ team and input the previous facilities inspection sheets into the SMS program. By providing drawings to the BIAT, Altus was able to identify and update previously missed as-built information from past facilities work (e.g., an extra wall separating office areas or missed Variable Air Volume (VAV) boxes).

The initial data collection schedule ran much quicker with a direct rating system. Altus used direct rating on all components to populate its database. Once Altus developed the five year staggered re-assessment schedule, it considered adding items such as D30 HVAC systems to a distress rating system.

During the analysis process, the R&O sub-AMP managers continually refreshed BUILDER to update work items and reports. All reports from BUILDER™ and IWIMS were analyzed to identify degraded asset conditions, RSL schedules, and backlog work tasks to target “worst-first” systems. Once degraded and at-risk systems were identified, R&O developed stand-alone requirements and bundled projects for execution.

Results:

- Commanders appreciate the data-driven recommendations informed by the trend and root cause analysis enabled by SMS when considering and approving opportunities
- Revealed three facilities that were under the radar but in desperate need of attention (e.g., FCIs < 60), resulting in an unexpected amount of project opportunities
- Current-year: Altus has $31.7M allocated over 21 projects, which are funded in the IPL using SMS
- Out-year: Altus has $12.3M allocated over 25 projects that are awaiting funds
- BUILDER™ SMS has armed Altus’ Squadron leadership with a site picture of RPIE across the base. This enabled Commanders at the Group level to see immediate funding needs (i.e., ability to prioritize “the needs” over “the wants”) during facility boards

Challenges/Lessons Learned:

- Commanders appreciate the data-driven recommendations informed by the trend and root cause analysis enabled by SMS when considering and approving opportunities
- Revealed three facilities that were under the radar but in desperate need of attention (i.e., FCIs < 60), resulting in an unexpected amount of project opportunities

Best Practices:

- Weekly coordination with RPO to ensure RP updates were reconciled in a timely fashion
- Provided BUILDER™ analysis to Engineering to ensure BCIs were legitimate and to validate RPIE replacements (i.e., prove a RPIE item would not be better served with a PM update or funding a project based on an antiquated (invalid) SMS entry)

- Created a data-driven process via Microsoft Access, which compares BUILDER™ information, IWIMS data, MDIs, and IPL scores to further assist in analytical decision making for current-year and out-year project generation in ACES

- R&O attends weekly Civil Engineering (CEN) project review meetings to assist in BUILDER™ validation. Its role at the meetings includes tracking completed facilities for assessment; identifying erroneous data used to start projects; reviewing BUILDER™ SMS data and secondary assessments; participating in discussions relevant to the SMS or project processes. R&O also helps CEN find the correct condition indices (i.e., BCI, CSCI, etc.) so CEN can calculate project funding

- Added BUILDER™ SMS validation to the AF FORM 332 closeout process. This provides a paper trail displaying what work is being completed on base, whether in-house or contract, and identifies the need for SMS equipment data updates or new inspections

- BUILDER™ SMS is a living document. Maintenance and upkeep is essential when new situations/updates arise to keep accurate data. To combat this issue, Altus R&O has integrated into the schedulers meetings. R&O identifies systems that are called into question and provides BUILDER™ SMS data updates to reflect repairs in the system. Often, this calls for a new assessment, in which case, Altus has a BUILDER™-trained person in each shop able to assess the repaired RPIE item. Alternatively, R&O can perform an inspection with the AMP Manager, Sub-AMP Managers or planners. Altus' R&O section "triple hats" these duty positions as current staffing levels do not provide the personnel to fill the current P-Plan manpower allocation

BUILDER Outputs

The table below shows BUILDER™ outputs and their end use. Please note that this table does not show all possible alignments of BUILDER™ outputs, rather it is intended to illustrate the minimum connections.

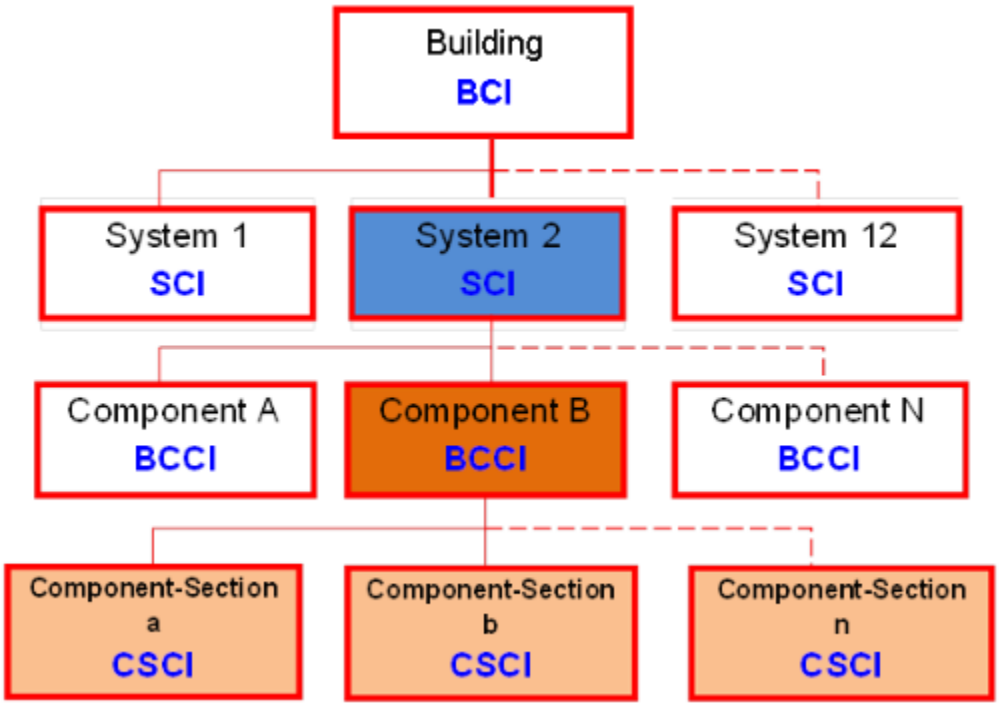
FUNCTIONAL AREAS RELYING ON BUILDER OUTPUTS								
	CONDITION INDEX	REMAINING SERVICE LIFE	WORK ITEM	FUNCTIONALITY INDEX	FACILITY CONDITION INDEX	RAW SCORED LIST	MODELING	WARRANTY
OPERATIONS FLIGHT	X	X	X	X	X	X	X	-
OPERATIONS ENGINEERING ELEMENT	X	X	X	X	X	X	X	-
ENGINEERING FLIGHT	X	X	X	X	X	X	X	-
MAJCOM	X	-	-	X	X	X	X	-
PLANNING AND INTEGRATION (AFCEC/CP)	X	X	X	X	X	X	X	-
ASSET VISIBILITY TEAM (AFCEC/COA)	X	-	-	X	-	-	-	-
HAF	-	-	-	-	-	-	X	-
WORK PRODUCTS INCORPORATED IN BUILDER OUTPUTS								
INTEGRATED WORK PLAN	-	-	X	-	-	-	-	-
BASE IPL	-	-	-	-	-	X	X	-
PROJECT	X	X	X	X	X	X	-	-
INSTALLATION DEVELOPMENT PLAN	-	-	-	-	-	-	X	-
MAJCOM IPL	-	-	-	-	-	-	X	-

Definitions

BCI: The BCI measures the condition of the building as a whole. It is computed by averaging the condition indices of the building systems, weighted by the replacement costs of the systems.

FCI: The (FCI) is the industry standard index calculated by dividing the total cost of necessary repairs in the building divided by the replacement cost of the building. In BUILDER™, the total cost of necessary repairs is estimated by summing the individual section repair costs.

CSCI: The component-section is the "management unit" upon which asset management decisions are made, and the CSCI is the fundamental index metric in BUILDER™. As the fundamental condition metric for building assets, the CSCI is aggregated using a bottom-up approach to determine a Building Component Condition Index (BCCI), a System Condition Index (SCI), and a Building Condition Index (BCI). This hierarchy is illustrated in the figure below. Likewise, the BCIs can be average or aggregated for groups of buildings, complexes, or entire installations (or portfolios) to represent an overall condition indicator. BUILDER™ contains the programmed algorithms to compute the CSCI metric and all higher corresponding CI metrics from the condition survey data that is entered.



Condition Index Hierarchy

SMS – TNAP Guidance

Overview

This TNAP Supplemental Guidance provides an overview of the Air Force Transportation Network and Airfield Pavement (TNAP) Asset Management Program and how Sustainment Management Systems (SMSs) and other pavement and non-pavement evaluation tools are used to meet Air Force operational requirements, manage Air Force TNAP assets, and achieve the standardized facility condition assessment objective outlined in the Under Secretary of Defense, Acquisition, Technology and Logistics 10 Sep 2013 Policy Memorandum for SMS implementation. This memorandum mandates that the Air Force properly record a facility condition index for each asset at each installation.

The Air Force pavement community has been gathering pavement inventory and condition data by conducting Pavement Condition Index (PCI) Surveys for airfield pavements, road, and parking pavements. As of the publication of this SMS – TNAP Supplemental Guidance, the Air Force has PCI data for 100% of airfield and roughly 80% of the road and parking pavement at our main operating bases. In addition to the 20% gap in road and parking pavements data at our main operating base, we have limited pavement condition data for road and parking pavement at geographically separated units (GSUs) and ranges which constitutes approximately 9% of the entire pavement inventory. The PAVER SMS is available for managing the airfield pavements and the road and parking pavements and is currently being updated to manage other non-pavement TNAP assets as determined by the TNAP AMP community.

The RAILER SMS is available for managing rail systems but not used consistently across the AF. There is currently no SMS specifically established for other non-pavement TNAP assets, but there is condition data on bridges, arresting systems and other TNAP assets in disparate decentralized data sources. This document outlines the plan to capture inventory and condition data on TNAP assets where it exists, define criteria to rate the condition of TNAP assets if such criteria does not exist, define procedures and process for collecting data where they do not exist, and identify the SMS to be used to collect and house this data for use in managing all TNAP assets.

Asset Management

The Air Force has established a goal to reduce the amount of infrastructure in accordance with AFPD 32-10. AFPD 32-10 states “Provide and retain the minimum number of installations and facilities necessary to effectively support Air Force missions and people at the lowest life-cycle cost and in a sustainable way. The Air Force will inactivate or dispose of installations and facilities that are excess to requirements.” SMSs provide data on funding required to maintain / repair essential infrastructure at a prescribed level of service at the lowest possible life cycle cost to accomplish this goal.

Infrastructure is divided into five activities: Transportation Networks, Utilities, Facilities, Real Estate, and Natural Infrastructure. The transportation networks include asset groups such as airfield, roads and vehicle parking areas, curbs and gutters, drainage structures, culverts, bridges, sidewalks, markings, traffic signals, signs, airfield lighting, rail systems, and ports (wharfs and piers). See Figure 1 below for listing of Asset Groups, TNAP AMP Assets, Category Codes, MDI, Asset Descriptions, SMS / Projected SMS, and Asset Data Sources.

Activity Management Plans (AMPs) developed for each of these major CE activities. These plans include information on Real Property inventory, Levels of Service (LOS), Key Performance Indicators (KPI), and the planned investments (projects/requirements) identified to achieve the required LOS.

TNAP SMS Background and Systems Description

Air Force TNAP Management Tools History

The DoD began in the 1940s performing periodic inspections to manage its airfield pavement assets. The Air Force started doing standardized pavement condition index (PCI) surveys over 40 years ago and began using software tools to manage transportation assets in the 1980s. These tools include the Pavement-Transportation Computer Aided Structural Engineering (PCASE) program for structural evaluation and design, PAVER, for determining surface condition and projecting deterioration and maintenance and repair (M&R) requirements for both airfield and road and parking pavements, and RAILER for determining the condition and projecting M&R requirements for rail systems.

PAVER 7.05 System Description: The current version of PAVER (7.05) is a desktop application. PAVER is used to calculate the surface condition and deterioration rate of the pavement using the work history and PCI inspection data on the type, severity, and quantity of distresses on the pavement surface. Assessors conduct PCI surveys using statistical sampling procedures outlined in ASTM standards. PAVER uses this data to predict the future condition and both the short and long-term maintenance and repair requirements of each pavement asset using cost-by-condition curves developed for each location. It is important to note that PAVER is not only used as asset management tools but perhaps more importantly, as a contingency planning tool. Several functional users use the PAVER analysis results for mission and investment decisions. For example, Combatant Commanders use the information to make mission beddown decisions, airfield managers use it to make daily operational decisions, and civil engineers use it to prioritize pavement repair requirements at forward operating locations. Since PAVER is used in contingency planning, it will be maintained with both a stand-alone and on-line capability.

PAVER 7.1 Description: Development of PAVER 7.1 is currently underway with an expected release in late 2015. It will have both a standalone and on-line capability with a similar look and feel as the current stand-alone version. PAVER 7.1 will be centrally hosted and in the near term will provide access to centrally hosted on-line PAVER databases for both airfields and roads and parking. In the longer term, it will provide access to the enterprise TNAP database for all Air Force users. AFCEC is currently investigating hosting options for all SMSs as well as centralized SMS data. Note that AFCEC has already rolled up all existing pavements data and is using this data to test PAVER 7.1.

PAVER Field Inspector System Description: PAVER Field Inspector is a companion desktop application for PAVER which allows multiple teams to collect pavement evaluation data which is then imported into the PAVER database for each location. It has a similar look and feel as the PAVER data entry screens, but has a smaller footprint than PAVER has. It has a basic geospatial information system (GIS) and geographic positioning system (GPS) capability that allows the user to identify their location within the pavement network and enter data for specific sample units. Teams can use this tool to update a local PAVER database or the centrally hosted enterprise TNAP database.

PCASE (PCASE 2.09 and 7.0) System Description: PCASE is the DoD mandated software tool for designing all airfield pavements and for designing roads and parking areas under specific circumstances for all DoD installations. PCASE is structured to share inventory with the PAVER program. Inventory includes the pavement network, branch and section data as well as work history, but does not currently share other key data elements such as the traffic, PCI, Pavement Classification Number (PCN), or Friction Index between the applications. In combination with PAVER, it provides a comprehensive set of tools that automates complex pavement design, evaluation, and management calculations for rigid and flexible pavements using both conventional and layered elastic methodologies. PCASE 2.09 is a stand-alone application used by pavement evaluation teams to collect airfield pavement characteristics data and use that data to compute the load bearing capacity of the airfield pavement PCASE 7.0 is currently under development with beta versions expected to be released in late 2015. In the future, both PCASE and PAVER data will be merged into a single database accessible to other applications such as TRIRIGA and GeoBase.

AF engineers and other functional users use PCASE data at all levels as an asset management tool to objectively quantify and prioritize recommended repair requirements and build airfield repair projects. Contingency planners use PCASE reports/data to make beddown decisions for forward operating locations, and to track the condition and risk as operations progress. The Operations (A3) community uses PCASE data as part of the Airfield Suitability and Restrictions Report (ASRR) process and by airfield managers at both forward operating locations and main operating bases to make daily local airfield operational decisions.

RAILER System Description: RAILER is currently a stand-alone desktop application for documenting rail system inventory, collecting and consolidating distress data, computing the condition of rail system components, and projecting the repair requirements for the rail network at each base. RAILER data is used to prioritize repair requirements for the rail network based on the condition and importance of those components. RAILER has a sister program, RAILER Remote Entry Database (RED) which is also a desktop application which is described below. The AF certified both programs for use on AF systems. Army's ERDC CERL developed RAILER to capture data on rail systems on military installations. Over the last several years, rails on AF installations used by DLA have been inspected by the ERDC Airfield and Pavements Branch using PAVER. Bases have also used other tools for capturing and analyzing rail condition data. The intent is to aggregate inventory and inspection data on all AF rail assets in a RAILER database. . RAILER and RAILER RED will continue to be used to collect field data for the foreseeable future.

RAILER Remote Entry Database (RED) System Description: RAILER RED software allows for electronic collection of rail inventory and inspection information by multiple teams in the field. This software can be installed on a tablet PC for quick, accurate, and easy data collection for upload into RAILER software. The RAILER RED software also displays defect findings from a previous inspection for verification if the defect was fixed or still remains. In addition, it displays the operating restriction for a recorded defect in real time based on the governing track standard. There is ongoing discussion of adopting another system Called EREDS for rail system data collection. This application was developed at ERDC in Vicksburg and has a both automated data collection capabilities and a more robust GIS component.

SMS Support for Other TNAP Assets: As mentioned in the overview, the Air Force has not historically centrally tracked other assets such as drainage structures, culverts, bridges, navigational aids (NAVAIDS), sidewalks, curbs and gutters, traffic control devices, airfield lighting, and ports (wharfs and piers) in a SMS. Working groups have been established to identify existing TNAP asset data on non-pavement assets, determine other data required for collection, and establish processes, procedures, and tools for maintaining the data. These processes will use current condition rating factors when available and if none exists, rating procedures will be established for these assets. The objective is to determine which SMS will be used to capture these data elements (PAVER, BUILDER, etc.) and make the updates required so the inventories and conditions can be captured. The intention is to use existing sources and processes to maximum extent possible. For a summary of the Asset Groups the team will be looking at, refer to Figure 1 above.

TNAP SMS Certification

SMS	CERTIFICATION
PCASE 2.X	PCASE re-certified by HQ AFSPC/A6S until March 2016. The local DAA must still update their ATO to include it.
PAVER 7.X	PAVER re-certified by HQ AFSPC/A6S until March 2016. The local DAA must still update their ATO to include it.
PAVER Field Inspector 1.X	PAVER Field Inspector re-certified by HQ AFSPC/A6S until June 2017. The local DAA must still update their ATO to include it.
RAILER 6.X	RAILER re-certified by HQ AFSPC/A6S until May 2017. The local DAA must still update their ATO to include it.
RAILER RED 6.X	RAILER RED re-certified by HQ AFSPC/A6S until May 2017. The local DAA must still update their ATO to include it.

Data Access Authority

The security is defined in three levels of access described below:

- **Read-only:** Permission to view and export reports of inventory and inspection data
- **Assessor:** In addition to Read Only, Assessor has permission to add, view, and edit Assessor's own inventory and inspection data. This includes exporting and importing PAVER Field Inspector files and RAILER Remote Entry Database (RED) files
- **Base Data Manager:** In addition to above, Base Data Manager has permission to edit a base's own inventory and inspection data in their assigned installation
- **Evaluator:** The evaluation team (APE Team or contractor) will have permission to edit a base's inventory and inspection data for a limited period of time during the course of an evaluation and report generation.
- **MAJCOM DET Data Manager:** In addition to above, MAJCOM DET Data Manager has permission to edit all inventory, inspection data, and perform work plan execution for all bases in a MAJCOM DET when supported by a documented field inspection or analysis by the AFCEC team
- **AFCEC or Enterprise Data Manager:** In addition to above, AFCEC or Enterprise Data Manager has permission to validate and edit all inventory, inspection data, and perform work plan execution for all bases in the enterprise

We recommend two Data Managers at each level. These restrictions are important because having too many data editors makes it difficult to control the data validity. In addition, accessibility to the SMS site is finite and could become overwhelmed with too many users. The Data Manager permissions may be transferred to others within the organization, but responsibility remains with whoever is designated as POC.

SMS – TNAP Guidance: PAVER

Overview

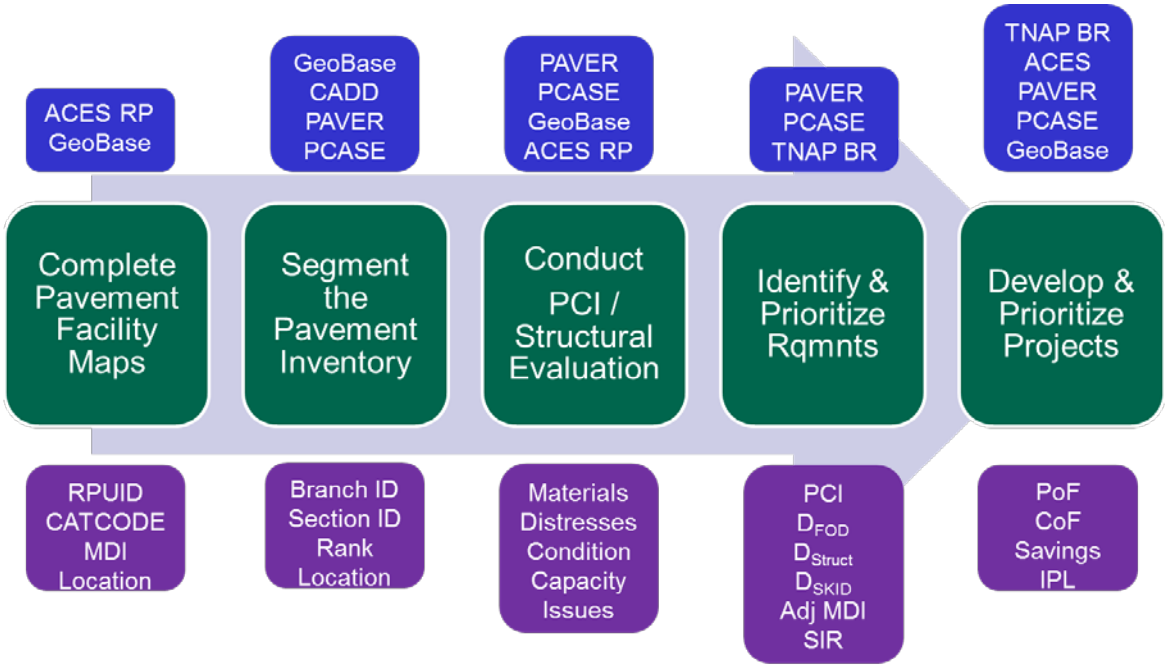
Process Overview

AFCEC centrally manages Pavement Condition Index (PCI) surveys and structural evaluations for airfields as well as road and parking areas. PCI surveys are conducted every four years. Every eight years airfields will receive a full structural, full PCI, and friction characteristics evaluation.

In between these regularly scheduled evaluations, the base is responsible for maintaining the PAVER database. Base personnel should update the construction history and condition whenever a project or significant in-house work is completed. They are also responsible for developing a Preventive Maintenance Plan (PMP), which is part of the TNAP Asset Management Plan (AMP). The PMP is updated annually and involves using the data available from the current PAVER database, structural evaluation report, and Friction Characteristics report. The goal is to translate the requirements in PAVER, and information in these other reports, into executable, prioritized projects to maintain the base's TNAP assets at an optimal level. Refer to TNAP resources below for a link to the Engineering Technical Letter (ETL) 14-3: Preventive Maintenance Plan (PMP) for Airfield Pavements, which outlines the overall process for generating the PMP.

An ETL PMP for Roads and Parking Pavements is under development.

Process Overview Map



Process Steps

- Complete/Update Pavement Facility Maps - Define Network Inventory
- Update Facilities Segmentation (Update Branches and Sections)
- Do Structural Evaluation/Pavement Condition Index Survey
- Identity Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules
- Bundle Requirements into Projects and do Detailed Estimates
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC Using TNAP Business Rules
- Combine Projects on Integrated Priority List (IPL)
- Prioritize IPL
- Repeat Process

Management Overview

AFCEC/CO is the focal point representing the Air Force on the Tri-service PAVER User Group and is the lead for the implementation and incorporation of PAVER into Air Force enterprise asset management activities. The PAVER Tri-Service User Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the PAVER Tri-Service User Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs. A similar structure will be used for other non-pavement TNAP assets to manage overall SMS requirements and develop any required SMS tools needed to collect and maintain inventory and condition data on TNAP assets.

Installation Points of Contact

Each installation should provide a primary and alternate Point of Contact (POC) to AFCEC for all issues related to PAVER/TNAP data and tools. AFCEC recommends that these POC's be the TNAP AMP and BCAMP Manager. They will be the guardians of the data at the installation and will have overall responsibility for the integrity of the data. The installation POCs will be made aware who at the MAJCOM Detachment (DET) and Field Operating Agency (FOA) has permission to alter the data. All requests for rights to data (Read-Only, Assessor, or Data Manager) must be coordinated with the base POC, whose name will go in the Requesting POC block of the PAVER User Account Request Form. The approval authority at AFCEC is the "Account Verifier" and will typically approve assessor or data manager rights to requests validated by the appropriate base POC.

MAJCOM DET Points of Contact

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to PAVER/TNAP data and tools. They should keep the base informed of who at the MAJCOM DET has permission to make changes to data, (i.e., Data Managers). They should inform the base about any changes the MAJCOM DET has made to the database. The approval authority at AFCEC will typically approve assessor or data manager rights to requests validated by the appropriate MAJCOM DET POC, whose name will go in the "Requesting POC" block of the PAVER User Account Request Form.

AFCEC POCs

The following are also the Account Verifiers for the RAILER User Account Request Form:

- Mr. George Van Steenburg, Pavement Evaluation Program Manager
  George.vansteenburg.1@us.af.mil, DSN 523-6083
- Mr. Brian Lee, Transportation and Airfield Pavement AMP Manager
  Brian.Lee@us.af.mil, DSN 969-9400
- Mr. Pat Kelly, Transportation sub-AMP Manager
  patrick.kelly.26@us.af.mil, DSN 523-6304

Roles and Responsibilities

Pavements (Airfields and Roads/Parking Lots):

Base Responsibilities:

- Create a pavement facility map for airfields and for roads and parking
- Update real property records using DD Form 1354 to reflect what was in the PCI survey Real Property Report
- Develop preventive maintenance plans and generate projects to address requirements in PCI report
- Update construction history and PCI for projects completed between 4-year evaluations
- Provide support to structural evaluation teams and AFCEC PCI consultants performing surveys

AFCEC Responsibilities:

- Review facility maps and work with base to make any needed adjustments
- Centrally manage PCI programs for both airfields and roads and parking on a 4-year cycle. This includes completing linear segmentation and validating actual areas, performing analysis, and generating report that outlines issues, budget scenarios, and requirements
- Centrally manage structural and Friction testing program on 8-year cycle

Other Pavements (Curbs and Gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Traffic Control Devices (Markings, Signs, Signals):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Bridges (Includes pedestrian bridges and culverts with width 20’ and greater):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Drainage Structures (Under pavements; includes culverts with width under 20'):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Aircraft Arresting Systems (AASs):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Navigational Aids (NAVAIDS):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Airfield Lighting:

Airfield lighting is under Electrical in the Utilities SMS. Utilities SMS is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Ports (Wharfs and Piers):

PAVER is under development. Continue to use local procedures to collect inventory and condition data until further guidance is established.

Training

The following outlines PAVER required training:

- **Data Managers**: 3-Day AFCEC/USACE PAVER training
- **Non-pavement TNAP Asset training**: TBD
- **Evaluators**: 5-day AFCEC/USACE PAVER training, AFCEC/USACE PCASE Training
- **Read Only Access**: None

AFCEC recommends Base Programmers and MAJCOM DET personnel who have direct involvement with the information contained in the TNAP Database have assessors' rights.

The 3-Day AFCEC/USACE training schedule can be found at: https://transportation.wes.army.mil/triservice/

To schedule training, contact Mr. George Van Steenburg, George.vansteenburg.1@us.af.mil

Computer based AFCEC/USACE Training is currently in development.

Implementation Support

Websites to assist with implementation:

RESOURCE	LOCATION
Tri-service Website	https://transportation.wes.army.mil/triservice/
AFCEC Portal	https://app.eis.af.mil/a7cportal/CEPlaybooks/OPS/OE/FCA/default.aspx
Pavements Community of Practice	https://cs3.eis.af.mil/sites/OO-EN-CE-A6/24048/OO-EN-CE-55

AFCEC Planning and Integration milBook Page	https://www.milsuite.mil/book/groups/afcec-planni
AFCEC Reach Back Center	DSN: 523-6995 COMM: 1-850-283-6995; Toll Free: 1-888-232-3721 Email: afcec.rbc@us.af.mil

TNAP Resources

RESOURCE	LOCATION
Pavements and Airfield Damage Repair	https://cs3.eis.af.mil/sites/OO-EN-CE-A6/24048/OO-EN-CE-55
PAVER Download	https://transportation.erdc.dren.mil/triservice/
USACE PAVER Manual and Training Slides	https://cs3.eis.af.mil/sites/OO-EN-CE-A6/24048/OO-EN-CE-55/PAVER/Forms/AllItems.aspx
Pavement Evaluation Reports and Databases	https://tyndall.eim.acc.af.mil/apps/afcec/Pavement%20Reports/default.aspx
AFI 32-1041, Pavement Evaluation Program	http://www.e-publishing.af.mil/
Unified Facility Criteria	http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4 • UFC 3-260-16FA Airfield Pavement Condition Survey Procedures • UFC 3-270-05 & 06 Airfield PCIs
ETL 14-3, Preventive Maintenance Plan (PMP) for Airfield Pavements	http://www.wbdg.org/ccb/browse_cat.php?c=125
Tri-Service Transportation: Pavements-Transportation – Community of Practice	https://transportation.wes.army.mil/triservice/
TNAP Business Rules	See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information

Inventory/Assess

Pavement Data Collection and Inspection Approach

The approach to collecting inventory and condition data for TNAP assets differs from the approach used for vertical facilities. While the main effort of data collection for vertical facilities is by base personnel, historically, the collection of pavement condition data has been centrally accomplished through AFCEC's Airfield Pavement Evaluation (APE) Team, one of its consultants, and/or the USAFR S-Team. AFCEC's intent is for this process to continue in the future with additional support from the bases. In the past, the base's role has been to provide data to the APE team, the USAFR S-Team, or contractor to update work history, provide input on current issues, and provide a point of contact (POC) that coordinates the field survey schedule and access requirements for the evaluation team. In the future, the bases will use PAVER to actively maintain the TNAP database between PCI surveys/structural evaluations. This includes updating construction history and condition data, but does not require the bases to do PCI surveys. The APE Team will continue to conduct structural evaluations for each airfield on an 8-year cycle. AFCEC plans to centrally fund and execute PCI surveys for airfields, roads, and parking areas every four years. AFCEC plans to use consultants that specialize in pavement management and PCI surveys to execute this work. The final deliverables include the PCI report, PAVER database, and mapping, as well as all source documents for the report. This report data will be updated in the central database for AFCEC, MAJCOM DETs, and bases to plan and prioritize projects that compete for funds at the enterprise level.

Airfield Structural Evaluations: The APE Team has established an eight-year schedule for conducting structural evaluations for 100% of all airfield pavements. These evaluations include PCI inspection, coring, DCP, concrete and soil testing as well as Heavy Weight Deflectometer (HWD) testing, friction testing, and anchor testing as required. Note historically, the team did not conduct full PCI surveys as part of structural evaluations, but will start doing full

PCIs as part of structural evaluations in the future. In the interim, the team will continue to schedule PCI surveys by contract in the same year as the structural evaluation to accomplish the objective until contract or government positions can be established to do full PCIs.

Airfield PCI Surveys: Historically AFCEC has centrally executed airfield PCIs with funding from the MAJCOMs and bases. PAD 12-03 established centralized funding for both airfield and road and parking PCI surveys to eliminate significant inefficiencies with the old process and provide a framework to align the PCI survey schedule and structural evaluation schedule. PCI surveys will be conducted on 100% of airfield pavements to achieve a 95% confidence level by AFCEC consultants via contract every four years. In between these surveys, the base is responsible for maintaining their condition data by ensuring construction history is updated when projects become complete as part of the capitalization process and as outlined in ETL 14-3, *Preventive Maintenance Plan (PMP) for Airfield Pavements*.

Road and Parking PCI Surveys: In the past, road and parking PCIs used the same process for funding and execution as for airfield PCIs although some MAJCOMs had opted not to fund these PCIs. As mentioned above, PAD 12-03 established centralized funding for both airfield and road and parking PCI surveys to eliminate significant inefficiencies with the old process. The current objective is for AFCEC to conduct a centrally funded and executed, 95% confidence level PCI survey at each base by contract to complete linear segmentation implementation process and establish a condition and deterioration rate baseline. Once this baseline is established, AFCEC will determine how future surveys will be conducted. As with airfield PCI surveys, each base is responsible for maintaining their PCI data in between these regularly scheduled surveys by updating construction history and condition data as projects are completed. **Specific guidance for maintaining PCI data and using it to develop road and parking pavement management plans is currently under development.**

Other Pavement Inspections: Other pavements include; curbs and gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc. A working group of MAJCOM DET and AFCEC engineers is currently developing rating criteria and maintenance policies for these asset types. They will determine what inventory data needs to be collected, what currently exists for these assets in GeoBase and other sources, and recommend alternatives for collecting and maintaining this data in a central repository. Some are straightforward; starting in FY 15, we will include curbs and gutters in road and parking PCI surveys. For others such as equipment pads and sidewalks, simple annual inspections conducted by the base with tools to populate the central TNAP database are the likely course of action.

Traffic Control Device Inspections: Data does exist at some MAJCOMs and bases regarding signage and retro reflectivity compliance. There are also traffic management studies that document the number and, in some cases, condition of other control devices. The intent of these inspections is to identify tools and procedures currently used to collect and maintain this data; to develop standard tools and condition ratings (if there is variability); and to determine key data elements for tracking at the enterprise level.

Bridge Inspections (Includes pedestrian bridges and culverts with width 20' and greater): In the past, bases used in-house labor or contract labor to accomplish their periodic bridge inspections using Federal Highway Administration (FHWA) inspection criteria and funding. The current plan is to have the FHWA retain the funding and execute the bridge inspections for the Air Force on a rotating cycle (20% of bases each year). FHWA will provide detailed reports that not only identify condition but also define repair requirements and costs for use by the respective bases to develop projects to compete on the IPL. In the near term, AFCEC/CO, in concert with AFCEC/DTS, plan to develop a database to replace the rollup spreadsheet used to roll-up bridge data. Until then, the detailed inspection report data will continue to be rolled up into this central database and posted on the AFCEC SharePoint Site. In 2015, AFCEC will consolidate key data elements such as inventory, criticality, and three condition factors (on a scale from 0 to 9); one each for the substructure, superstructure, and deck in the PAVER database for each location with the intent of using this data for prioritizing requirements and developing TNAP budget projections. In 2016, the intent is to migrate the roll-up bridge database to the central server that will host PAVER Web and the Pavements Database. AFCEC/CO will also investigate making further upgrades to modify the central PAVER pavements database to accept all data elements of bridge inspection data. Additionally, they will investigate linking the PAVER pavements database with the bridge database created in 2015, which will create a TNAP database with all TNAP data elements.

Drainage Structures (Under pavements; includes culverts with width under 20'): In 2015, AFCEC will investigate and define existing data sources on the inventory and condition of drainage structure assets. Where applicable, AFCEC will consolidate data into a central data repository and define/modify processes for maintaining

this data. In 2016, this central database will migrate to the central server that will host PAVER Web and the Pavements Database. AFCEC/CO will also investigate making further upgrades to either modify the central PAVER pavements database to accept drainage structure inventory and condition data elements or to link the PAVER pavements database with the drainage structure database as part of a TNAP database with all TNAP data elements. Further, if it is determined that data has not been collected on these assets, in 2016 AFCEC/CO will investigate the information required and define requirements for drainage structure inspection tools similar to Field inspector for collecting and maintaining drainage structure data.

Aircraft Arresting Systems (AASs): Inspection data on aircraft arresting systems currently exists at the bases and potentially some of the MAJCOM DETs. In 2015, AFCEC will investigate what data currently exists and in early 2016 will consolidate this data into a central AAS database. In mid-2016, this central database will migrate to the central server that will host PAVER Web and the Pavements Database. AFCEC/CO will also investigate making further upgrades to either modify the central PAVER pavements database to accept all data elements of AAS inspection data or to link the PAVER pavements database with the AAS database created in 2015, as part of a TNAP database with all TNAP data elements.

Navigational Aids (NAVAIDS): In 2015, AFCEC will investigate and define whether we should be tracking these assets in our central TNAP database and whether the Flight Standards, TERPS, or Communications communities have already been collecting and maintaining inventory and condition data on these assets. If it is determined that all or some of these assets need to be included in the TNAP database, AFCEC will consolidate any existing data into a central data repository and define/modify processes for maintaining this data. In mid-2016, this central database will migrate to the central server that will host PAVER Web and the Pavements Database. AFCEC/CO will also investigate making further upgrades to either modify the central PAVER pavements database to accept NAVAIDS inventory and condition data elements or to link the PAVER pavements database with the NAVAIDS database as part of a TNAP database with all TNAP data elements. Further, if determined that data collection not yet done on these assets, in 2016 AFCEC/CO will investigate the information required and define requirements for NAVAIDS inspection tools similar Field inspector for collecting and maintaining NAVAIDS data.

Airfield Lighting: Airfield lighting is under Electrical in the Utilities SMS.

Ports (Wharfs and Piers): The intention is to use the Navy's well-defined inspection criteria for port facilities to the maximum extent possible. In 2015, AFCEC will investigate and define existing data sources to inventory and assess condition of port assets. Where it exists, AFCEC will consolidate data into a central data repository and define/modify processes for maintaining this data. In 2016, this central database will be decided and migrated to the central server that will host PAVER Web and the Pavements Database. AFCEC/CO will also investigate the status of any inspection tools the Navy uses and adapt them to AF needs.

Analyze/Forecast

Pavements Data Analysis and Forecasting Approach: Airfield Pavements/ Roads and Parking Lot Pavements/ Other Pavements (Other pavements include; Curbs and Gutters, equipment pads, sidewalks, hiking, jogging trails, troop walks, and covered walkways, etc.)

Asset management requires knowing the inventory, condition, and criticality of the asset to the mission. PCI surveys and pavement evaluations only provide some of the total requirements. Installations TNAP working group should meet to determine all of the requirements and formulate cost-effective solutions for PM, minor and major M&R, and reconstruction.

Assessment Purpose: A pavement assessment is required to develop a pavement PMP.

Team Composition: The assessment team should consist of experienced personnel from airfield operations (for airfield pavements) and civil engineering. At a minimum civil engineering should be represented by the pavements engineer, community planner, and an Operations pavement/equipment shop person.

Procedure: The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the pavements to validate known requirements from data in AFCEC reports, and

identifying new requirements. These requirements will be prioritized using the same TNAP business rule processes that are used to evaluate projects on the IPL. Next, work with base programmers to develop project scopes and costs for the pavements. The requirements and projects applicable to PM will be included in the PMP.

Airfield Pavement Management Process

- Develop, maintain, and organize the pavement inventory
- Assess the current condition of pavements
- Keep track of M&R history
- Use/Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

Data Collection and Analysis Processes

See SMS - TNAP Guidance: Business Rules for TNAP Segmentation for additional information

Traffic Control Devices (Markings, Signs, Signals) Data Analysis and Forecasting Approach

Assessment Purpose: Assessments on traffic control devices are required to develop PMPs.

Team Composition: The assessment team should consist of experienced personnel from civil engineering. At a minimum, the civil engineering team should be represented by the pavements engineer (or assigned engineer), community planner, and operations personnel from the pavement and equipment shop and sign shop.

Procedure: The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the traffic control assets to validate known requirements, identifying new requirements, and developing project scopes and costs for traffic control devices. The requirements and projects applicable to PM will be included in the PMP.

Traffic Control Device Management Process

- Develop, maintain, and organize the inventory for the traffic control devices
- Assess the current condition of the traffic control devices
- Keep track of M&R history
- Use/Develop models to predict conditions
- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

Data Collection and Analysis Processes

TNAP is under development. Continue to use local procedures until further guidance is established.

Bridges Data Analysis and Forecasting Approach (Includes pedestrian bridges and culverts with width 20' and greater)

TNAP is under development. Continue to use local procedures until further guidance is established.

Drainage Structures Data Analysis and Forecasting Approach (Under pavements; includes culverts with width under 20')

TNAP is under development. Continue to use local procedures until further guidance is established.

Aircraft Arresting Systems (AASs) Data Analysis and Forecasting Approach

TNAP is under development. Continue to use local procedures until further guidance is established.

Navigational Aids (NAVAIDS) Data Analysis and Forecasting Approach

TNAP is under development. Continue to use local procedures until further guidance is established.

Airfield Lighting Data Analysis and Forecasting Approach

(Airfield lighting is under Electrical in the Utilities SMS). TNAP is under development. Continue to use local procedures until further guidance is established.

Ports (Wharfs and Piers) Data Analysis and Forecasting Approach

TNAP is under development. Continue to use local procedures until further guidance is established.

SMS – TNAP Guidance: Business Rules for TNAP Segmentation

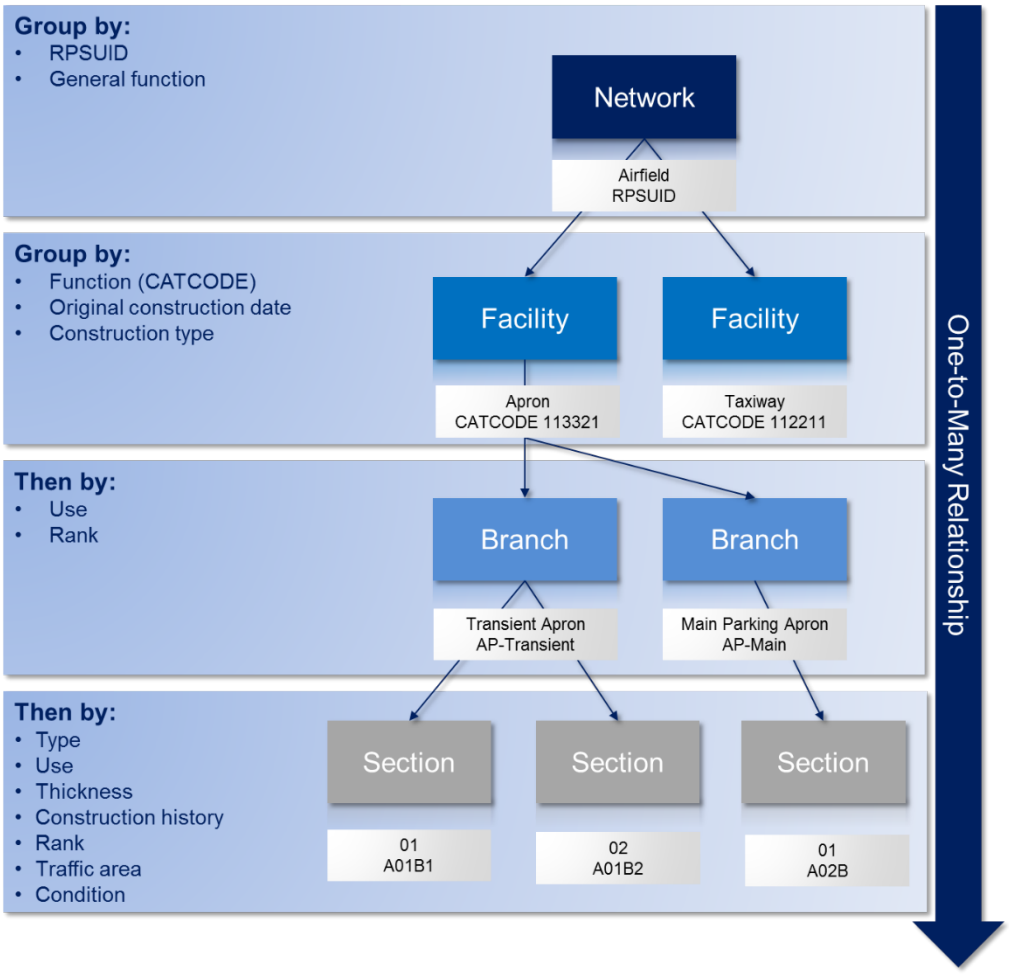
Overview

This section outlines general business rules for the linear segmentation of pavements and provides visual examples of network component identification. Air Force Instruction (AFI) 32-1041, *Airfield Pavement Evaluation Program - Chapter 3, Linear Segmentation of Pavements* provides in-depth guidance for roads and airfield pavements. Please note that there is significant variability in how Real Property Office (RPO) has implemented the rules for designating pavement facilities. This poses a challenge for anyone assigning segments to these facilities. The examples below outline possible scenarios and suggest how they can be handled.

Segmentation Hierarchy

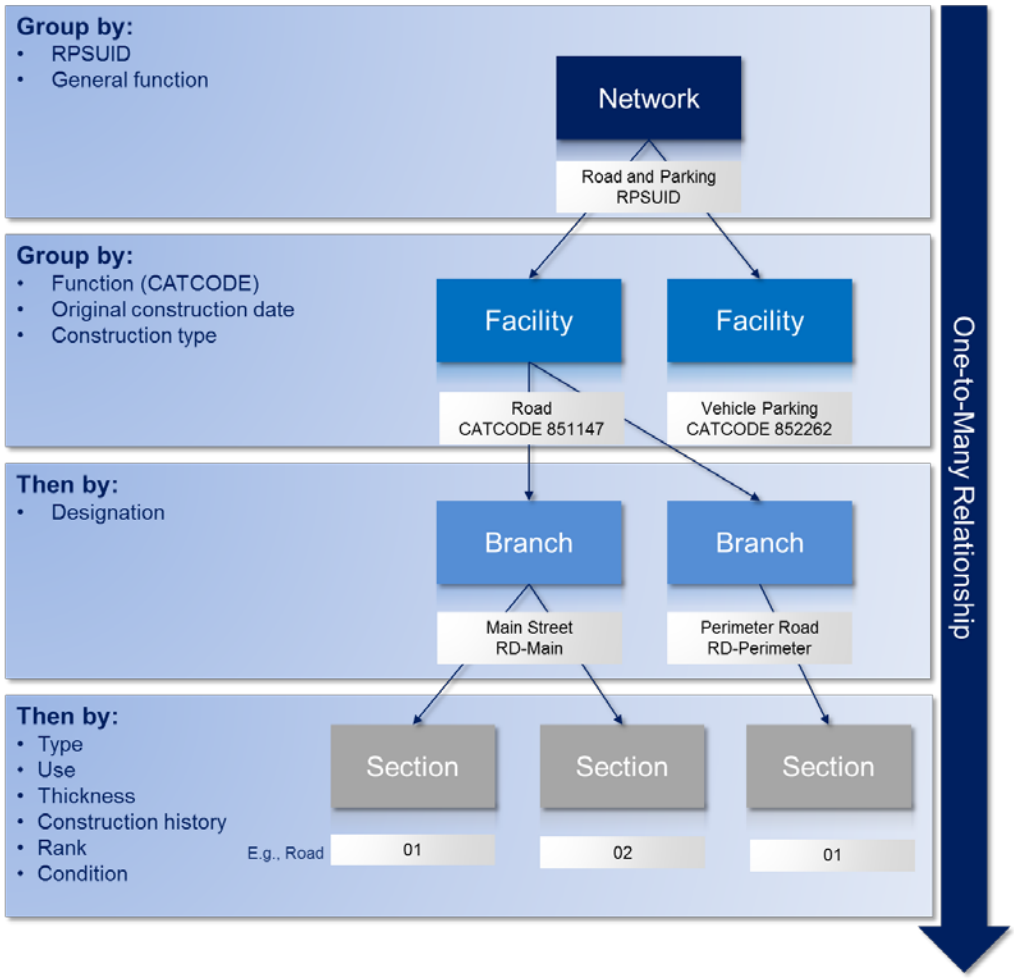
The Segmentation Hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy. A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics. The hierarchies shown below are based on business rules established to maintain a structured relationship between real property data elements and pavement engineering data elements. It is important to note that the Real Property Unique Identifier (RPUID), facility number, Facility Analysis Category (FAC),and category code (CATCODE) associated with each facility are all assigned at the section level in PAVER to provide maximum flexibility for data analysis and to accommodate potential changes to business rules or requirements in the future. It should also be noted that FAC is included for analysis because sustainment costs are based on FAC rather than CATCODE. In most cases, there should be no problem maintaining this hierarchy. Instances may arise where the facility was assigned in a way that compromises the ability to manage the asset from an engineering perspective. In these cases, engineers should work with the RPO to modify the facility designation to resolve the conflict. If this is not possible, the hierarchy may be disregarded to maintain the integrity of the branch. An example of this would be a runway that has two facility numbers, one for the reconstructed portion of the runway and another for the original runway. Ideally, there should only be one facility number for the load bearing surface of the runway. From the engineering perspective, the team should consider the entire load bearing surface of the runway as a branch. Creating two runway branches to align with the facilities would cause issues in evaluating and reporting the runway condition and capability as a whole. If the RPO cannot combine the two runway facilities, the runway sections should be aligned as separate facilities, but only one branch should be created for the runway since the hierarchy cannot be maintained.

Airfield Segmentation Hierarchy



Airfield Segmentation Hierarchy

Road and Parking



Road and Parking Segmentation Hierarchy

Pavement Management Segmentation Rules

AFI 32-1041 delineates specific pavement segmentation business rules. The table below summarizes that guidance.

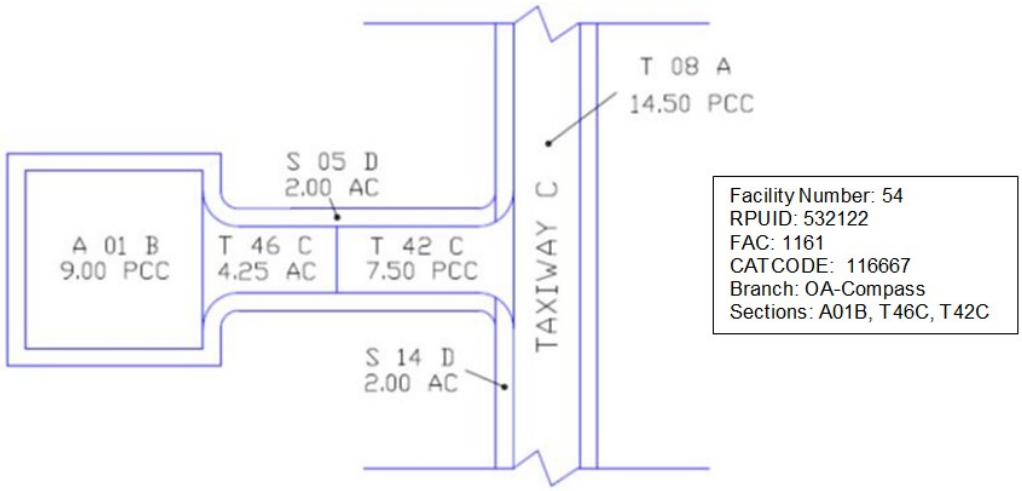
SEGMENT	DESCRIPTION	CONSTRAINT	DATA ELEMENTS	AUTHORITATIVE SOURCE
Network	Pavement group based on general function, such as airfield pavement network or paved road, drive, and parking area network	Network can only be associated with one RPSUID	PAVER Network ID, RP network, RPSUID	OSD Real Property Information Model (RPIM) Version 5.0
Facility	An area of pavement with a specific single function, such as a runway, apron, taxiway, road, driveway, or parking area	For linear assets, a facility can have only one FAC and CATCODE	CATCODE, FAC, facility number, RPUID	AFI 32-1041, AFI 32-9005

SEGMENT	DESCRIPTION	CONSTRAINT	DATA ELEMENTS	AUTHORITATIVE SOURCE
Branch	A logical subset of the network, such as a named taxiway or a named road	Branches are confined to a single pavement use for airfields, road name for roads, and facility supported or use for parking areas	Branch name, PAVER Branch ID	AFI 32-1041
Section	A subset of a branch that is assigned based on specific physical and/or usage characteristics	Sections are confined to a unique combination of physical or usage characteristics	PAVER Section ID, pavement type, use, thickness, construction history, rank, traffic area, surface condition. Note that RPUID, facility number, FAC, and CATCODE are all assigned at the section level in PAVER	AFI 32-1041

Pavement Management Segmentation Rules

The following examples illustrate segmentation rules for airfield, road, and parking pavements.

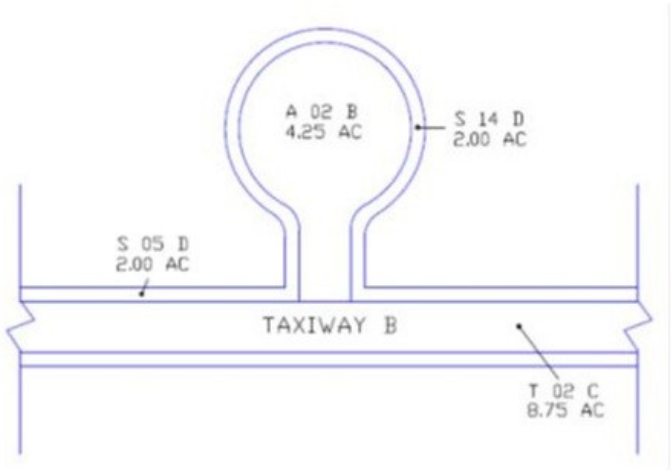
Army and Air Force Compass Calibration Pad



Calibration Pad Segmentation

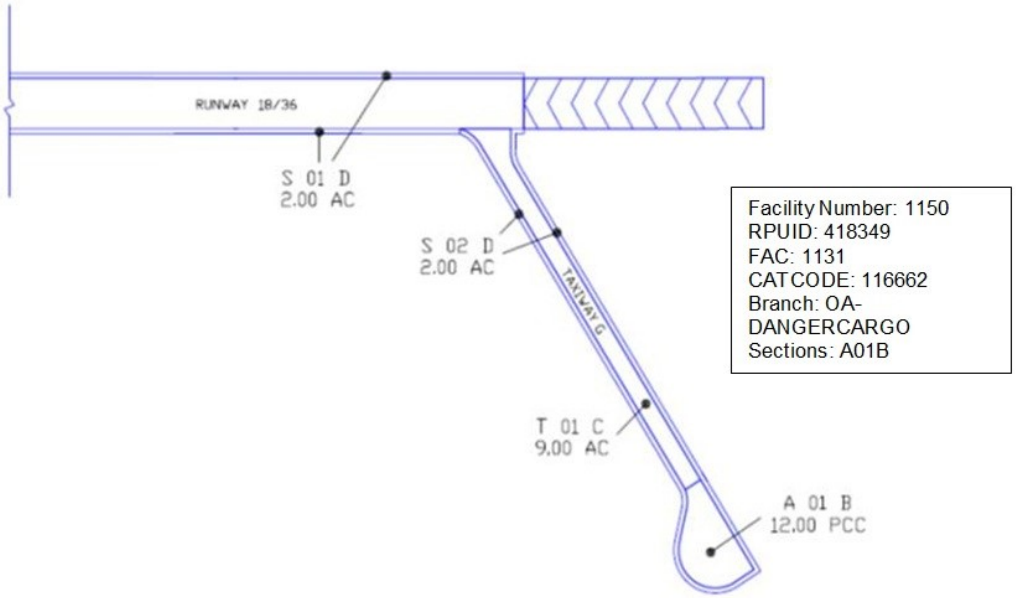
In the figure above, the compass calibration pad facility is made up of one branch, Other Apron (OA)-Compass. The branch is made up of three sections; the access taxiway to the compass calibration pad services no other aprons or pads and consists of two sections. One is constructed of asphalt and the other of concrete. The pad itself is a separate section constructed of concrete. All three sections are assigned the RPUID and facility number for the compass calibration pad at this base. They are also assigned the FAC 1161 (Compass Calibration Pad, Surfaced) and the CATCODE 116667 (Calibration pad). The shoulder section for both the access taxiway and the pad are part of a separate facility and apron shoulder, and they are assigned to the FAC 1165 (Aircraft Pavement, Shoulder) and CATCODE 116642 (Paved Shoulder). The shoulder associated with Taxiway C has the same category code and FAC as the apron shoulder, but it should be broken out as a separate facility with its own RPUID and facility number. In some instances, bases may combine all shoulder pavements into one facility, but ideally, they should be separated into separate facilities; one for apron shoulders, one for taxiway shoulders, and one for runway shoulders.

Hazardous Cargo Pad



Hazardous Cargo Pad Segmentation

In the figure above, the Hazardous Cargo Pad facility is made up on one branch, OA-HazCargo. The branch is made up of one section. Since the construction is the same for both the access taxiway to the Hazardous Cargo pad and the pad itself, and it serves no other pads or aprons, they are considered one section. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). Note the terms 'Dangerous' and 'Hazardous Cargo' are used interchangeably in the pavement Unified Facility Criteria (UFC). The shoulder section is handled the same way as described in the Calibration Pad example.

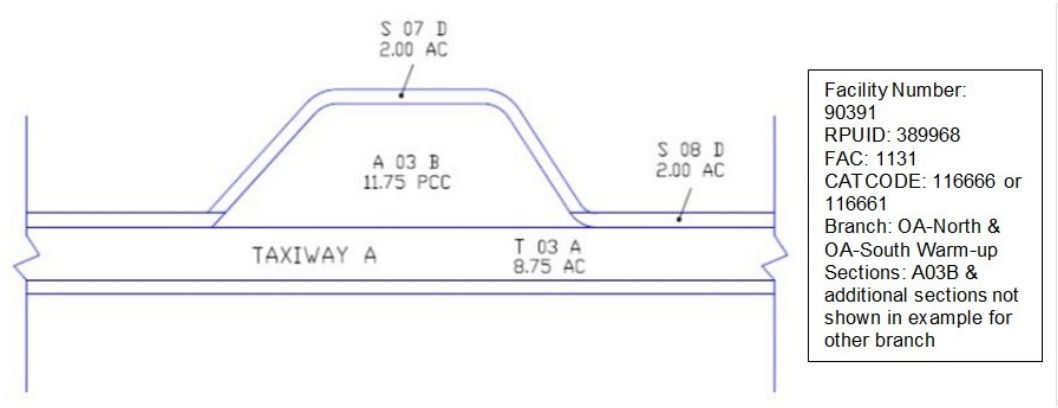


Hazardous Cargo Pad Segmentation

In the figure above, the Hazardous Cargo Pad facility is made up of one branch, OA-DANGERCARGO. The branch is made up of one section, A01B. The section is assigned the RPUID and facility number for the Hazardous Cargo Pad at this base. It is also assigned the FAC 1131 (Surfaced Aircraft Apron) and the CATCODE 116662 (Dangerous Cargo Pad, Load/Unload). The taxiway to this hazardous cargo pad was given the alpha designation G, so in this instance, T01C should be assigned to the taxiway facility. The shoulder around A01B should be assigned to the apron shoulder facility; the shoulder associated with T01C should be assigned to the taxiway shoulder facility; and the runway shoulder should be assigned to the runway shoulder facility. As noted previously, some bases may have all

shoulders assigned to one facility, in which case, all shoulders should be assigned to that facility. Separate shoulder facility assignments are preferred.

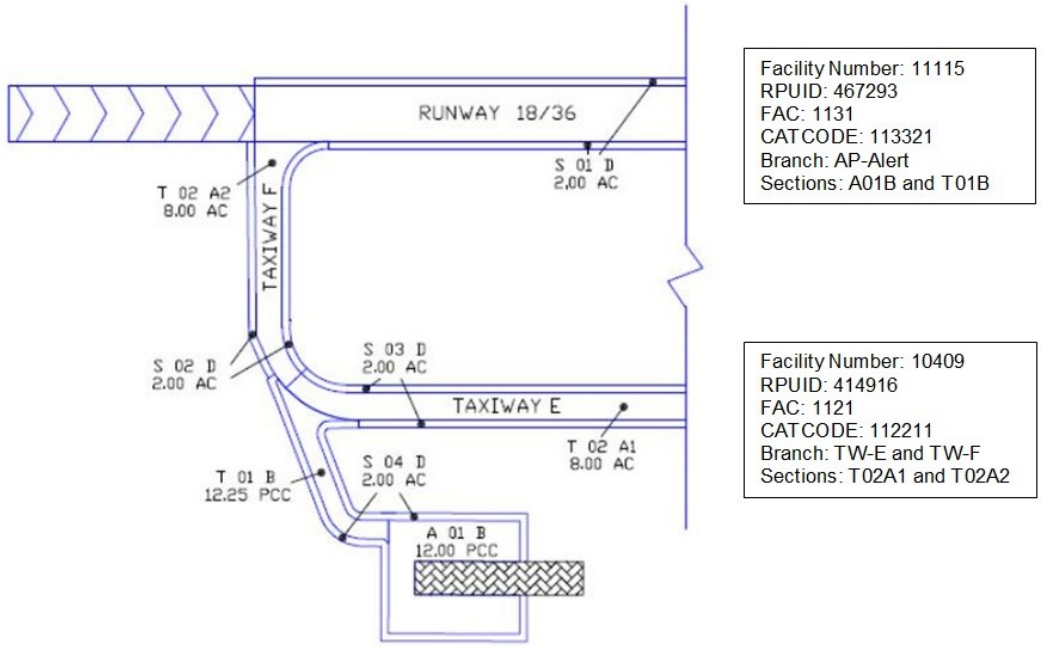
Warm-Up Aprons and Arm / Disarm Pads



Warm-up Apron Arm / Disarm Pad Segmentation

FAC 1131 also includes Warm-Up Aprons (CATCODE 116666) and Arm/Disarm Pads (CATCODE 116661). In some cases, there may be multiple Warm-up Aprons or Arm/Disarm Pads at opposite ends of the runway. In these instances both pads (with a given category code) may be included in the same facility. If so, each will be considered a separate branch (e.g., OA-North Warm-up and OA-South Warm-up). Each of these branches may have one or more sections depending on construction characteristics. The shoulders are handled in the same way as the previous example.

Alert Apron and Taxiways



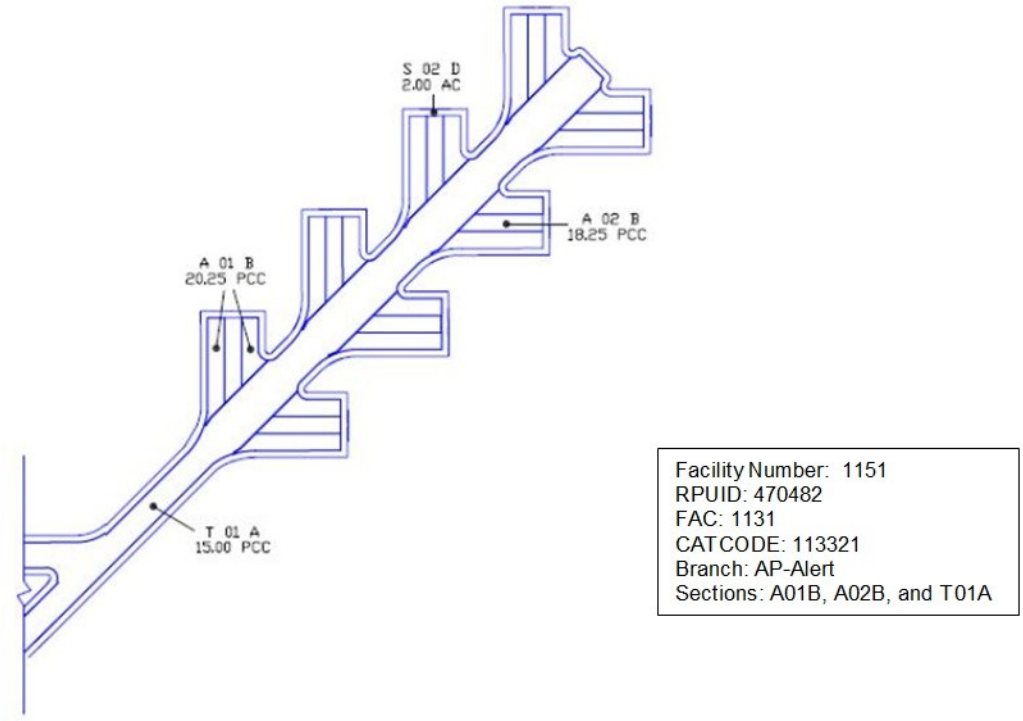
Alert Apron and Taxiway Segmentation

- **Alert Apron:** The figure above shows an alert apron with an access taxiway. The access taxiway does not have an alpha designation, so it is considered part of the alert apron facility. The facility has one branch

Apron, (AP)-Alert, which is made up of two sections: the access taxiway T01B, which is constructed of 12.25 inch concrete pavement, and the main alert apron A01B, constructed of 12.00 inch concrete. Both sections are assigned FAC 1131 and CATCODE 113321. If there are any shoulders present on either the access taxiway or the alert apron itself, they will be handled the same as described in the compass calibration pad example

- **Taxiways:** Ideally each named taxiway will have its own facility number. In practice, however, taxiways are sometimes included in one facility, or multiple taxiways are included in one facility. In this graphic, even though the construction is similar for both T02A1 and T02A2, they are divided into two separate segments: one assigned to Taxiway E and one to Taxiway F. Taxiway E and F should both be separate branches, but both of these branches are assigned to Facility Number 10409. Named taxiways assigned to multiple facility numbers (e.g., parallel taxiway) should be broken into two parts. The team should work with the base RPO to see if these facilities can be combined. If not, the team should create sections that align with the facility boundaries but maintain the entire taxiway as a branch

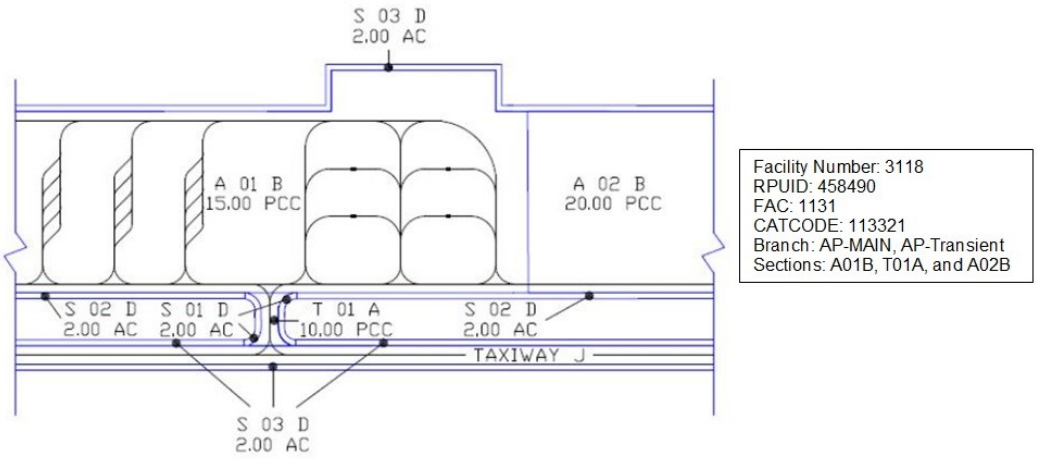
Alert Area



Alert Area Segmentation

The alert pads and the access taxiway, which does not have an alpha designation and only services the alert pads, are treated as one branch AP-Alert. The branch has three sections that are structurally different, even though they are both constructed of 16-inch Portland cement concrete (PCC). They are assigned the FAC 1131 and CATCODE 113321. Ideally the alert apron would have its own facility number but, in practice, it may be included in a facility with other aprons. In the latter case, each of these aprons will be assigned a different branch designation. Shoulders should be handled as described previously.

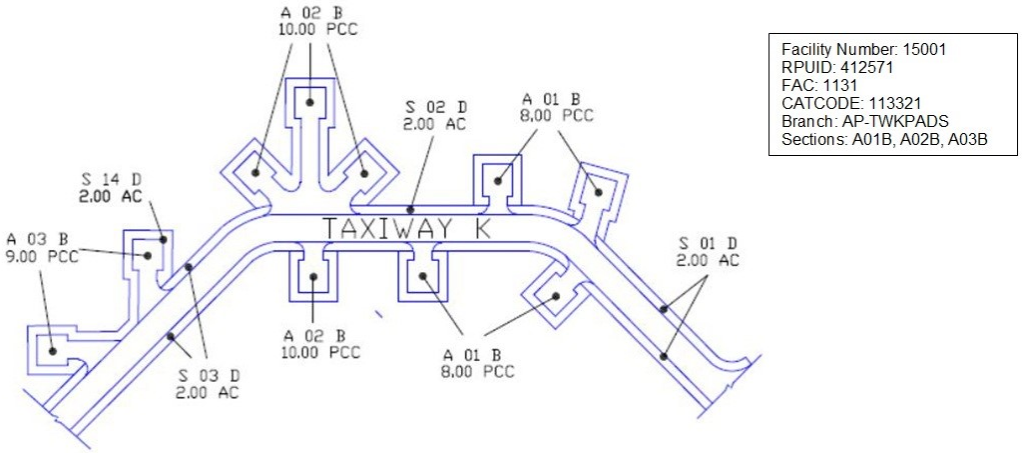
Parking Apron



Parking Apron Segmentation

The figure above shows a main parking apron facility. The facility has two branches, the main parking apron (A01B and T01A) and the transient parking apron (A02B). Note that the taxilanes on the main apron are not broken out as separate sections; they are considered part of the apron. Shoulders are handled as described previously.

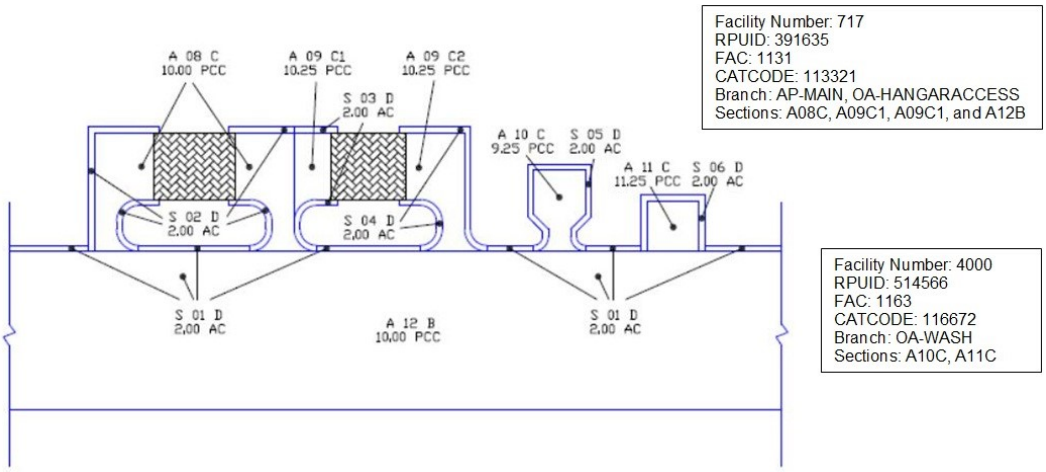
Dispersed Parking Aprons (Pads or Hardstands)



Dispersed Parking Apron Segmentation

In the figure above, all the dispersed aprons on taxiway K are in one facility (15001). They are all assigned to a single branch (AP-TWKPADS). The branch consists of three sections A01B, A02B, and A03B. Taxiway K is a separate facility with its own branch and sections. The shoulders for Taxiway K, S01D, S02D, and S03D are all part of the taxiway shoulder facility and the taxiway K shoulder branch. The shoulders for the dispersed parking aprons are all part of the apron shoulder facility. In this example, they are all included in one section S14D, which is part of the taxiway K shoulder branch. Dispersed parking pads or aprons can become complex. If the team encounters a base where each pad has been given a facility number, they will need to assign a section number to each pad. If the pads are structurally similar, as shown in the figure above, they would shred out the sections (e.g., A01B1, A01B2). Each of the separate facilities should also have its own branch.

Hangar Access Aprons and Washracks

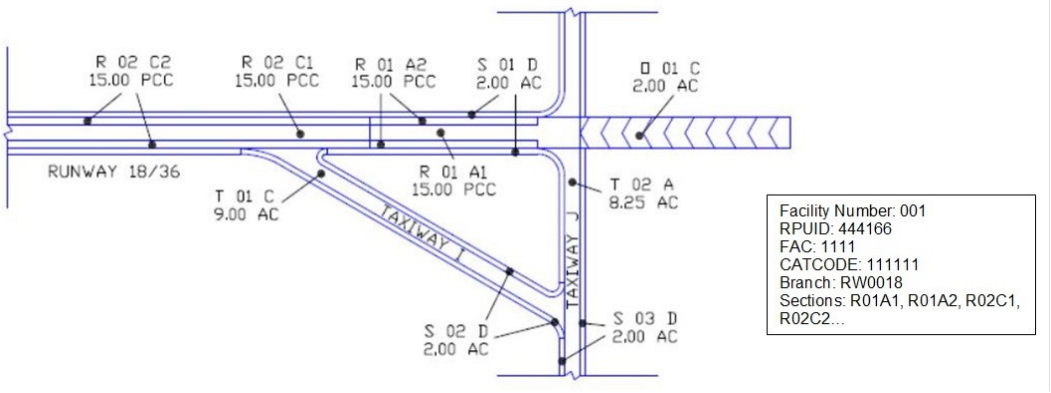


Hangar Access Apron and Washrack Segmentation

- **Hangar Access Aprons**: Hangar Access Aprons are typically tow-only areas that include the apron surface and the access taxiway. Ideally, all hangar access aprons should be included in a separate facility, but in the figure above, the hangar access aprons are part of a facility that includes the main apron. The main apron should have a branch designation, AP-MAIN, and the hangar access aprons should have a branch designation, OA-HANGACCESS. The main apron has an "AP)" prefix, because it is for parking aircraft. The Hangar Access Apron is given an "OA" designation, because its main purpose is not parking aircraft but rather to provide a surface for maneuvering aircraft into/out of the hangar. The Hangar Access Apron Branch has three sections: A08C, A09C1, and A09C2. Note A09C1 and A09C2 are structurally similar but are shredded out because there is a significant (>15-point) difference in the pavement condition index (PCI) (Note: the base may have given the Hangar Access Aprons a separate facility number. In that case, the facility would have only one branch in this example).

- **Washracks**: Washracks are handled the same way as compass calibration pads or hazardous cargo pads. In the figure above, both washracks are included in one facility (4000) with FAC 1163 and CATCODE 116672. Both washracks should also be assigned to one branch (OA-WASH). The branch should have two sections, A10C and A11C. In the event the base has given each of the washracks a separate facility number, the team should create a separate branch for each washrack, and each branch should be assigned a single section number. Shoulders should be handled as described previously

Runways and Overruns

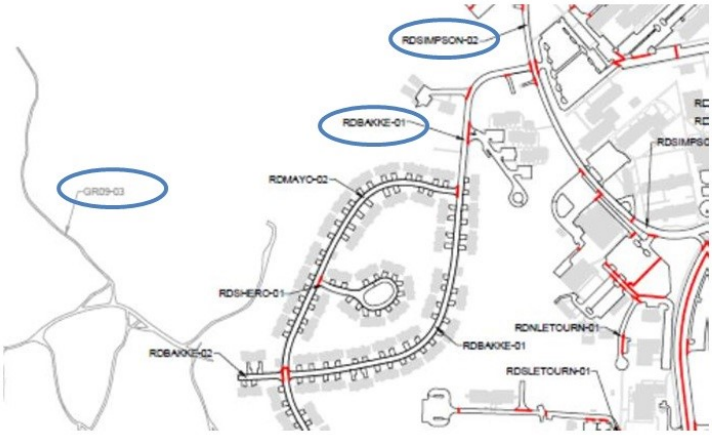


Runway and Overrun Segmentation

- **Runways**: Typically, each runway on a base has a facility number. This facility (001) consists of the load bearing pavement, FAC 1111, CATCODE 111111. The load-bearing surface of the runway also has one branch (RW0018). This branch typically has multiple sections. In the example provided, R01A1 and R01A2 are structurally the same. R01A2 is created because it may not receive the same level of traffic as the keel section, will likely have a different deterioration rate, and may not be considered as critical as the keel section. R02C is treated in a similar manner. Note: not all sections for this runway are shown. The keel section is typically considered the center 75 feet, although, this may be adjusted to align with joint spacing or if the keel section is structurally different that the outer portions of the runway. Ideally, runway shoulders are assigned to a runway shoulder facility. That facility should have one branch for runway shoulders. In the event all shoulders are combined into one facility at a base, shoulders should still be broken out as separate branches

- **Overruns**: Typically, the overruns for each runway on a base should be assigned a facility number (002 in this example). All overruns for the runway should be included in one branch (OR0018). The branch should be divided into at least two sections (one for the overrun at each end of the runway O01C and O02C). Overruns do not typically have shoulders, but if the team encounters this situation, they should include these shoulders in the runway shoulder facility

Roads



Facility Number: 3100
RPUID: 417909
FAC: 8511
CATCODE: 851147
Branch: RDSimpson….multiple
Sections: multiple

Facility Number: 3010
RPUID: 1036518
FAC: 8512
CATCODE: 851201
Branch: UR09
Sections: multiple

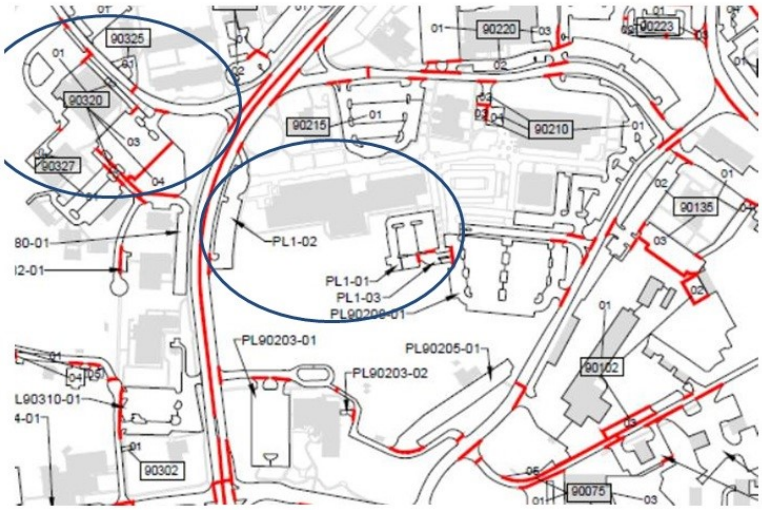
Road Segmentation

- RDSIMPSON-02: This section is part of the Simpson Road Branch (RDSIMPSON). The branch can have from one to “x” number of sections depending on its length and physical characteristics. As mentioned previously, each named road on a base should be assigned a branch name, which in turn is assigned to a facility. In this case, Simpson Road is just one of the branches that are in facility 3100. The team may find that the base has one facility for all paved roads or multiple facilities

- RDBAKKE-01: This section transitions from the cantonment area into the housing area. Housing areas may be created as separate networks (and as separate facilities), especially if they are privatized. If this housing area were in a separate network/facility, the section would need to be divided at the point where the transition from cantonment to privatized housing takes place. The respective sections should be placed in the appropriate facility

- GR09-03: This section is an unsurfaced road that is part of the unsurfaced road network. Note the branch name will need to be changed from GR09 to UR09 to reflect the current naming standard. Unsurfaced roads are handled the same as paved roads. Each named road is typically a branch. These branches are assigned to the facility(ies) for unpaved roads. In many instances, unsurfaced roads are not named. In these cases, the team lists them as Unnamed Road 01 to Unnamed Road XX or, as in this case, gives the road a number 09. As with paved roads, the branch can have one to many sections depending on its length and physical characteristics

Parking Areas



Facility Number: 30012
RPUID: 417871
FAC: 8521
CATCODE: 852262
Branch: PA1
Sections: 01-03

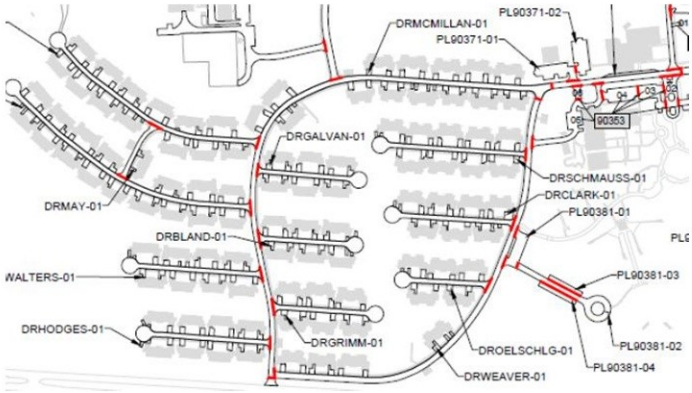
Facility Number: 30011
RPUID: 417871
FAC: 8521
CATCODE: 852262
Branch: PA90320
Sections: 01-04

Parking Area Segmentation

PA1 (formerly PL1): PA1 has three sections. Even though these sections are not contiguous, they all service the same building and are part of the same facility (30011). Note that unpaved islands have been identified and excluded from the area included in the section.

PL90320: The branch name should be changed from PL90320 to PA90320 to reflect current standards. PA90320 has four sections. Sections 03 and 04 divide the contiguous area based on physical characteristics. Note that the access drives from the road to the parking are included as part of the parking area. In some instances, these access drives may be divided into separate sections if they have different physical characteristics.

Driveways



Facility Number: 30002
RPUID: 417864
FAC: 8511
CATCODE: 851145
Branch: DRMAY, DRGALVAN, DRMCMillan
DR HOGES...
Sections: each branch shown has 1 section

Driveway Segmentation

The figure above shows the driveways in a privatized housing area. All the driveways on a given road are included in a branch with the DR prefix for driveway and the name of the road. For example, DRWalters includes all of the driveways on Walters Street. Multiple driveways may be included in a section to get a sufficient sampling size or to simplify the segmentation. For example, all the driveways on the north side of Walters Street may be section 1 and all of those on the south side will be included in section 2.

Unpaved roads typically have a prepared surface whether it is compacted gravel or simply a graded soil surface. In some instances trails are shown on maps. The team should work with the RPO to determine the proper categorization or to determine if it should be included in the unpaved road network. The image of the unpaved trail below is an example that would not be considered a facility.

Unpaved Trail

- **Templates**
  - N/A
- **Policies and Regulations**
  - AFI 32-1041, *Airfield Pavement Evaluation Program*
  - AFI 32-9005, *Real Property Accountability and Reporting*
  - OSD RPIM Version 5.0
  - UFC 1-300-08, *Criteria for Transfer and Acceptance of Real Property*
  - UFC 3-260-01, *Airfield and Heliport Planning and Design*
  - UFC 3-260-03, *Airfield Pavement Evaluation*
- **Forms**
  - N/A
- **Documents**
  - Air Force Category Codes
- **File Directories / Systems**
  - N/A
- **Websites**

- Air Force Publications Website
- Whole Building Design Guide

- **Related Playbooks**
  - N/A

Advice and Tips

- Facility numbers should follow a pattern at each base, but there is no standard numbering scheme for assigning facility numbers across the Air Force. The RPUID provides the unique number that identifies each facility

- Unpaved roads typically have a prepared surface, whether it is compacted gravel or simply a graded soil surface. In some instances, trails are shown on maps. The team should work with the RPO to determine the proper categorization or to whether it should be included in the unpaved road network

SMS – TNAP Guidance: RAILER

Overview

Process Overview

Railroad System Assessments: By the end of 2016, AFCEC will collect and consolidate all data that exists on rail assets in RAILER databases. Once consolidation of these RAILER databases is complete, the base will be responsible for maintaining the RAILER data. AFCEC intends to centrally manage and fund inspections in the future. AFCEC will review and update current rail inspection guidance to incorporate any modifications, particularly those regarding determining probability of failure and consequence of failure. As mentioned previously, an online version of RAILER to be available in 2017, at which time the consolidated rail database will be hosted on the same server with the PAVER pavements database, bridge inspection data, and other TNAP asset inspection data.

This railroad inspection program follows the guidance and recommendations specified in Unified Facilities Criteria (UFC) 4-860-03, “Railroad Track Maintenance and Safety Standards,” 13 February 2008. RAILER is a knowledge-based track management program that gives planners decision support in the sustainment, restoration, and modernization (SRM) of their track network. It combines condition assessment, work plan generation, and spatial analysis through a companion Geographical Information System (GIS) program to help provide support and informed decisions to managers.

Process Overview Map

- Complete/Update Rail Facility Maps - Define Network Inventory
- Update Facilities Segmentation (Update Segments and Nodes [Stationing])
- Do Rail Condition Index (RCI) Survey
- Identity Base-Level Requirements and Parametric Costs
- Rack and Stack Requirements using TNAP Business Rules
- Bundle Requirements into Projects and do Detailed Estimates
- Prioritize Projects at Base Using TNAP Business Rules
- Validate and Prioritize Projects at MAJCOM/AFCEC Using TNAP Business Rules
- Combine Projects on Integrated Priority List (IPL)
- Prioritize IPL
- Repeat Process

Management Overview

AFCEC Operations Directorate (AFCEC/CO) is the focal point representing the Air Force on the Tri-service RAILER Working Group and is the lead for the implementation and incorporation of RAILER into Air Force enterprise asset management activities. The RAILER Tri-Service Working Group in turn provides information and input to the DoD Installation Support Panel. The Air Force Member of the RAILER Tri-Service Working Group is also a member of the Air Force Sustainment Management Systems (SMS) Implementation Working Group (SMSIWG). The Chair of the SMSIWG is the official Air Force Representative to the DoD Installation Support Panel for all SMSs.

Installation Points of Contact

Each installation should provide a primary and alternate point of contact (POC) to AFCEC for all issues related to PAVER/TNAP data and tools. AFCEC recommends that these POC's be the TNAP AMP and BCAMP Manager. They will be the guardians of the data at the installation and will have overall responsibility for the integrity of the data. In addition, they will have overall responsibility for the integrity of the airfield pavement structural evaluations and PCI survey data. The installation POCs will be made aware who at the MAJCOM Detachment (DET) and Field Operating Agency (FOA) has permission to alter the data. All requests for rights to data (Read-Only, Assessor, or Data Manager) must be coordinated with the base POC, whose name will go in the Requesting POC block of the RAILER User Account Request Form. The approval authority at AFCEC is the "Account Verifier" and will typically approve assessor or data manager rights to requests validated by the appropriate base POC.

MAJCOM DET Points of Contact

Each MAJCOM DET should provide a primary and alternate POC to AFCEC and to each of their installations for all issues related to PAVER/TNAP data and tools. They should keep the base informed of who at the MAJCOM DET has permission to make changes to data, (i.e., Data Managers). They should inform the base about any changes the MAJCOM DET has made to the database. The approval authority at AFCEC will typically approve assessor or data manager rights to requests validated by the appropriate MAJCOM DET POC, whose name will go in the "Requesting POC" block of the PAVER User Account Request Form.

AFCEC POCs

The following are also the Account Verifiers for the RAILER User Account Request Form:

- Mr. George Van Steenburg, Pavement Evaluation Program Manager
  George.vansteenburg.1@us.af.mil, DSN 523-6083
- Mr. Brian Lee, Transportation and Airfield Pavement AMP Manager
  Brian.Lee@us.af.mil, DSN 969-9400
- Mr. Pat Kelly, Transportation sub-AMP Manager
  patrick.kelly.26@us.af.mil, DSN 523-6304

Roles and Responsibilities

Rail System (Includes Railroad Bridges)

Base Responsibilities:

- Create a rail facility map for the rail system
- Update real property records using the DD Form 1354 to reflect what was in the RCI survey Real Property Report
- Develop preventive maintenance plans and generate projects to address requirements in the RCI report
- Update construction history and RCI for projects completed between 4-year evaluations

- Provide support to rail system evaluation teams and AFCEC RCI consultants performing surveys

AFCEC Responsibilities:

- Review facility maps and work with base to make any necessary adjustments
- Centrally manage RCI program for rail system on a 4-year cycle. This includes completing linear segmentation and validating actual rail system inventory; performing analysis; and generating reports that outline issues, budget scenarios, and requirements

Training

The following outlines RAILER training:

- **Assessor Training**: Data Collection and QC/QA training to be developed for RAILER/RAILER RED
- **Data Managers**: Training to be developed for analyzing track inventory and inspection data, work planning, and generating reports
- **Evaluators**: AFCEC/USAERDC Certified Track Inspector training is forthcoming
- **Read Only Access**: None

AFCEC recommends that base programmers and MAJCOM personnel who have direct involvement with the information contained in the TNAP Database have assessors' rights.

Computer-based AFCEC/USACE Training is currently under consideration for development.

Implementation Support

Several websites assist with implementation:

RESOURCE	LOCATION
Creating a Railroad Route Coverage for use with ESRI ArcView and RAILER	http://sms.cecer.army.mil/Shared Documents/Downloads/RAILER/03-HowTo-ESRI.pdf
RAILER GIS Integration	http://sms.cecer.army.mil/Shared Documents/Downloads/RAILER/04-HowTo-GIS.pdf
RAILER Sectioning Concepts	http://sms.cecer.army.mil/Shared Documents/Downloads/RAILER/05-HowTo-Sectioning.pdf
AFCEC Planning and Integration milBook Page:	https://www.milsuite.mil/book/groups/afcec-planni
AFCEC Reach Back Center	DSN: 523-6995 COMM: 1-850-283-6995; Toll Free: 1-888-232-3721 Email: afcec.rbc@us.af.mil

TNAP Rail System Resources

RESOURCE	LOCATION
RAILER Downloads	http://sms.cecer.army.mil/SitePages/RAILER%20Downloads.aspx

USACE RAILER Training	http://sms.cecer.army.mil/SitePages/RAILER%20Training.aspx
Unified Facility Criteria	http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4 • UFC 4-860-01FA Railroad Design and Rehabilitation • UFC 4-860-03 Railroad Track Maintenance and Safety Standards

Inventory/Assess

Rail System Data Collection and Inspection Approach

The first step in the RAILER implementation process is the creation of track inventory. Track inventory is a physical survey of the track network, and includes pertinent information about the rail, ties, switches, culverts, curves, grades, grade crossings, etc. A key part of this inventory process involves establishing a track naming convention and stationing scheme. The stationing helps to establish a reference point and location for each track, makes it easier to locate defects during the inspection and subsequent repair. Once the inventory is collected, a detailed inspection of the track structure is performed to identify, locate, and record track defects. The inspection process includes a complete visual inspection of the track including, rails; fasteners and other track materials (F&OTM); ballast; ties; turnouts; grade and rail crossings; bridges (from stringers up); and geometry. RAILER takes the defects entered and, based on preset criteria, rates each defect and the resulting RAILER maintenance table and cost estimates, informing the user of the requirements to remedy all defects found in the track system. The user can then prioritize the maintenance work, fixing the “close-to-traffic” defects first.

For training on rail system data collection and inspection, refer to the USACE RAILER training link above.

Analyze/Forecast

Rail System Data Analysis and Forecasting Approach

Asset management requires knowing the comprehensive condition and criticality of the asset. RCI surveys and rail bridge evaluations only provide elements of the total requirements. A comprehensive assessment by a working group is needed to pull together all of the requirements and formulate cost-effective solutions for Preventive Maintenance (PM), minor and major M&R, and reconstruction.

Assessment Purpose: A track structure assessment is required to develop a rail system Preventive Maintenance Plan (PMP).

Team Composition: The assessment team should consist of experienced personnel from civil engineering. At a minimum, the civil engineering team should include the assigned engineer, a community planner, and operations personnel from the roads and grounds shop and the equipment shop.

Procedure: The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the track structure to validate known requirements, identifying new requirements, and developing project scopes and costs for rail system. The requirements and projects applicable to PM will be included in the PMP.

Rail System Management Process

- Develop and organize the rail system inventory
- Assess the current condition of rail system/track structure
- Keep track of M&R history
- Develop models to predict conditions

- Report on condition performance
- Develop scenarios for M&R based on budget (Work Planning)
- Plan projects

Data Collection and Analysis Processes

RAILER helps the base POCs and data managers responsible for rail assets answer the following questions:

- What rail assets exist?
- What defects and deficiencies exist, and how much do these cost to fix?
- What restrictions are imposed due to defects, and what is the effect on rail operations and readiness?
- What is the physical health and condition of the track?
- What are the best short and long-term maintenance strategies under limited budgets?

RAILER links each recorded defect to operations restrictions and maintenance levels based on governing standards, RCI metrics relating physical quality and condition, and local work actions to correct the defect.

Base POCs and data managers can use this information to make informed decisions in the development of efficient short and long-range work plans. Using the RCI and the track standards and customized set of business rules and prioritization schemes, managers can use RAILER to narrow down a long list of deficiencies to a filtered list of the most important work based on the condition and operations for the track.

For training on rail system data collection and analysis, refer to the USACE RAILER training link above.

TNAP Business Rules for RAILER are forthcoming.

SMS – Utilities Guidance

Introduction to Utilities

This Utilities Supplemental Guidance expounds on the standard process information in the Sustainment Management System (SMS) Playbook related to utilities. This section also further describes how linear segmentation (LS) requirements coincide with the built infrastructure assessment (BIA) process and includes specific information on leveraging Utilities SMS (U.SMS) and FUELER SMS development to support asset management efforts.

This supplemental guidance provides instruction to continue efforts to meet the OSD mandates.

Each system (electric, gas, water, wastewater, and fuels) contains assets with an independent physical identify, functional identify, and age. Effective management of these important utility systems requires a framework to assess and achieve sustainable infrastructure. This section of the SMS Playbook outlines the processes for the LS of utilities and serves as the standard operating procedures (SOP) to segment linear assets.

General Process Description

Data Migration Background

Data needs migrated to the most current Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) version, which is currently SDSFIE 3.1. Esri tools are available at the following links:

Esri conversion tools, crosswalk software, and implementation videos on the CE Portal: https://cs1.eis.af.mil/sites/ceportal/ProgramGroups/Resources/GeoBase%20Documents/Forms/Data.aspx

Additional videos can also be found on milSuite: https://www.milsuite.mil/book/groups/wgio-afcec-gio-training

Concurrent Linear Segmentation and Condition Assessments

SMS Implementation and Audit Readiness Timelines: The USD (ATL) September 10, 2013 policy memo states,

"…ensure that a facility condition index for each asset ….is properly recorded ….with inspections using the SMS standard process completed for all facilities and facility components within 5 years of the date of this policy document."

The intent of the "5-year" guidance was to establish a review/validation cycle that matches the real property review cycle required by DoDI 4165.14, as paragraph 5 of the Implementation Guidance points out. Paragraph 1 of the Implementation Guidance states,

"All real property assets shall have a validated Facility Condition Index (FCI) by September 2017."

The 2017 date corresponds to the audit readiness target date of the Financial Improvement & Audit Readiness (FIAR) Act. As asset condition is an auditable data element (see http://comptroller.defense.gov/fiar page C-28, Line 17). It was suggested that Components strategize to meet audit readiness by focusing inspections on buildings first, leaving structures and lineal structures toward the end so, at minimum, building assets meet the FIAR schedule.

The Operation Program Group (OPG) approved the AFCEC implementation approach to execute LS with in-house staff and contract augmentation support. The CE Board was briefed 10 June 2015 on the required resources needed to support LS for Active AF installations.

The AF implementation process will involve AFCEC/COAU government civilians as Utilities sub-Activity Management Plan (AMP) managers to lead base visits augmented by GIS contractor support. Asset conditions will be determined through a knowledge based data collection approach through interviews with base civil engineer personnel. This

course of action best supports Asset Management implementation and Real Property Inventory validation to meet the intent of the LS policy.

The initial phase of LS considers the standardization for identifying linear segments and ensuring the real property (RP) records reflect the inventory at the segmented level. This will require coordination with the Real Property Office (RPO), GeoBase, and CE Operations. AFCEC/COAU is the AF Lead office for Linear Segmentation of Utilities Systems

Data Maintenance

This step-by-step process provides simplified guidance for fulfilling the minimum GeoBase data field entry requirements. Failure to follow instructions provided within this guidance may prevent requirements from receiving prioritization and/or funding within Comprehensive Asset Management Plan (CAMP) development and Integrated Priority List (IPL) execution. Utilities requirements not assessed as part of the AMP will not be considered during the IPL process.

Step 1: Focus on Inventory and Assessment of Worst and Most Important Requirements First

sub-AMP Managers and sub-AMP working groups should continue to strive to collectively identify the installation's worst and most important utilities requirements. It is recommended that sub-AMP Managers focus priorities on Critical Infrastructure Tier 1 assets that have a preponderance of repairs and outages, leaks, service calls, or failures, as defined in the *Categories and Definitions Critical Infrastructure Mission Dependency Index (MDI)* workbook.

The *Operations Engineering Playbook* provides instructions for pulling various Interim Work Information Management System (IWIMS) and Automated Civil Engineering System (ACES) reports that may facilitate focus in the outlined areas.

Step 2: Establish Installation Geospatial Information System (IGIS) Asset Record and Minimum Data

The Air Force will use GeoBase to establish inventory and condition data for linear utilities assets while U.SMS and FUELER are undergoing development. Verify that the utility requirement(s) selected are segmented according to the standards in this Playbook. If the installation has the results from a recent utility survey, CE personnel should migrate that data into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming *SDSFIE 3.1 Standards*. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred to in the *Utilities Condition Index AMP Scoring Worksheets*, on the identified priorities.

Step 3: Sustain and Maintain Data

Verify that the utility requirement(s) selected are segmented according to the standards set forth in this Playbook. If sub-AMP Managers are in possession of the installation's most recent utility survey results, that data should be migrated into GeoBase for use in the AMP process. Update the geodatabase to account for the increase in the numbers of utility segments and to comply with the upcoming SDSFIE 3.1 Standards. At a minimum, perform surveys and/or assessments to collect the AMP-identified attributes, referred in the Utilities Condition Index AMP Scoring Worksheets, on identified priorities.

Step 4: Utilize Data to Analyze and Fine-Tune Work Programs

While GeoBase data enables the Air Force Civil Engineer Center (AFCEC) to develop long-range budget plans for corporate use, collecting and maintaining additional attribute data is of great utility to local engineers and mission owners as well. This practice enables Work Order supply budgeting, benefit scheduling strategy, improved business case analyses, and/or facilitate advocacy for third party funding. Local condition assessment ratings and scoring algorithms can be adjusted to consider a higher level of detail for Preventive Maintenance or Priority Action programs.

Roles and Responsibilities

ROLES	RESPONSIBILITIES

AMP Manager	• Anticipate and manage water supply, wastewater/storm, mechanical, electrical, and liquid fuels services. This includes the management of supporting infrastructure networks and coordination with sub-AMPs to meet regulatory requirements, such as Environmental Quality (EQ) and public health permitting • Retains final authority in accepting segmentation assignments
Utilities sub-AMP Manager	• Provide day-to-day operational support and guidance at the base as it relates to specific AF utility systems and governance documents • Responsible for all installation facilities and systems that are for the sole purpose of providing transmission, monitoring, and maintenance support of base utility systems. Specific responsibilities include review/validation of installation comprehensive planning support, system design and modeling, and development of projects for utility systems
Real Property Office (RPO)	• Determines AF-owned assets and distinguishes between linear and non-linear assets • Has final authority regarding any changes to the facilities/facility map resulting from this process
GeoBase Office	• Identifies geographical/functional area of the linear utilities assets as well as the segment assignments • Creates a geometric network of segment groupings if the necessary technology capabilities are available • Supports in-house field evaluations • Incorporates necessary changes to the facility map following linear utilities assets evaluations
Civil Engineer (CE) Operations	• Provides input identifying attributes such as ownership, geographical/functional area, and grouping of the linear utilities assets based on maintenance records, and any other knowledge • Supports in-house field evaluations • Comprises of the Utilities AMP Manager, Operations Engineering, and the Shop, wherein the Utilities AMP Manager retains final authority in accepting segmentation assignments and Operations Engineering designs and/or manages the design of new utilities • Ensures design meets linear segmentation guidelines and provides as-builts of existing utilities (where available) and new facilities upon completion • Receives assistance from the when identifying geographical/functional areas and segment groupings based on the linear segmentation rules for utilities
Evaluation Team	• Composed of an in-house team of experts or a team of contractors with the necessary expertise • Collects data points on a facility's current use and compares this information to most recent documentation in order to identify discrepancies

Desired Outcomes

This guidance supports the desired outcome of collecting and logging detailed utility asset inventories and assessments on utility systems for each real property facility in GeoBase using SDSFIE 3.1. Utilities assets include all Air Force-owned electrical power production and transmission systems within the base boundary (normally up to the five foot line of serviced structures) and service contract oversight for electrical distribution systems within base boundaries that have been privatized in accordance with 10 United States Code (USC) 2688.

The goal of the linear segmentation program is to use GeoBase maps to associate linear and non-linear segments of real property facilities to facilitate asset management of the infrastructure at the sub-AMP manager level and focus infrastructure assessment to all areas. The implementation of linear segmentation is ongoing across the enterprise.

Bases should ensure GeoBase, Sustainment Management Systems (SMS), and Automated Civil Engineering System – Project Management (ACES-PM) data are complete, accurate, and up to date.

SMS – Utilities Guidance: FUELER

FUELER Development Status

FUELER Development Status

- FUELER SMS is being developed by the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL.
- Software development will leverage GIS (SDSFIE) Version 3.1 standards
- Defense Logistics Agency (DLA) is funding FUELER software development
- Developing assessment and project-level work generation rules leveraging existing Air Force ACC Fuels tool (Fuels Assessment Tool [FAsT] as technical foundation
- Anticipating additional DLA funding to reduce software development time and for program level views and data consolidation (working capital funds)
- Additional funding support anticipated from Service Delivery Points for service unique work management system interfaces (TRIRIGA for Air Force)

SMS – Utilities Guidance: U.SMS

UTILITIES SMS Development Status

UTILITIES SMS Development Status

- UTILITIES SMS (U.SMS) is being developed by the USACE Engineering Research Development Center (ERDC), Construction Engineering Research Laboratory (CERL), Champaign, IL.
- Software development will leverage GIS (SDSFIE) Version 3.1 standards
- AFCEC is funding development of water and electrical modules
- ESRI GIS Software used by AF Enterprise will interface with U.SMS
- U.SMS will interface with AF CE work management system, TRIRIGA
- HAF GIO is implementing SDSFIE 3.1 Adaptation across Air Force (AF) Enterprise
- Initial enterprise capability version 1.0 (Water and Electric only)
    - Field testing begins Q1 FY16
    - Partial deployment anticipated Q3 FY16
    - Contains inventory, direct rating (R/A/G) assessment, and life expectancy-based replacement investment forecasting
- Additional funding support anticipated from other DoD Services to fully develop other utility modules
- Full U.SMS software development is dependent DoD Service funding

SMS – Utilities Guidance: Linear Segmentation Rules for Utilities

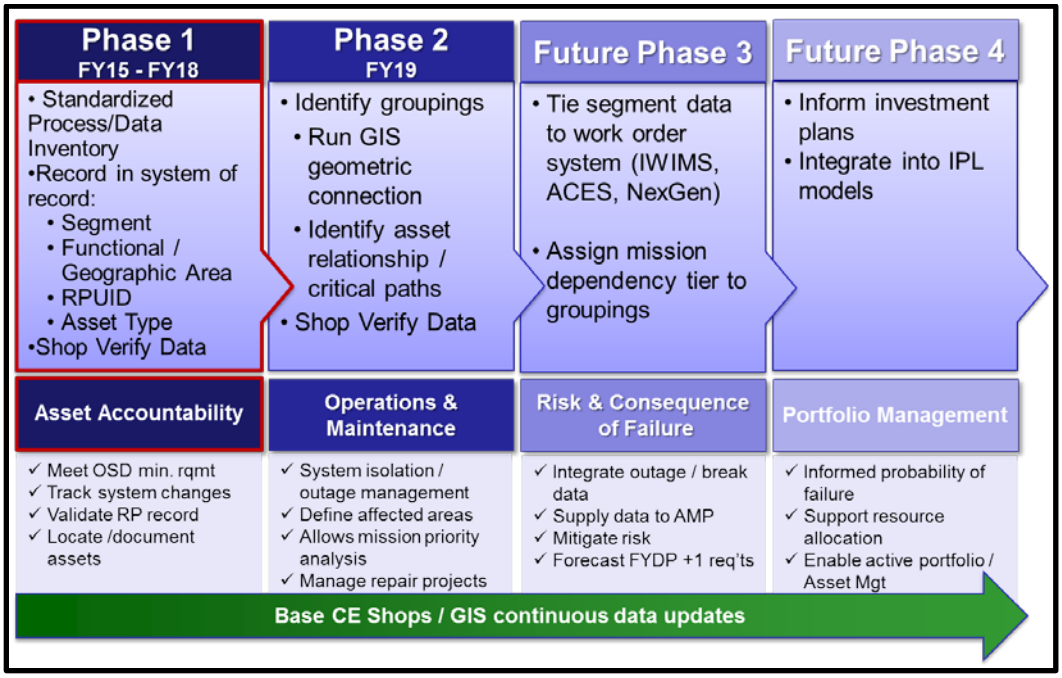
Introduction

This section outlines general business rules for the linear segmentation of utilities and provides visual examples of network component identification. Air Force Instruction (AFI) 32-1067, Water and Fuel Systems provides guidelines for managing water and wastewater systems at United States Air Force (USAF) bases.

Linear Infrastructure Overview

Linear segmentation achieves more accurate real property (RP) data to support increased asset visibility; more auditable RP records; investment planning for operations and preventive maintenance efforts; and an understanding of the impacts on related facility systems in the environment. This guidance captures key rules for segmenting assets as well as best practices for implementing segmentation on an AF installation.

This guidance will help implement Department of Defense (DoD) and Air Force (AF) policy to institute the linear segmentation approach for asset management, where each asset is divided into standardized nodes and segments. The concept of linear segmentation dates back to 2005 with the implementation of the Real Property Inventory Requirements (RPIR) initiative. The Office of the Secretary of Defense (OSD) established linear segmentation as a policy directive in 2008. This directive refers to the RPIR initiative and requires the DoD Components to identify linear structures (e.g., pavement, railroads, and distribution lines) into trackable and measurable modules in the appropriate RP asset management system.



Linear Segmentation Plan

Per the figure above, the implementation of the linear segmentation policy is four-phased. The guidance in this document supports the first phase, in which the installation employs a standardized approach in identifying linear segments and ensures the RP records reflect the inventory at the segmented level. This phase achieves compliance with the OSD requirement; ensures records reflect the most current state of pavement and utility systems; and validates the RP records. This phase is expected to start immediately and be completed over the next few years.

Sub-AMPs

Electrical

The Electrical Systems and Generators Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned electrical power production and transmission systems within the base boundary normally up to points of demarcation (see Utility Demarcation Guidance below). Electrical activities encompass overhead and underground distribution lines; transformers; substations and switching stations; generation plants; and poles.

Mechanical Plants/Distribution

The Mechanical Plants (Thermal) and Distribution Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned facilities that exist for the sole purpose of providing transmission monitoring and maintenance support to the distribution system, including natural gas; hot water and steam transmission systems; facility-specific heating and ventilation; and centralized Heating, Ventilation, and Air Conditioning (HVAC) plant systems. It also includes service contract oversight for privatized Mechanical distribution systems within the base boundaries that have been privatized.

Potable/Non-Potable Water

The Potable/Non-Potable Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned potable water, non-potable water, and Fire Emergency Services (FES) systems up to the five-foot line of serviced facilities, including wells, distribution lines, potable water treatment plants, pumps, valves, hydrants, storage, and service contract oversight for Potable distribution systems within the base boundaries that have been privatized.

Wastewater/Storm Water

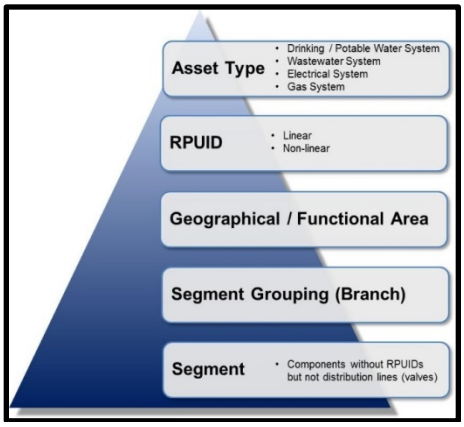
The Wastewater/Storm Water Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned industrial and domestic wastewater systems up to the five-foot line of serviced facilities and service contract oversight for wastewater distribution systems within the base boundaries that have been privatized. It also includes the edge of paved surfaces for storm water, including lift stations, collection lines, manholes, wastewater treatment plants, oil/water separators, other wastewater pre-treatment units, storm water pipes, swales, detention/retention areas, and outfalls

Liquid Fuels

The Liquid Fuels Systems Sub-Activity Management Plan (Sub-AMP) encompasses all Air Force-owned real property. USAF aircraft refueling is accomplished using pressurized hydrant fueling systems or with refueling trucks. There are a total of ninety (90) hydrant systems at fifty (50) Installations world-wide. Fuels systems are comprised of subsystems supporting fuels receipt, bulk storage, transfer lines, fill stands, refueling pits and hydrants. Hydrants are designed to operate automatically with seamless transition from one fuel servicing to the next. When fuel is uploaded from a refueling pit through a hydrant hose truck (HHT) or pantographic arm, the system senses the change in pressure and flow and reacts by maintaining pressure and flow as needed to other pits along the flight line. This is accomplished by use of electronic pump controls and hydraulic control valves (Cla-Val). It is imperative that everything operate smoothly under constantly changing system loads ranging from full flow (as high as 4,800 gallons per minute) to no flow. The fuel flow must also be controlled through each filter to a maximum flow rate in order to prevent filter damage and to ensure clean dry fuel is supplied to the loop. The loop flow rate must also be monitored and controlled by way of a bypass loop and back-pressure control valve. Additionally, the hydrant pit valve, which is also a Cla-Val must control max pressure and flow rate while protecting equipment and aircraft connected to the outlets. Hydrant Systems are designed to refuel multiple aircraft simultaneously at flow rates up to 900 gallons per minute at each outlet. These systems enable operators to upload large quantities of fuel (30,000 pounds to wide body aircraft) in very short periods of time. They may also be used to quickly upload tactical aircraft even while being armed for quickly returning to the fight. These systems may sit idle for days on end, immediately followed by periods of hyperactivity to support long range bombing missions, tactical fighter sorties, or critical TRANSCOM airlift requirements. Hydrants are critical assets, which directly support the USAF flying mission.

Segmentation Hierarchy

The utilities segmentation hierarchy represents a one-to-many relationship among linear segments moving down the hierarchy. A facility can consist of many branches, which can consist of many sections. Sections are the most specific segment type and are identified by a unique combination of physical and usage characteristics.

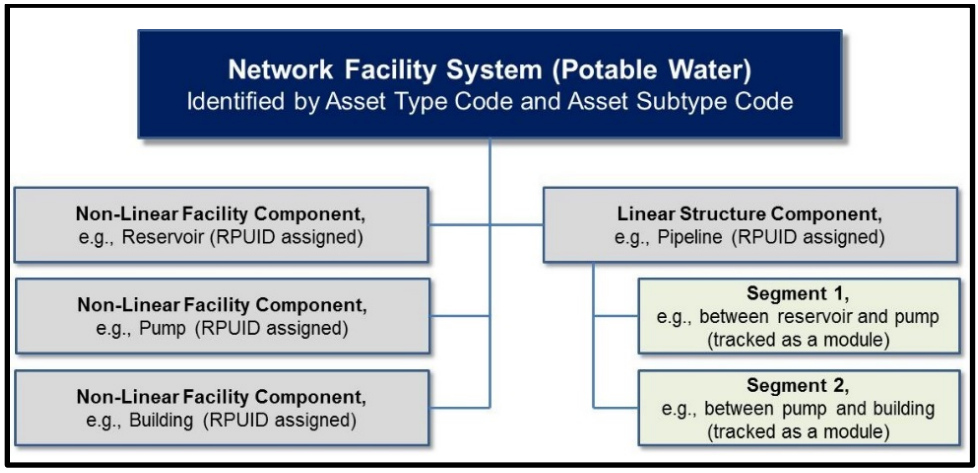


Segmentation Hierarchy

Utilities Management Segmentation Rules

Asset Type and Real Property Unique Identifiers (RPUIDs) are established by Real Property records and should be the starting point for linear segmentation. The below business rules provide descriptions from the highest level (Asset Type) to lowest level (Segment).

Asset Type



Network Facilities (Non-Linear Facilities) may contain linear structures (pipes, wires, fence, etc.), non-linear structures (pumps, valves, transformers, etc.), and buildings/structures (clarifiers, settling tanks, buildings labs, etc.) which when combined will create a facility or system. This could be a wastewater treatment plant, water treatment plant, reservoir system, or a power sub-station facility.

RPUIDs – Linear and Non-linear

RPUIDs are the specific facility/asset identification number under the DoD Real Property systems. RPUIDs are assigned to a complete and separate facility, or assets with a category code (CATCODE). RPUIDs can be for non-linear facilities (vertical construction) or linear structures (water distribution lines, wastewater collection, electrical distribution lines, etc.).

For linear structures, RPUID will be assigned by the Real Property Officer and annotated in SDSFIE. It is important to note that for linear assets that there can be multiple RPUIDs for each CATCODE. Bases will need to work with existing RP records for official RPUIDs listings. Each linear segment must contain the appropriate segment ID and that information must be available through Geographic Information Systems (GIS) to link the linear structure segment information to the RPUID.

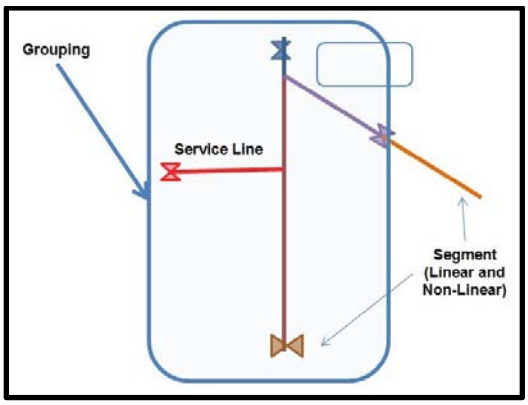
Follow Unified Facilities Criteria (UFC) 1-300-08 for specific guidance on establishing RPUIDs and the instructions for the use of the DD Form 1354, Transfer and Acceptance of DoD Real Property.

Geographical / Functional Area

Categorization is based on attributes provided by base civil engineer programing/planning such as flight line, cantonment, housing or others. At larger bases, there may be a need to expand the areas since there may be multiple tenant units or remotely located portions of an installation such as Air Force Reserve or Air National Guard areas.

Segment Grouping (Branch)

Grouping consists of interconnected segments (linear and non-linear), which would isolate a utility service line with the minimum by valves, switches, or other mechanisms needed from the rest of the utility service line. The figure below displays a low-level schematic depicting segment grouping; it is not meant to show exact pipe placement.



Segment Grouping

- Each area should be named after main function – at least 75% of the utilities support a function (flight-line, cantonment, or certain utility support areas)
    - Flight-line – at least 75% of the utilities support a flight-line function
    - Cantonment – at least 75% of the utilities support a cantonment function
    - Housing – at least 75% of the utilities support a housing area
- Circuit A – electrical circuit that supports a certain area
- When no function represents at least 75% of the utility system, use geographical area descriptions
    - Northside, Bayside, Southside, etc.

Segment

Segments should contain elements of pipe/ distribution segments and other components without RPUIDs such as valves, pumps, backflows, transformers, etc.

Each linear structure asset begins at the installation boundary or point where DoD's interest begins, as stipulated in easements, rights-of-way, etc.

Segmentation of linear structure asset occurs where a non-linear real property asset, called a node, connects to the linear structure. For example, a potable water distribution line (linear structure asset) feeds into a water storage tank (a non-linear structure; a node) and then continues on to another part of the site. ***See rules for nodes below.***

Below are commonly used components of non-linear assets associated with linear utilities assets. If a particular asset does not fit under any of the listings below, another non-linear component may be used.

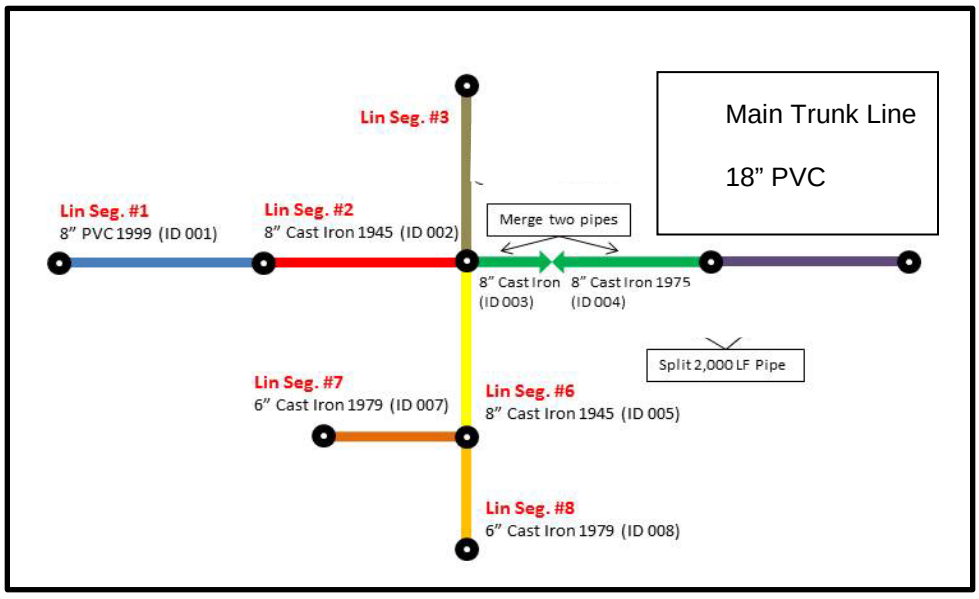
- **Water**: Valves, backflow prevention, Supervisory Control and Data Acquisition (SCADA) component, flush point, hydrant, meter manhole
- **Electrical**: Transformers, generation plants, emergency generation for multiple facilities, substations / switching stations, security / street lighting, pole (includes cross arms, arrestors, etc.), sectionalized junctions, sectionalized switches
- **Wastewater**: Valves, cleanout, manhole, SCADA component
- **Storm water**: Culverts, manhole, headwall, wing wall, inlet, outlet
- **Natural Gas**: Valves, cathodic protection, SCADA component
- **Liquid Fuels**: Valves, pumps, filter/separators, meters, sump pumps, line strainers, automatic air eliminators, truck or car offload systems, tanker and barge offloading, fill stands, hydrants, pantographs, ground product dispensing, operational storage tanks (above and below ground), and bulk fuel storage tanks (above and below ground).

Linear Segmentation Rules for Utility Linear Segmentation

Rule 1:

Segmentation of any utility linear structure asset occurs where there are changes in the characteristics that affect capacity or delivery of a service or commodity, such as installation date, diameter, type of material, and type of service. For linear assets, the segmentation should follow these protocols:

- A line segment must be made of common attributes (installation date, material, diameter, etc.)
- A line segments may be commonly assigned from pipe junction (intersection) to pipe junction, and pipe junctions to distribution valves ***but no minimum or maximum length is required***
- A line segment does not have to be broken at nodes if the pipe characteristics do not change (i.e., service line to facility, valves, meters, fire hydrant) will not break a segment)
- A line segment should be broken at facilities such as sanitary sewer manholes, boundary of lift station, and at treatment plants



Linear Segments

Rule 2:

The following minimum attributes (as listed in Table 1 below) must be completed for each linear segment and non-linear asset to constitute completion of Linear Segmentation.

Table 1 – Linear Segmentation Requirements

DESCRIPTION	ATTRIBUTE	COMMENTS
Asset Type	[sdsFeatureName]	See latest SDSFIE data dictionary
Real Property Unique Identification (RPUID)	[realPropertyUniqueIdentifier]	See real property officer
Segment Identification Number	[segmentID]	See latest SDSFIE data dictionary
Geographical/Functional Area	[functionalArea]	See latest SDSFIE data dictionary
Operational Status	[operationalStatus]	Operation status indicates whether an asset is active, inactive or abandoned
Total Length	[measuredLength]	A line segment can exceed 1,000. No minimum or maximum required length
Use	[utililtyNetworkType]	See latest SDSFIE data dictionary
Location Coordinates (linear and non-linear)	[lattitudeFrom] [latitude to] – longitudeFrom] [longitude to] [latitude], [longitude]	Coordinates should be in the same format as GeoBase records and can be used by Civil Engineer (CE) Operations to locate each segment during fieldwork
Installation Year	[installedDate]	The installation year indicates when the segment was first installed or the year that the system was constructed
Material Type	[generalMaterialType]	See latest SDSFIE data dictionary
Size (diameter to include Unit of Measure)	[lengthSize] [lengthSizeUOM]	Depending on the utility type, the size may vary in unit of measure (inches, kilo volt amps [KVA], etc.)
Condition Rating	[condRatingValue]	See latest SDSFIE data dictionary

Rule 3:

Segment lines when attributes change, which include overhead or underground utilities.

Rule 4:

When stormwater drainage systems have a change in cross-sectional area they will be segmented at the change.

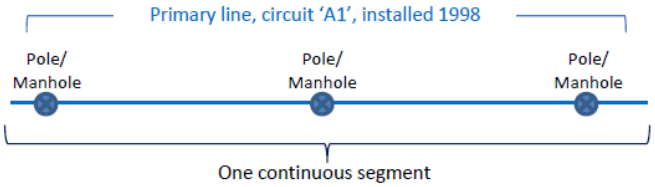
Rule 5:

Fuel systems will be divided into four major nodes for linear segmentation and evaluation: 1) Receipt, 2) Storage, 3) Distribution, and 4) Issue. Each node will be segmented within the linear segmentation construct.

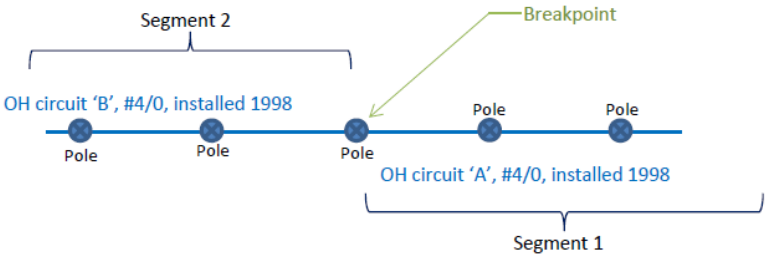
Rule 6: (Recommendation – Not Required for Phase 1 LS)

Non-Linear features (nodes) should be snapped to the line segment that it is associated with; however, they should not break the line segment if all attributes are the same on each side of the node. This includes valves, pumps, junctions, poles, etc., but not sanitary sewer manholes

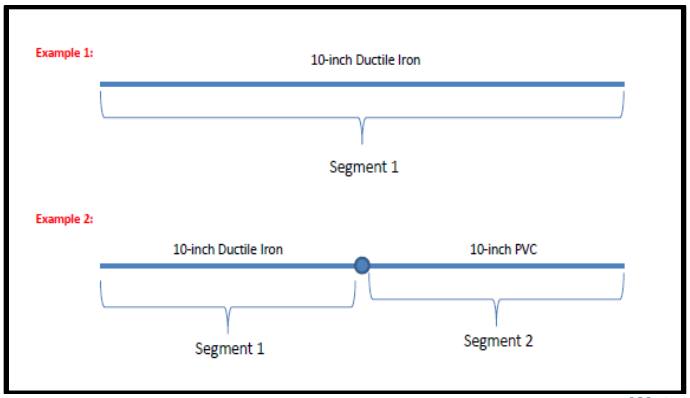
Example 1: Manhole or power Pole does not break a linear segment if attribute does not change.

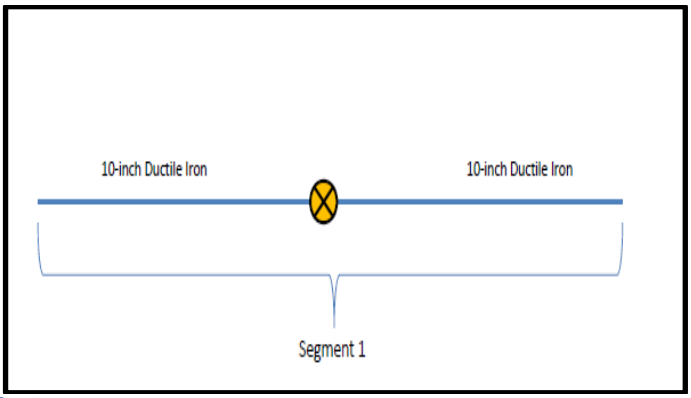


Example 2: Attribute changes, segment breaks.

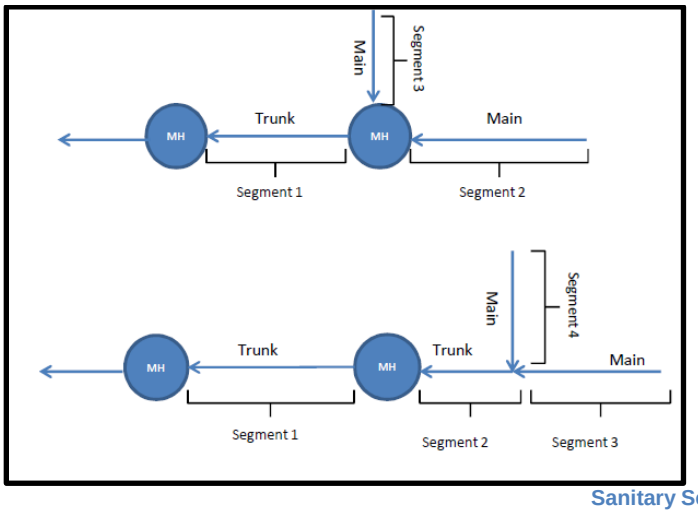


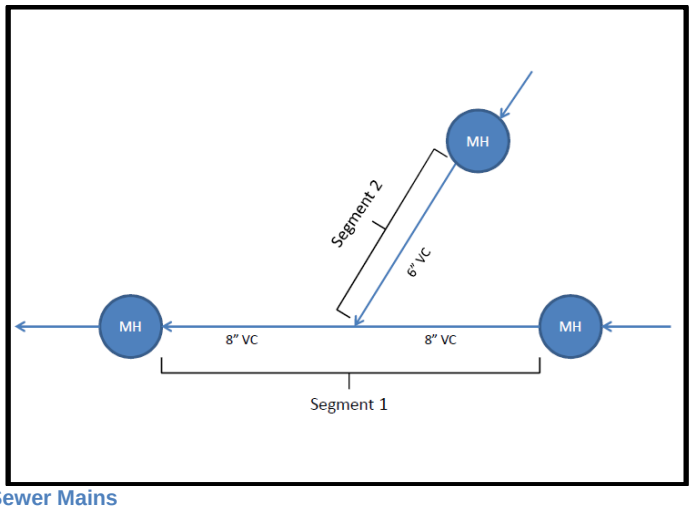
Segmentation Examples:



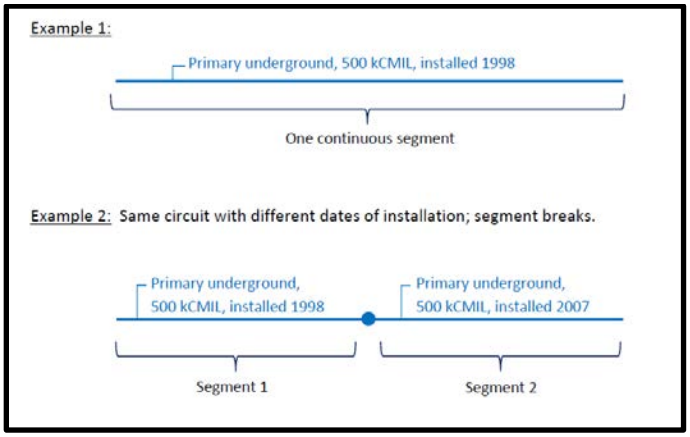


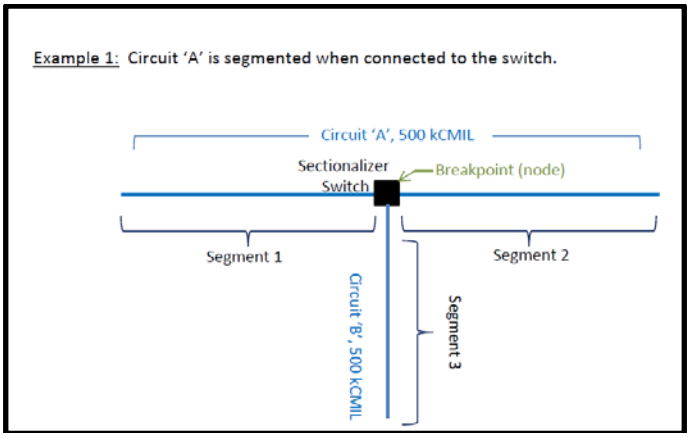
Water System

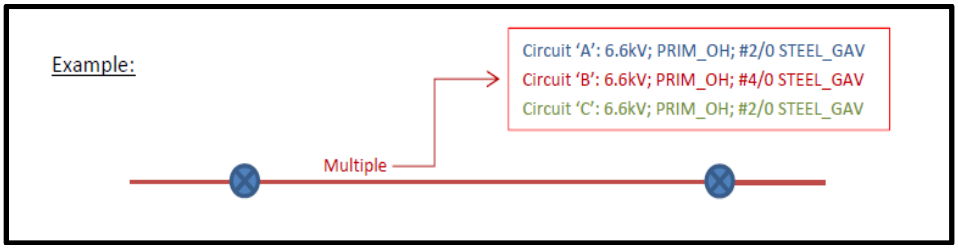




Sanitary Sewer Mains







*where it states circuit subject to feeder circuit and where steel gav – use copper

Electrical System

Utility Demarcation Guidance

The following indicates service demarcation points starting from item 1 moving through item 3 as the order of precedence. If a service is for a single building this should be captured under the BUILDER™ Sustainment Management System (SMS) otherwise it should be captured under the Utilities SMS.

1. Utility privatization demarcation point
2. Utility meters, exterior cross-connection devices (i.e. backflow preventer, etc.), cleanouts, secondary side of transformer, single source pump station, and check valves
3. 5-foot from building if no other single point is noted

Electric System

General Definitions

1. Service - The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the facility served.
2. Service Drop -The overhead conductors from the last pole or other aerial support to and including the splices, if any, to the Service Entrance Conductors or Service Lateral.
3. Service Lateral - The underground conductors between the Service Drop, including any risers at a pole or other structure, and the Service Entrance Conductors or from the secondary side of the pad mounted transformer to the Service Entrance Conductors.
4. Unit Substation - A substation consisting of a primary switch, transformer, secondary transition section, and a secondary switchgear section.
5. Service Entrance Conductors - The conductors between the Service Equipment and the point of connection to the Service Drop, typically at the weatherhead, or Service Lateral, typically at the transformer or service disconnect.
6. Service Equipment - The main control and cutoff equipment for a facility, usually consisting of a circuit breaker(s) or switch (es) and fuse(s), and their accessories, connected to the load end of conductors to a building or other structure.
7. Service Point - The service point is the point of connection between the serving utility and the facility and also the ’`Point of Demarcation’ where ownership changes.

Specific Point of Demarcation

1. Service Drop Demarcation - The point of demarcation (Service Point) is at the load end of the service drop where spliced to the service entrance conductors, typically at the weatherhead.
2. Service Lateral Demarcation - The point of demarcation (Service Point) is at the connection to the secondary lugs of the transformer or at the connection to the service drop.
3. Unit Substation Demarcation - The point of demarcation (Service Point) for a unit substation with the secondary switchgear physically attached to the secondary transition section is at the connection to the secondary switchgear circuit breaker load stabs. The point of demarcation (Service Point) when the secondary switchgear is physically separated from the secondary transition section is at the connection to the secondary lugs of the transformer.
4. Electric Service Meter - Regardless of service point, all KWH meters used for revenue are owned by AF except when a negotiated agreement exists, such as Public Private Venture (PPV) housing where the consumer owns the meter.
5. Piers & Docks - The point of demarcation (Service Point) is at the shore to ship power receptacle.
6. Airfield Lighting and Lighting Vault - Electrical utility distribution ends with the secondary taps of the transformers servicing airfield lighting and the lighting vault and airfield lighting distribution.
7. Area Lighting - Area Lighting includes: Airfield Apron Lighting, Parking Lot Lighting, Roadway Lighting, Recreational Lighting, and Security Lighting. Area Lighting including the secondary service from a transformer or panel to the lighting and poles with piers is considered electrical distribution.

Water System

General Definitions

1. Cut Off Valve - The first exterior valve off the main line which will disconnect service to the entire building or structure being served without disrupting other water services.
2. Post Indicator Valve (PIV) - A valve that is operated by a permanent above ground mechanism which also indicates whether the valve is in the open or closed position.

3. Back Flow Preventer - A device that is installed between fixtures, equipment, appliances, or buildings and the potable water supply that allows flow only in one direction. The back flow prevention device is intended to prevent contamination or pollution of the potable water supply caused by back pressure or back siphoning of non-potable waters into the potable water.
4. Service Point - The service point is the point of connection between the serving utility and the facility and is also the 'Point of Demarcation' where ownership changes. This is the transition between AF and customer funding for Sustainment, Restoration, and Modernization.
5. Potable Water Treatment Plant – The central facility for the production of potable water, containing all treatment processes and appurtenances exclusive of the distribution system.

Specific Point of Demarcation

1. Water Distribution System - The Point of Demarcation is the downstream side of first cutoff valve (exterior to the facility) off the main. If there is no exterior cut-off valve or the cut-off valve cannot be located, the Point of Demarcation is at the connection to the main.
2. Water Meters - Regardless of the service point, all water meter assemblies (including any bypass piping, meter box, meter, and valves) used for revenue are owned by AF except when a negotiated agreement exists, such as Public Private Venture (PPV) housing where the consumer owns the meter.
3. Fire Protection Systems - The Point of Demarcation is the downstream side of the Cut-Off Valve (typically a PIV). If there is no Cut-Off Valve, the Point of Demarcation is at the AF connection to the main.
4. Fire Hydrants – AF owns Fire Hydrants served by AF owned mains. Fire Hydrants that are on a facility dedicated fire loop are part of the facility and not part of the utilities system.
5. Piers & Docks - The Point of Demarcation is at the pier riser at the hose connection point.
6. Backflow Preventers – AF owns and maintains backflow preventers on the AF owned downstream piping. All other backflow preventers are the responsibility of the customer of the facility being served.
7. Potable Water Treatment Plants – Potable Water Treatment Plants that produce water for a distribution system serving multiple facilities are part of the utility owned system. Potable Water Treatment Plants that serve a single facility are not part of the utility owned system.

Sanitary Sewer

General Definitions

1. Building Activity - The command/activity having financial responsibility for a building or facility.
2. Lateral - The line that extends from the building to either the main sewer line, a manhole located on the main sewer line, or a pump station. Cleanouts are considered a component of the Lateral.
3. Main Sewer Line - Sewer lines from the point of connection to a commercial sanitary sewer system or wastewater treatment facility, to the furthest upstream manhole.
4. Manhole - A structure, which is all or partially underground, and is accessible to entry. The structure is designed to collect sewage from underground piping by means of gravity flow or pumping, and discharge by means of gravity.
5. Oil-Water Separator - A structure/tank, which is underground, partially underground, or above ground and is accessible to entry. The structure is designed to collect, separate and/or hold oil from an oil-water mixture waste stream.
6. Pump Station - A structure designed to receive, hold, and discharge sewage. Discharge of sewage is accomplished by pumping through underground piping (force main) to a manhole where gravity flow occurs.
7. Wash Rack - A structure designed for the washing and rinsing of vehicles, aircraft and equipment.
8. Diversion Valve - A valve intended to divert effluent between a sanitary sewer system and storm drainage system.
9. Service Point - The service point is the point of connection between the serving utility and the facility and is also the 'Point of Demarcation' where ownership changes. This is the transition between AF and customer funding for Sustainment, Restoration, and Modernization.
10. Wastewater Treatment Plant – A facility where wastewater (municipal or industrial) is treated with chemical, physical, and/or biological processes to produce clean water that can be returned to rivers and waterways. This includes all components of the plant facility (i.e. ponds, basins, mechanical works, etc.).

Specific Point of Demarcation

1. Gravity Lines, Manholes, and Force Mains - The Point of Demarcation is the downstream connection point to the Main Sewer Line that is usually at a manhole. If there is not a manhole, the Point of Demarcation is at the connection to the main.

2. Storm Drainage Systems - Combined sanitary sewer and storm drainage systems are not allowed. Separation of connections between sanitary sewer and storm drainage systems are the responsibility of the offending system's owner.
3. Cesspools, Holding Tanks, and Septic Tanks - Cesspools, Holding Tanks, and Septic tanks with or without leaching fields, are the responsibility of the facility and cannot be connected to the main sewer line directly or via laterals except where a leaching field is connected to a permitted treatment process.
4. Cleanouts – Installation and maintenance of cleanouts are the responsibility of the property/facility owner. For each connection to the Main Sewer Line, a sewer cleanout is required. .
5. Sanitary Sewer Pump Stations – AF is responsible for pump stations that meet all of the following: (a) serve more than one facility, (b) are located on the Main Sewer Line, and
6. (c) are constructed to AF standards. All other pump stations are the responsibility of the property/facility owner.
7. Piers & Docks - The Point of Demarcation is at the pier riser at the hose connection point.
8. Wash Racks - Wash racks are the responsibility of the property/facility owner.
9. Oil-Water Separators - Oil-water separators (OWS) are the responsibility of the facility that the OWS serves. Any lines or manhole upstream of an OWS are considered part of the facility.
10. Grease Interceptors – Grease Interceptors (GI), also called Grease Traps, are the responsibility of the facility that the GI serves. Any lines or manhole upstream of the GI are considered part of the facility.
11. Diversion valve - The diversion valve or any structure upstream of this valve are the responsibility of the facility.
12. Wastewater Treatment Plants - Wastewater Treatment Plants that receive wastewater from a collection system serving multiple facilities are part of the utility owned system. Wastewater Treatment Plants that serve a single facility are not part of the utility owned system.
13. Drawings for Sanitary Sewer System Service Points - Drawings depicting examples of Service Points can be found under Appendix C for the following:

Mechanical System (Thermal)

General Definitions

1. Industrial Purposes- Steam which is used for any purpose other than water or building heating.
2. Isolation Valve- The first valve off the main line that will isolate service to the facility without disrupting other steam services.
3. Pressure Reducing Station - Reduces steam from the higher pressure to the lower pressure. A Pressure Reducing Station typically includes a pressure reducing valve, upstream and downstream isolation valve, and bypass valve.
4. Utilization Pressure - Any pressure that the facility uses steam to support industrial or domestic needs.
5. Steam Distribution System - Network of piping, valves, fittings and other appurtenances that delivers steam from a central plant to multiple points of service.
6. Central Steam Plant - A facility that contains boilers and feeds a Steam Distribution System. Centralized steam plants may be small and part of a nodal strategy but will always primarily function to distribute steam to multiple facilities. Satellite boilers are not considered Central steam plants.
7. Boiler - An electrical/mechanical device containing a heat transfer fluid under pressure designed to convert chemical (or electrical) energy to thermal energy. The thermal energy may then be used for a variety of purposes such as space heating or the production of electricity. Steam generators and hot water generators are considered boilers, while steam and hot water converters are not.
8. Satellite Boiler - Small boiler(s) designed and constructed to primarily feed the load at the facility where it is located but may also feed an adjacent facility.
9. Service Point - The service point is the point of connection between the serving utility and the facility and is also the 'Point of Demarcation' where ownership changes. This is the transition between AF and customer funding for Sustainment, Restoration, and Modernization.

Specific Point of Demarcation

1. Steam Distribution Pipeline - The service point is at the downstream valve on the first Pressure Reducing Station that delivers utilization pressure. In the absence of a PR station, utilities ownership ends at the Isolation Valve at the main.
2. Satellite Boilers – No Point of Demarcation is necessary for these facilities because they are not utility systems.
3. Pier Steam Distribution - The Point of Demarcation is at the pier riser at the hose connection point.
4. Steam Service Meter - Regardless of service point, all steam service meters used for revenue are owned by the AF except when a negotiated agreement exists, such as Public Private Venture (PPV) housing

where the consumer owns the meter. Steam Service Meters may be located on the steam supply line or the condensate return line.

5. Condensate Return System – When the condensate pumping station is located inside the facility the service point is at the connection to the condensate receiver. When the condensate pumping station is located outside the facility, the service point is on the condensate line where it exits the facility.
6. Non-Returning Condensate System - The customer owns and maintains the entire condensate line and system components when the condensate is not returned to the steam distribution plant.
7. Drawings for Steam and Condensate System Service Points - Drawings depicting examples of Service Points can be found under Appendix D for the following:

Natural Gas

General Definitions

1. Pressure Regulator – Natural gas pressure regulators are designed to maintain outlet pressure at a constant level independently of fluctuations in inlet pressure or gas flow. Under zero-flow conditions, regulators close tightly.
2. Service Point - The service point is the point of connection between the serving utility and the facility and is also the 'Point of Demarcation' where ownership changes. This is the transition between AF and customer funding for Sustainment, Restoration, and Modernization. Refer to Appendix E, Drawings G-1 and G-2.

Specific Point of Demarcation

1. Natural Gas System - The service point is the last of either the discharge side of the Pressure Regulator or downstream side of the Gas Service Meter for the building or structure being served. Where natural gas is supplied and distributed to facilities by an outside service provider, everything beyond the outside service provider's point of demarcation (typically the provider owned meter) is owned by the facility. Any components owned by an outside service provider shall be maintained by the service provider.
2. Gas Service Meter - All meters used for revenue are owned by the AF except when a negotiated agreement exists, such as Public Private Venture (PPV) housing where the consumer owns the meter and outside provider owned meters.

Liquid Fuel Systems

General Component Definitions (UFC 3-460-03)

3. Liquid Fuel Systems are Real Property. Liquid Fueling systems belong to the installation real property records and the BCE is responsible for them. This includes the day-to-day operation, environmental compliance, project programming (in-house and by contract), and developing the MILCON program for new systems.
4. Fuel Product Provider. DLA owns the fuel on base to the point of issue. As a result, they fund system sustainment, restoration and modernization (SRM) contracts as well as minor construction. Funding comes from a surcharge place on each gallon of fuel issued. DLA also manages the fuels MILCON and advocate for Congressional funding.
5. Sustainment Support Source. DLA only funds for fixed, permanent facilities including: Aircraft fuel storage, distribution and dispensing systems, related facilities such as POL operations buildings, security fences and access roads, and bulk MOGAS and diesel facilities (under limited circumstances).
6. Pipeline Systems. On-base pipelines are used to fill base fuel storage tanks, withdraw fuel from base storage tanks, fill trucks, transfer fuel between base storage and operating storage tanks, and fill aircraft from hydrant operating storage tanks and dispensing systems. Pipelines are categorized into commercial pipelines, bulk fuels storage pipelines and transfer pipelines. These are linear assets subject to the linear segmentation rules.
7. Mechanical Systems.
    i. Pumps. In mechanical systems, pumps are used for unloading, transferring, and dispensing fuels.
    ii. Filter/Separators (F/S). F/S remove undissolved (free) water and solids from petroleum products.
    iii. Meters. Petroleum systems typically use positive displacement meters designed for either one-or-two-way flow; however, MIL-HDBK-1022A allows turbine and orifice meters under certain circumstances. One-way flow meters are installed on truck fill stands and receipt facilities. Two-way flow meters are installed in the filter meter pit of some Type 1 hydrant fueling systems. The meters record the actual amount of fuel issued and defueled through the system.
    iv. Valves. Manual valves are used to isolate portions of the fuel systems, to throttle, to control flow, or direct the flow of fuel. All valves should be identified on the system charts and identified with a

matching tag or stenciled marking on the valve.

v. Sump Pumps. Manual or automatic sump pumps are installed in some pits to evacuate water or fluid from the pit. Most automatic pumps are float-actuated.

vi. Line Strainers. Line strainers are installed to prevent entry of foreign matter. Strainer location and size are detailed in MIL-HDBK-1022A.

vii. Automatic Air Eliminators. The automatic air eliminator has a chamber with a float-operated valve at the top. Air is continuously discharged through the vent to the atmosphere until the air eliminator tank is filled with liquid, then the vent valve closes.

viii. Truck and Tank Car Offloading. These are facilities for receiving fuel and are found typically near the installation fuel storage area. Major components of offloading facilities include underground, low-profile, or above-ground tanks, grounding systems, suction hoses, piping, pumps, air-elimination equipment, and electrical control equipment.

ix. Tanker or Barge Offloading. Fuel piers and wharves are used to receive fuel from marine vessels at air bases and tank farms near navigable waters. The pier or wharf has mooring facilities, hose connections, derricks, or unloading arms, attaching hose, hose storage racks, pipelines, and fire protection equipment. A separate pipeline is usually provided for each product. Tankers and barges have pumps to discharge cargo, and usually offloading hoses as well. When necessary, booster or transfer pumps are installed in the pipelines on shore to transfer fuel from the tanker to the tank farm.

x. Fill Stands. Fill Stands are used to issue fuel to refueler trucks, tank trucks, or rail cars. Separate facilities are provided for each fuel product.

xi. Ground Product Fueling Systems. These systems are usually designed to dispense fuel from either an above ground or an underground storage tank through a service station type dispenser. Fuel is pumped using a dispenser-mounted suction pump, or a submersible pump mounted in the fuel tank. Separate systems are used for each grade of fuel dispensed. The primary fuels dispensed are MOGAS (motor gasoline), diesel, and JP-8.

8. Hydrant Fueling System, Type I (Panero). This was the first hydrant system used by the Air Force and it was built throughout the 1940s and 1950s. These systems were based on the concept of bringing the aircraft to the fuel. Fuel was pumped to a single refueler outlet at the edge of the aircraft parking ramp and aircraft had to be moved to the refueling outlet, refueled, and then moved back to the parking location. This reduced the need for truck refueling. The Original Panero system had two automatic control valves in the filter meter pit: one on the refueling line and a separate valve on the defueling line. Since hydrant systems are constantly improved and upgraded there are few Original Panero systems left. Major modifications to the Original Panero created the Modified Panero system. The Modified Panero system is still in use at some military installations today and uses one automatic control valve (302AF refuel/defuel control valve) in the filter meter pit to perform both refuel and defuel operations.
9. Hydrant Fueling System, Type II (Prichard). The Type II Pritchard System was developed in 1955 to improve operating characteristics in conventional hydrant fueling systems. It can service multiple hydrant outlets per control pit, so allowing more flexibility in parking aircraft and reducing the need to tow aircraft to refueling positions. The Type II pump house is similar to the Type 1 except the separate defuel tank is no longer needed. Instead, one Type II operating tank is designed as the defuel tank for the day. The filter/meter pit of the Panero system is now the lateral control pit (LCP), and a defueling pump with four different automatic valves has replaced the dual-purpose 302AF valve. The MH-2 hose cart is standard equipment for connecting the hydrant outlet to the aircraft, so there is no need for filtration or meters in the LCP.
10. Hydrant Fueling System, Type III & IV (Phillips). The constant-pressure hydrant fueling system is the newest system used by the Air Force. It was conceived by the Phillips Petroleum Company in the mid-1950s to refuel military transports and bombers, and has come into extended use since the mid-1980s. Current standards for design are in the DoD Standard Design 78-24-28-88-AF, Pressurized Hydrant Fueling Systems Type III. This system is constantly under pressure when energized, and responds automatically to refueling and defueling requirements. Supervision is not required at the pump house during the automatic mode if a “pump run” light and emergency shut-off switch are provided at the Resource Control Center (RCC). Any number of aircraft parked along the fueling loop can receive fuel simultaneously up to the flow capacity of the system. Additionally, aircraft can be defueled while other is refueling. Because the system relies on pneumatically operated valves at the hydrants, the electrical problems encountered with Type I and Type II systems do not exist. The heart of the Type III & IV system is the computer or microprocessor in the pump house control room, which controls the components operations.
11. Fuel Storage Tanks. The majority of the aboveground storage tanks used for Air Force petroleum products are built according to the API Std 650, Welded Steel Tanks for Oil Storage, API Std 653, and Air Force standard designs.

i. Above Ground, Floating Roof. These types of tanks are in general use for storage of light-weight volatile liquids and jet fuels. The tank is designed to decrease vapor space over the stored liquid. Most floating –roof tanks have aluminum fixed roofs installed over the open top where excessive water contamination of fuel is a possibility. The efficiency of an open-top floating roof in preventing evaporation losses, entrance of precipitation, and reducing the possibility of rim fires, depends largely on the effectiveness of the seal closing the space between the rim of the roof and the tank shell.
ii. Below Ground Tanks. Tanks must be constructed to meet the requirement of NFPA 30, NFPA 30A, and NFPA 31. Horizontal Cylindrical. New tanks should be factory constructed Type II double=walled tanks complying with UL 58 criteria. Underground Vertical (Cut-and-Cover). These tanks are primarily used for overseas locations. The design typically conforms with USAFE and NATO standards. This tank is not typically constructed in the CONUS.

12. Service Point - The service point is the point of connection between the fuel receipt source and the fuels system receipt point and is also the 'Point of Demarcation' where real property ownership is established. This is the transition between AF and customer funding for Sustainment, Restoration, and Modernization.

Specific Point of Demarcation

For Liquid Fuels Systems, the service point is the last of either the discharge side of the downstream fuels distribution side of the liquid fuels service meter to the skin of the aircraft or vehicle being served. Liquid Fuels Systems from the receipt point to point of issue is considered real property and shall be maintained and managed under the BCE. Linear Segmentation of fuels linear assets will involve all piping and segments will be established based on the linear segmentation rules in this guidance. DLA owns the fuel product contained in these systems and fuel is purchased at the point of issue. Any components owned by an outside service provider shall be maintained by the service provider. These systems will not require linear segmentation.

Selected GIS Attribute Data

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities							
CathodicProtection_P		890269	G40	G4010	G401010	15	75
CathodicProtection_L		890269	G40	G4010	G401010	15	75
ErosionControl	Erosion Control are control measures used on a site to prevents excessive sediment from being produced.	890311	G30	G3030	G303006	5	69
PipeCasing_L	Casings are used to protect pipelines from the weight, pressure, and vibration caused by traffic on roads, railroads, and other types of line crossings.	890181	G90	G9010	G901002	50	75
Sample_P	A sampling site is a location for collecting water/wastewater samples within a collection system. Sampling site may be dedicated sampling devices, or they may be other devices of the system where a sample may be obtained. Excluded are random sampling points for water quality.	TBD Based on System type	TBD Based on System type	TBD Based on System type	TBD Based on System type	N/A	
UtilityFailure_P	A point location within a utility system where an unintended or accidental failure occurs.	TBD Based on System type	TBD Based on System type	TBD Based on System type	TBD Based on System type	N/A	
UtilitySurvey_P	Utility markers are GPS'd points taken directly on the utility being surveyed, such as the top of a line, which provides accurate coordinates and elevation of the utility at that exact location. A marker can be where the GPS pole touches the utility or where a point was located by the line locator unit.	TBD Based on System type	TBD Based on System type	TBD Based on System type	TBD Based on System type	N/A	

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for utilities Stormwater							
dControlValve_P	A fitting or device used for shutting or throttling flow through a storm sewer line.	871183	G30	G3030	G303090	50	70
dCulvert_L	Used for the conveyance of surface drainage water under a roadway, railroad, canal, or other impediment.	871183	G30	G3030	G303004	55	70
dDischarge_P	A point of discharge for a stormwater system. Normally the permitted discharged point.	871183	G30	G3030	G303007	N/A	70
dInlet_P	The location where storm water is collected and received into the utility system.	871183	G30	G3030	G303002	N/A	70
dLineGravity_L	A gravity main line is a type of main line that is unpressurized and relies on gravity to move the water through the main.	871183	G30	G3030	G303001	55	70
dManhole_P	A manhole is a facility that is used to allow access to the stormwater lines.	871183	G30	G3030	G303002	50	70
dOpenDrainage_L	Interception and removal of ground water or surface water by natural means.	871183	G30	G3030	G303090	25	70
dPump_P	A mechanical device for storm sewer system that draws material into itself through an entrance port and forces the material out through an exhaust port.	871185	G30	G3030	G303090	25	76

dStorageReservoir_P	The location where storm sewer water is collected.	841426	G30	G3030	G303007	50	61
dStorageReservoir_A	A natural or artificial lake, storage pond, or impoundment used to store water. Reservoirs may be created in river valleys by the construction of a dam or may be built by excavation in the ground or by conventional construction techniques such as brickwork or cast concrete.	841426	G30	G3030	G303007	N/A	61

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for utilities Electrical							
eAccessPoint_P	Access Point is a simple junction feature that includes vaults and manholes that house and protect electrical equipment.	pU 812225; sU 812226	G40	G4010	G401007	50	80
eConduitSystem_L	The underground system consists of ducts, trenches or pipes that can contain conductors, extending between vaults or manholes. New conductor and telephone cable are often installed underground in congested areas. Conductors and cables can be drawn or pulled from manhole locations for changes.	890181	G40	G4010	G401007	55	75
eDynamicProtectiveDevice_P	An isolation device which integrates with a system sensing device, such as an overcurrent relay, to isolates portions of an electrical distribution system in order to minimize system disruptions and damage.	813228	G40	G4010	G401003	40	81
eExteriorLight_P	Exterior lighting is supplied by local distribution systems and is generally the only service for which the electric utility installs, operates and maintains utilization equipment. The lights that illuminate roads and highways generally use high-intensity discharge lamps with ballasts compatible with common voltages and may be either high- or normal-power factor. High-intensity discharge lamps are usually phosphor-coated mercury, metal halide, or high pressure sodium. Lamps are available in several sizes range from 100 to 1000 watts (W) and may be sealed or filtered for longer life. Photoelectric controls are usually used with individual lights.	812926	G40	G4020	G402003	50	45
eGenerator_P	Generator is a power source for providing electricity. Generators may be primary or standby power sources.	890273	G40	G4090	G409003	25	75
eGuyWire_L	Span guys are installed to span from the top of one structure or pole to the other and offset the strain from the line conductor. Span guys transmit horizontal force to another pole until an anchor guy can be used.	Po 812223, So 812224	G40	G4030	G403004	25	78
eMeter_P	Meter Point is the point at which energy is supplied to a customer. A service point can have one, many, or no meters.	Po 812223, So 812224	G40	G4010	G401009	25	78
eOHPrimary_L	Contains information about primary overhead conductor features.	812223	G40	G4010	G401004	50	78
eOHSecondary_L	Contains information about secondary overhead conductor features.	812224	G40	G4010	G401004	50	78
eOHTransmission_L	Contains information about overhead transmission lines.	813231	G40	G4010	G401004	50	76

eStructureSupport_P	Support Structures features can have street lights, assemblies, power lines, and other attachments associated with them.	**pU 812225; sU 812226 Po 812223, So 812224**	**G40**	**G4010**	**G401005**	**50**	**80, 80; 78, 78**
eSubstation_P	A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels	**813231**	**G40**	**G4010**	**G401001**	**50**	**76**
eSurfaceStructure	Describes electric objects that are surface mounted.	**812225**	**G40**	**G4010**	**G401007**	**35**	
eSwitch_P	Switches are installed at strategic locations throughout distribution feeder circuits to redirect power flows to balance loads or for sectionalizing to allow repair of damaged lines or equipment. Switches may act as tie devices, which are set in an open state and energized from two directions at once. Switches can be manually or power operated, and can be operated individually or as a group.	**pU 812225; sU 812226 Po 812223, So 812224**	**G40**	**G4010**	**G401003**	**35**	**80, 80; 78, 78**
eSwitching Station		**813224**	**G40**	**G4010**	**G401003**	**35**	**81**
eTransformer_P	The Transformer feature class captures information about distribution and power transformers. Distribution transformers convert electrical energy from primary voltages to utilization voltages.	**813321**	**G40**	**G4010**	**G401002**	**45**	**72**
eUGPrimary_L	Contains information about primary underground conductor features.	**812225**	**G40**	**G4010**	**G401006**	**45**	**80**
eUGSecondary_L	Contains information about secondary underground conductor features.	**812226**	**G40**	**G4010**	**G401006**	**45**	**80**
eUGTransmission_L	Contains information about underground transmission lines.	**812225**	**G40**	**G4010**	**G401006**	**45**	**80**
eVoltageRegulator_P	Equipment used to regulate voltage.	**pU 812225; sU 812226 Po 812223, So 812224**	**G40**	**G4010**	**G401003**	**40**	**80, 80; 78, 78**

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities Gas							
gAlcoholInjectionEquipment_P	This device is used to inject alcohol into the flow of gas inside a pipeline.	**824464**	**G30**	**G3060**	**G306006**	**25**	**71**
gControlValve_P	A valve permits or prevents the flow of gas using ball, gate, plug or other mechanisms. Valves are pressure-rated by the American National Standards Institute (ANSI). Valves cover control valves and relief valves in a pressurized distribution system	**824464**	**G30**	**G3060**	**G306006**	**25**	**71**
gDrip_P	A Drip collects and pumps water that has accumulated in the gas distribution system. Drips are generally installed in low-lying areas.	**824464**	**G30**	**G3060**	**G306006**	**25**	**71**

gFitting_P	Fittings are set to control the flow of gas through pipes.	824464	G30	G3060	G306006	25	74
gGasLamp_P	A Gas lamp is a street lamp fueled by natural gas.	812926	G30	G3060	G306006	25	45
gLineDistribution_L	Main lines distribute, transmit, and gather natural gas. Transmission mains are high pressure pipelines that carry natural gas from their source. Distribution mains transport natural gas from transmission lines and redistribute it throughout an area.	824464	G30	G3060	G306006	55	77
gLineHeater_P	This device is used to heat natural gas inside a pipeline.	824464	G30	G3060	G306006	25	77
gLineService_L	Service Lines connect customers to the gas distribution main either directly or through the customer meter. The yard line is the portion of the service line typically located between the meter the property line.	824464	G30	G3060	G306006	55	77
gMeter_P	Meter Point represents the geographical location of a meter or bank of meters at meter points. Meters measure the volume of gas flow, which is defined by temperature and pressure.	824464	G30	G3060	G306006	25	77
gOdorizer_P	Because natural gas is odorless and colorless, odorizers are used for leak detection at or near the gas point of purchase. Odorizer delivery methods are based on the size of the system, flow, and electrical power available.	824466	G30	G3060	G306006	25	77
gPigLaunch_P	An oversized section in a pipeline where the "pig" can be entered.	824464	G30	G3060	G306006	N/A	77
gPressureMonitoringDevice_P	Pressure monitoring devices monitor the flow of gas through a pipe and include pressure recorders, pressure telemeters, and pressure charts. An electronic Pressure Monitoring Device can monitor the flow of gas remotely using Supervisory Control and Data Acquisition (SCADA) systems to collect data.	824464	G30	G3060	G306006	25	77
gPumpStation_A	A building in which one or more pumps operate to maintain flow at adequate pressure within a natural gas distribution system.	824462	G30	G3060	G306006	50	71
gRegulator_P	A regulator is a mechanical device used for the controlled reduction of pressure in a gas distribution system.	824464	G30	G3060	G306006	25	77
gReliefValve_P	This safety valve in a regulator station is designed to release when the set pressure is exceeded. Relief Valves ensure the system pressure does not exceed the maximum allowable operating pressure of a Distribution.	824464	G30	G3060	G306006	50	77
gScrubber_P	This device is used to remove or “scrub” foreign materials from natural gas. (e.g. dust, dirt, etc.)	824464	G30	G3060	G306006	25	77
gStrainer_P	A device designed to remove any free liquids or dirt particles from the gas before it enters a compressor.	824464	G30	G3060	G306006	25	77

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities Fuels							
oAirEliminator_P	A device or structure placed in the fuel distribution system to separate air from petroleum products.	121115	G30	G3060	G306004	25	99
oControlValve_P	A fitting or device used for shutting or throttling flow through a fuel line.	125977	G30	G3060	G306004	50	85
oFilterStrainer_P	A device through which fuel is passed to remove impurities to the fuel. Usually placed in fuel lines near fill points.	121115	G30	G3060	G306004	25	99

oFitting_P	A fitting is an item used to connect, cap, plug or otherwise alter a pipe carrying fuel.	**125977**	**G30**	**G3060**	**G306002**	**50**	**85**
oHydrant_P	Location where fuel is control discharged to users.	**121122**	**G30**	**G3060**	**G306002**	**50**	**99**
oInstallationPipeline_L	Installation pipelines are commonly used to transfer fuel on-base.	**125554**	**G30**	**G3060**	**G306002**	**50**	**85**
oInterterminalPipeline_L	Interterminal pipelines are crosscountry between installations.	**125554**	**G30**	**G3060**	**G306002**	**55**	**85**
oLineDefueling_L	A pipe used to carry fuel from location to location (main line, service line, vent line, etc).	**125554**	**G30**	**G3060**	**G306002**	**55**	**85**
oMeter_P	A device installed in a line for measuring the quantity and or rate of fuel to a facility or through a section of line.	**125554**	**G30**	**G3060**	**G306090**	**25**	**85**
oOilWaterSep_P	A filtering device placed in the fuel stream specifically to remove oil and water from the fuel.	**831155**	**G30**	**G3090**	**G3090004**	**50**	**62**
oPigLaunch_P	The location on a pipeline to deploy pigging devices.	**125554**	**G30**	**G3060**	**G306002**	**55**	**85**
oPump_P	A mechanical device for a fuel system that draws material into itself through an entrance port and forces the material out through an exhaust port.	**125977**	**G30**	**G3060**	**G306004**	**50**	**85**
oPumpStation_A	A building in which one or more pumps operate to maintain flow at adequate pressure within a natural gas or fuel distribution system.	**125977**	**G30**	**G3060**	**G306004**	**N/A**	**85**
oTankFarm_A	Designates the storage of Petroleum, Oil and Lubricants (POL) products which normally includes multiple tanks (above or below ground), berms, and monitoring wells.	**411131**	**G30**	**G3060**	**G306007**	**N/A**	**68**
oTank_P	An above or below grade receptacle or chamber for holding fuels on a temporary basis prior to transfer or use.	**TBD Based on type system**	**G30**	**G3060**	**G306007**	**60**	**TBD Based on type system**

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities Sewer							
sCleanOut_P	A clean out is an access point in a lateral used for maintenance purposes.	**TBD Based on line type**	**G30**	**G3020**	**G302002**	**55**	**84**
sControlValve_P	Valves are a set of valves that operate in special ways.	**TBD Based on line type**	**G30**	**G3020**	**G302001**	**50**	**84**
sFitting_P	The Fitting class represents the joint between two lines.	**TBD Based on line type**	**G30**	**G3020**	**G302001**	**50**	**84**
sGreaseTrap_P	A tank which separates grease from water, collects the grease for removal, and allows the water to exit.	**891023**	**G30**	**G3020**	**G302005**	**50**	**71**
sLineGravityMain_L	A gravity main line is an unpressurized sewer line that relies on gravity flow to convey sewage from one location to another.	**832266**	**G30**	**G3020**	**G302001**	**55**	**84**
sLineGravityService_L	A gravity service line is an unpressurized sewer line that relies on gravity flow to convey sewage from one location to another.	**832266**	**G30**	**G3020**	**G302001**	**55**	**84**

sLinePressurizedMain_L	A pressurized main line is a type of main line that is pressurized.	**832266**	**G30**	**G3020**	**G302001**	**55**	**84**
sLinePressurizedService_L	A pressurized service line is a type of main line that is pressurized.	**832266**	**G30**	**G3020**	**G302001**	**55**	**84**
sManhole_P	A manhole is a facility that is used to allow access to the wastewater lines.	**832266**	**G30**	**G3020**	**G302002**	**50**	**84**
sMeter_P	Meter Point represents the location of the metering device.	**832266**	**G30**	**G3020**	**G302001**	**25**	**84**
sOilWaterSep_P	A device or structure placed in the waste water stream to separate water from oil products.	**831155**	**G30**	**G3090**	**G309004**	**50**	**62**
sOutfall_P	The discharge point of a sewer system that receives wastewater from a collection system or from a wastewater treatment plant and carries it to a point of ultimate or final discharge in the environment.	**832266**	**G30**	**G3020**	**G302001**	**N/A**	**84**
sPump_P	A pump is a piece of equipment that adds energy to a fluid being conveyed through a pipe or other closed conduit.	**832267**	**G30**	**G3020**	**G302003**	**50**	**84**
sPumpStation_A	A building in which one or more pumps operate to maintain flow at adequate pressure within a sewer distribution system.	**832267**	**G30**	**G3020**	**G302003**	**N/A**	**84**
sSepticTank_P	A Septic Tank is a small-scale anaerobic digester and leach field designed to treat wastewater from an individual facility, and is not connected to the wastewater collection system.	**831169**	**G30**	**G3020**	**G302006**	**25**	**57**
sSepticTank_A	A Septic Tank is a small-scale anaerobic digester and leach field designed to treat wastewater from an individual facility, and is not connected to the wastewater collection system	**831169**	**G30**	**G3020**	**G302006**	**N/A**	**57**
sTreatmentPlant_P	A facility designed to treat wastewater using physical, chemical and/or biological processes prior to discharge into receiving waters. (Navy Wastewater Utilities Model - Data Dictionary -Ver 3.04.docm)	**831168**	**G30**	**G3020**	**G302004**	**50**	**71**
sTreatmentPlant_A	A facility designed to treat wastewater using physical, chemical and/or biological processes prior to discharge into receiving waters. (Navy Wastewater Utilities Model - Data Dictionary -Ver 3.04.docm)	**831165**	**G30**	**G3020**	**G302004**	**N/A**	**75**

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities Thermal							
tAnchor_P	A structure, typically concrete, used to either guide the expansion of pipes or used to fix the movement of some part of the expansion section.	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**25**	
tCondensateCollector_P	A Condensate Collector is a well or a tank that collects condensate. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**50**	
tExpansionJoint_P	An expansion joint is a piece of equipment installed in the system piping to allow for thermal growth or expansion. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**25**	

tFitting_P	Fittings represents the facility found at the joint between two lines where a transition of some sort must occur. In order to cut down on the number of network feature classes and improve geometric network performance, we have chosen to rely on subtypes here to differentiate the different types of fitting-related classes. (Navy Thermal Utilities Model - Data Dictionary - Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**55**	
tHeatCoolMain_L	A thermal mainline is pipe that transports steam, high-temperature water, low-temperature water, dual-temperature water or chilled water. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**55**	
tHeatCoolMService_L	A thermal service line is pipe that connects to the main line and transports steam, high-temperature water, low-temperature water, dual-temperature water or chilled water to, or from, the meter point. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**55**	
tJunction_P	A box or small vault (usually concrete, brick, or cast iron) in heating/cooling systems located below grade with above grade access where pipes intersect. The manhole also houses associated fittings, valves, meters, etc.	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**55**	
tMeter_P	Meter Point represents the geographical location of a point where service is provided. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**25**	
tPump_P	A pump is a piece of equipment that moves, compresses, or alters the pressure of a fluid, such as water or air, being conveyed typically through a pipe. (Navy Thermal Utilities Model - Data Dictionary - Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**23**	
tPumpStation_A	A building in which one or more pumps operate to maintain flow at adequate pressure within a thermal distribution system.	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**N/A**	
tRegulator_P	A device located in the heating/cooling line that automatically reduces the pressure on the downstream side of the valve to a preset magnitude.	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**50**	
tValve_P	Control valves are used to regulate pressure and/or flow. (Navy Thermal Utilities Model - Data Dictionary -Ver 3.04.docm)	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**TBD Based on type system**	**50**	

Feature Class	Definition	CAT Code	uniformatII System	uniformatII Component	uniformatII Section	Service Life	MDI
Feature Class for Utilities Water							
wBackflowPreventionValve_P	A prevention assembly used to protect potable water supplies from contamination or pollution from backflow	**842245**	**G30**	**G3010**	**G301002**	**50**	**77**
wFireHydrant_P	A firefighting support valve that allows for the external flow of water used in firefighting	**843314**	**G30**	**G3010**	**G301004**	**50**	**82**
wFitting_P	A non-adjustable device that is placed along or around and is associated with a water pipe	**TBD Based on line type**	**TBD Based on line type**	**TBD Based on line type**	**TBD Based on line type**	**50**	

wHydrant_P	A non-firefighting support valve that allows for the external flow of water. Excludes relief valves and drain valves	**841161**	**G30**	**G3010**	**G301002**	**50**	**77**
wLineMain_L	A principal supply pipe in an arrangement of pipes for distributing water	**841161**	**G30**	**G3010**	**G301002**	**55**	**77**
wLineService_L	A pipe from a water main to the point of connection with another non-main pipe or a final service location	**842245**	**G30**	**G3010**	**G301002**	**55**	**77**
wMeter_P	A device for measuring the quantity or rate of water flowing through a pipe	**841161**	**G30**	**G3010**	**G301002**	**25**	**77**
wPump_P	A piece of equipment that adds pressure or changes flow to water	**Main 841161; Service Line 842245**	**G30**	**G3010**	**G301002**	**50**	**77**
wPumpStation_A	A building in which one or more pumps operate to maintain flow at adequate pressure within a water distribution system.	**841166**	**G30**	**G3010**	**G301007**	**N/A**	**71**
wSample_P	A piece of equipment installed in a water system for the purpose of testing water properties. Excluded are random sampling points for water quality	**Main 841161; Service Line 842245**	**G30**	**G3010**	**G301007**	**N/A**	**77**
wSource_P	A source of water intake to the water system including reservoirs, natural water bodies, wells, and/or feeds from external water networks	**841162**	**G30**	**G3010**	**G301001**	**50**	**77**
wValveControl_P	A valve used to control flow by adjusting an aperture	**Main 841161; Service Line 842245**	**G30**	**G3010**	**G301007**	**50**	**77**
wValveRelief_P	A device actuated by static pressure that opens to relieve excess pressure above a predetermined level	**Main 841161; Service Line 842245**	**G30**	**G3010**	**G301007**	**50**	**77**
wWaterTank_P	A storage tank above or below ground used for impounding water	**841427**	**G30**	**G3010**	**G300103**	**70**	**68**
wWaterTreatment_A	A location where water is processed to make it acceptable for a desired/specific use	**841162**	**G30**	**G3010**	**G301008**	**50**	**77**
wWaterTreatment_P	A location where water is processed to make it acceptable for a desired/specific use	**841162**	**G30**	**G3010**	**G301008**	**N/A**	**77**

Data Analysis

Data analysis is a critical part of the asset/activity management process. The populated SMS modules provide large amounts of asset data directly at an installation's fingertips. Most of the analysis an installation performs serves a need specific to them. A new product, the Visible Asset Sustainment Tool (VAST), constitutes data analysis that all installations perform.

This chapter focuses primarily on VAST, its purpose, and proper use. Several Case Studies and Best Practices are included or linked in Section 8.4 to demonstrate some of the individual analyses other installations have performed. The additional illustrated analyses are not required but may inspire others in the field with ways to improve their asset/activity management processes with better data analysis.

8.1 Purpose of VAST

VAST was developed by AFCEC to aid in the activity/asset management process. The tool is prepopulated by AFCEC with installation data from BUILDER SMS. Installations validate and verify the data and use it to develop a 3-year sustainment plan for every asset on their installation.

Some of the outputs of VAST are used to populate fields in AFIMSC's AFBEAT tool as part of each installation's Execution Plan (ExPlan). Other benefits of VAST include improving SMS data quality, highlighting data completeness issues, breaking down CE squadron stovepipes, and shifting from a reactive to proactive approach to requirements identification.

8.2 The VAST Process

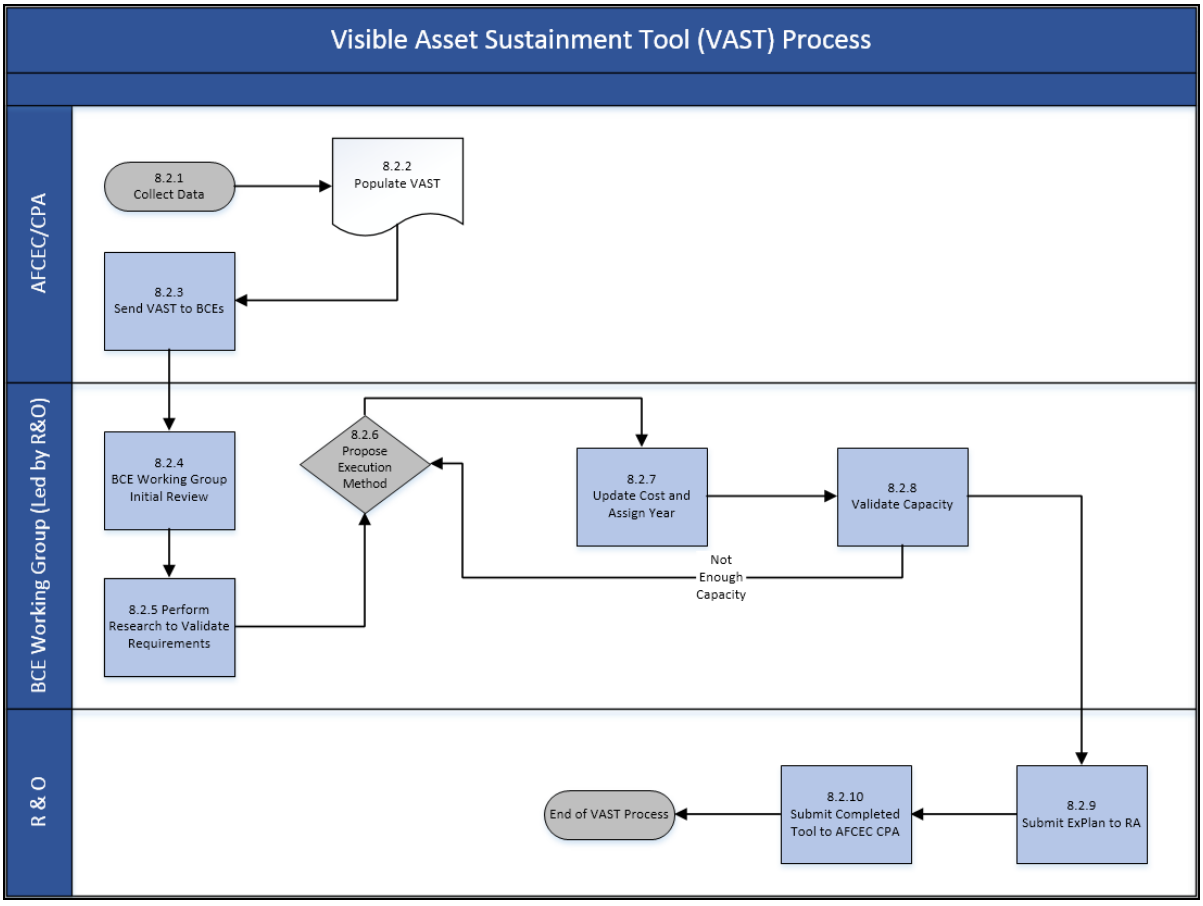


Figure 1 VAST High-Level Process

8.2.1 AFCEC Collects Data

Annually, AFCEC/CPA runs an unconstrained scenario in BUILDER™ to obtain raw data for VAST. An unconstrained scenario means the BUILDER projections are run with unlimited funds available. This captures all requirements. This is combined, as necessary, with supplemental data from other enterprise databases. VAST is the *Visible* Asset Sustainment Tool. It only displays assets for which the AF has asset *visibility*. If it is not in BUILDER, it will not be in VAST.

Note: If the information in any of the databases is inaccurate, the data presented in VAST reflects this.

8.2.2 AFCEC Populates VAST

AFCEC/CPA uses the data collected to prepopulate VAST for each installation.

8.2.3 AFCEC Sends VAST to the BCEs

AFCEC/CPA distributes each installation's copy of VAST to the installation's Base Civil Engineer (BCE). The BCE decides who to assign to develop the asset sustainment plans in VAST, but most installations will have a working group led by the Requirements and Optimization (R&O) Element with participation from AMP Managers, Community Planners, Programmers, Operations Shop Leads, and others.

8.2.4 BCE Working Group Initial Review

The BCE's working group performs an initial review of the information in VAST. The group identifies assets or systems requiring site visits to validate and/or update suspect data. Similarly, at this time, other assets requiring additional research are assigned to the appropriate participants. For example, the Programmer may need to provide information on projects already programmed or in progress, or the Community Planner may need to identify assets that are targeted for demolition. All preliminary research needed to validate requirements and create 3-year sustainment plans for each asset should be initiated at this time.

8.2.5 Perform Research to Validate Requirements

The various participants perform necessary research. When it is determined the data in VAST is not valid, R&O updates the source data in BUILDER. VAST will not be refreshed by AFCEC until the following year, so any changes should be conveyed to the BCE's working group for consideration in VAST population.

8.2.6 Proposed Execution Method

The working group reviews the requirements line by line and assigns a proposed execution method to each item. Possible execution methods include such things as In-House Organic, In-House Contract, Project on the books, Send to CEN for project, and No Work Needed.

8.2.7 Update Cost and Assign Year

The working group assigns costs to the upcoming 3 years in each asset's plan. These costs may or may not match what was generated by BUILDER. For example, SMS-generated costs assume the work will be contracted. If the proposed execution method is In-House Organic, labor is already covered by other funding streams, so the SMS-generated cost could be high. Or maybe the installation has decided to combine requirements from multiple years for the same asset into one larger requirement. Or perhaps they have pulled forward requirements in the out years for a facility that is failing faster than SMS predicts.

8.2.8 Validate Capacity

At this point, the working group has assigned a proposed execution method, a cost, and a year of proposed execution to all requirements. The Operations Flight now validates that the In-House work assigned to the shops for each of the 3 years is a reasonable workload. Similarly, the Engineering Flight validates that project workloads make sense.

If any of the workloads are determined to be unbalanced or unrealistic, the proposed execution methods and assigned years should be revisited until an achievable workload is obtained for all parties.

8.2.9 Submit ExPlan Information to RA

Two of VAST's built-in reports are the ExPlan Reports. Once VAST population is complete, the BCE's working group should provide these reports to the Resource Advisor (RA) responsible for providing CE inputs to the installation ExPlan. ExPlan business rules explain what the RA should do with this information.

8.2.10 Submit Completed VAST to AFCEC

Once all VAST entries are completed and the ExPlan information has been provided to the CE RA, the completed VAST file must be uploaded to the AFAMP VAST webpage. Instructions are available on the webpage.

8.3 Origination of Data in VAST

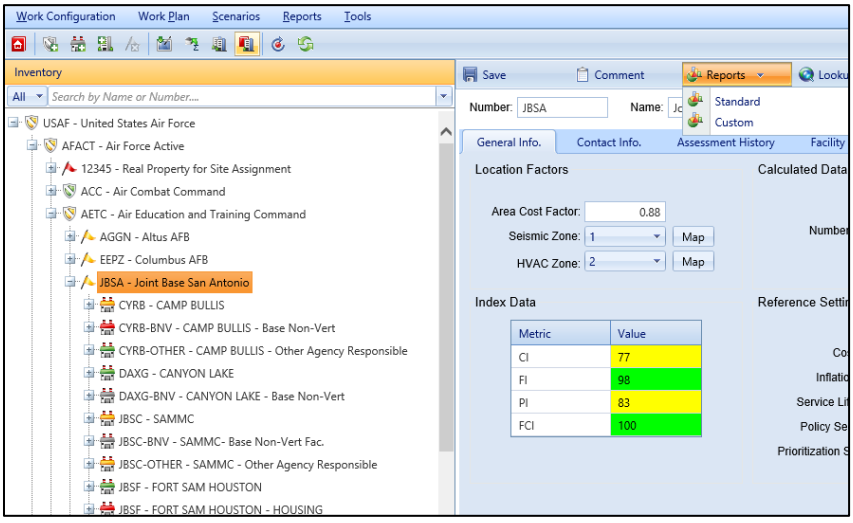
The information used to populate VAST is extracted from several enterprise databases. The majority of the information comes from an unconstrained scenario run in BUILDER. Additional information regarding existing programmed projects is pulled from ACES-PM or TRIRIGA as appropriate for that installation.

8.4 BUILDER Tips and Tricks

8.4.1 Useful BUILDER Reports for Data Analysis

BUILDER reports are a useful tool AMP and Sub-AMP managers can use to increase visibility of the facilities and effectively plan additional actions.

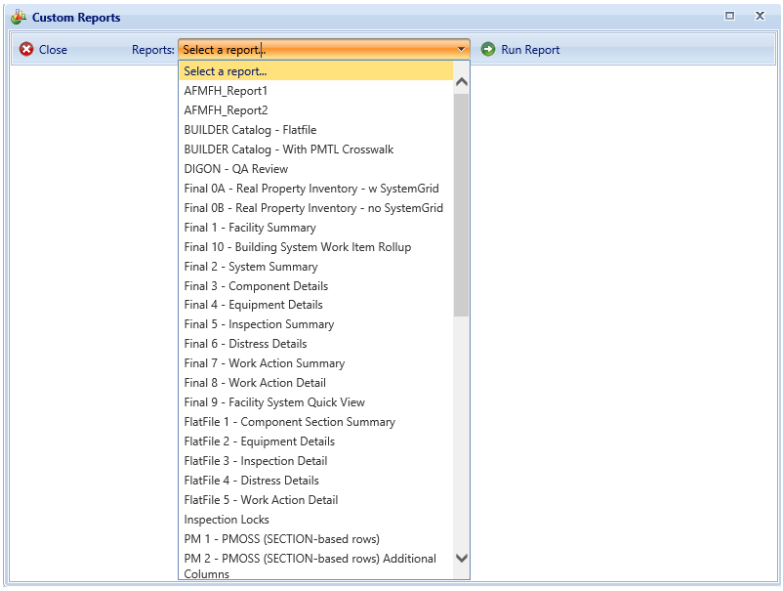
Verify the inventory tab is displayed.



1. Select the level at which you want to run the report.

The report will include all levels beneath what you select.

2. Click the reports drop down.
3. Select Custom.



4. Select from the available reports in the drop down list.
5. Click Run Report.

When the next window opens, you can choose to export the report to pdf, Excel or other file forms. As stated earlier, Excel is the best format for working with data. CSV format is useful when running large reports because it has no associated formatting.

1. **Final 9 – Facility System Quick View Report**
   The Final 9 – Facility System Quick View Report is a great place to ***start*** planning projects.
   - Review real property data and system condition installation wide.
   - Multi-disciplinary, multi-facility projects.
   - Shows the system condition index for all systems.
   - The system condition index is a general indicator of system health.
   - More detailed information gathering using the DIGON QA Review and QC 6 is still required.
   - The report is useful for multi-disciplinary and multi-facility projects.

   Optional information:
   - However, because of how the CI is rolled up from one level to another it is insufficient detail to plan a project.

- Sections with a high CRV have more influence on the CI, so this will hide issues that are tied to sections with a low CRV and exaggerate issues tied to sections with a high CRV.

2. DIGON – QA Review

The DIGON 4 – QA Review is a list of all sections, their names, subtypes, category, components, and systems. This is the most useful report for developing out year plans.

The review includes:

- Real property information such as site name, facility number, building construction year, and size.
- SMS produced data such as section design life, age, remaining design life, and remaining service life.
- Inspection information such as, inspection date, rating, and inspector name.
- CSCI which is the indicator of condition, section comments, number of inspections, number of details, and number of images associated with this section.

This report is useful because you can use the filters and:

- Plan work for a single building.
- Filter down to one building.
- Plan multi-disciplinary repairs based on the CSCI.
- Review the entire installation for single discipline work.
- Filter down to a single section subtype or section name.
- Sort CSCI from lowest to highest.

3. QC6 – Inspections Report

The QC6 lists most of the items the DIGON QA review does including all historical assessments.

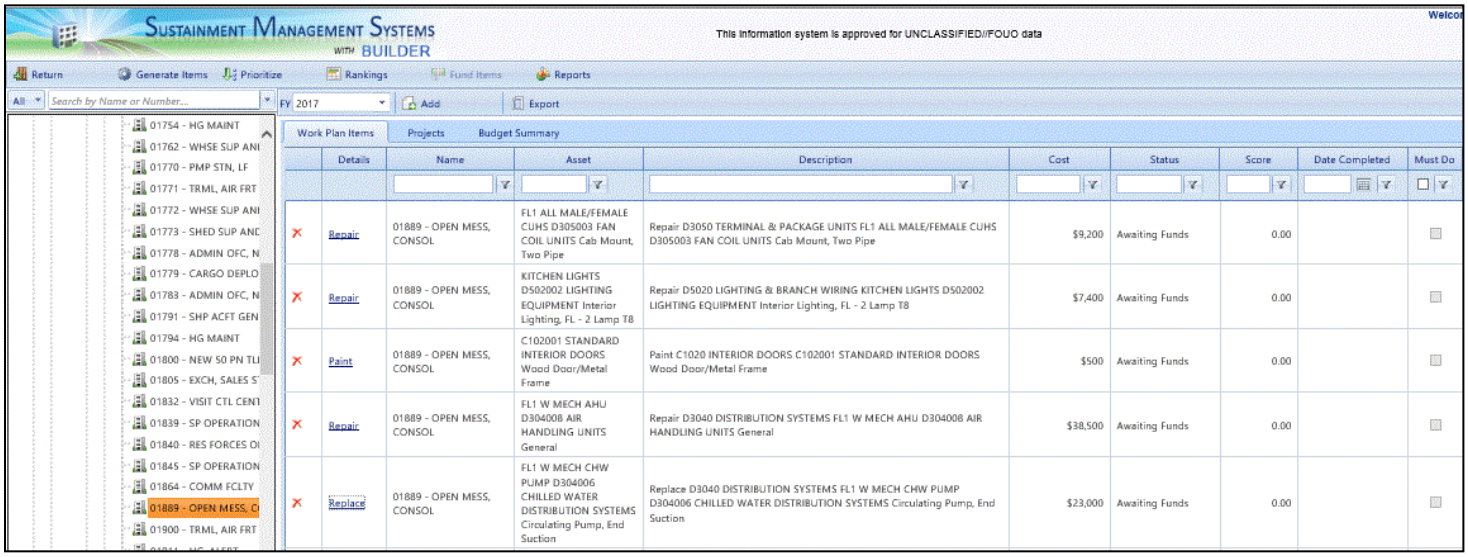
This report is most useful to validate assessments.

1. There should be a comment and a picture for every rating of Amber/Red. The report automatically highlights missing inspection comments.
2. Inspection comments should describe the distress in standard terms like on the back of the assessment cards (i.e., corroded).
3. Search the “Insp. Comments” column for key words like “old” and find inspections that are age based. Inspections should not be based on age but actual physical distresses.
4. Note other common inspection errors.

5. Compare the reports to previous assessments. This should show a gradual degradation of the equipment. It is suspicious to find assessments that show green, then red, in a short amount of time.

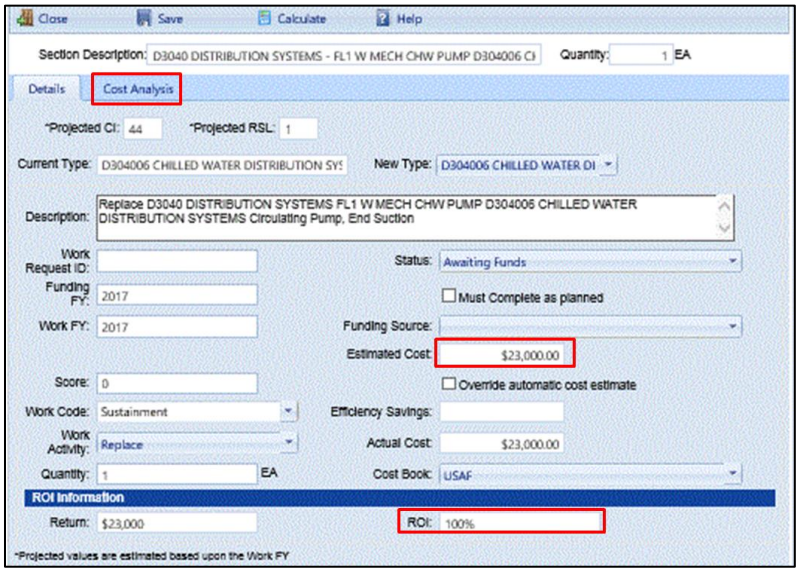
8.4.2 BUILDER Tips to Aid in the VAST Process

While VAST replaces this process, in the interim between VAST cycles, this section can help with determining whether to repair or replace an asset. Additionally, the work planning section of BUILDER can provide further information that can be helpful to the installations and clarify the VAST information provided. For example, when the generate work item button is clicked; BUILDER generates work items for a selected fiscal year. This could be helpful in preparation for the completion of VAST in the next fiscal year.



You can navigate to a specific building and view the work items for that building, review the asset description, cost, and suggested action from this screen.

When you click on the link in the details column BUILDER opens the details screen.



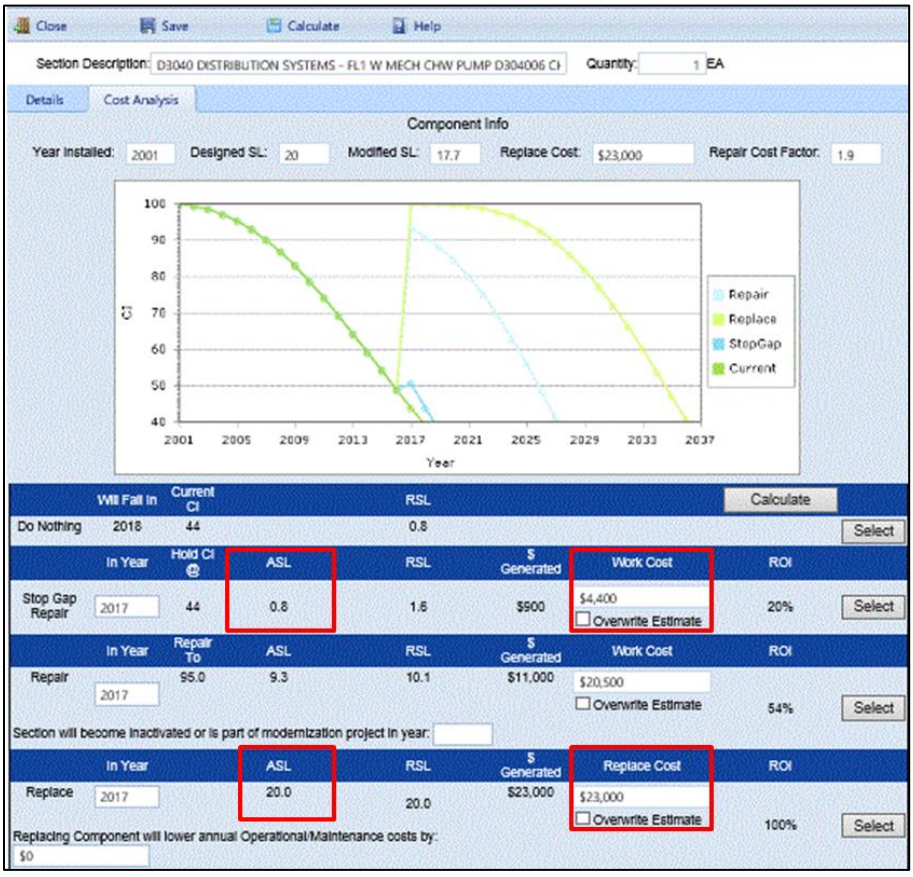
This shows more details such as return and ROI which are useful in justifying and prioritizing the work items for work orders and projects.

The estimated cost comes from the AF cost book and is uniform at every base.

This area does not have a level of accuracy required for a programming cost estimate.

Ensure the estimate accounts for the cost of doing business at your installation.

Select the cost analysis screen.



BUILDER compares the three types of work items economically.

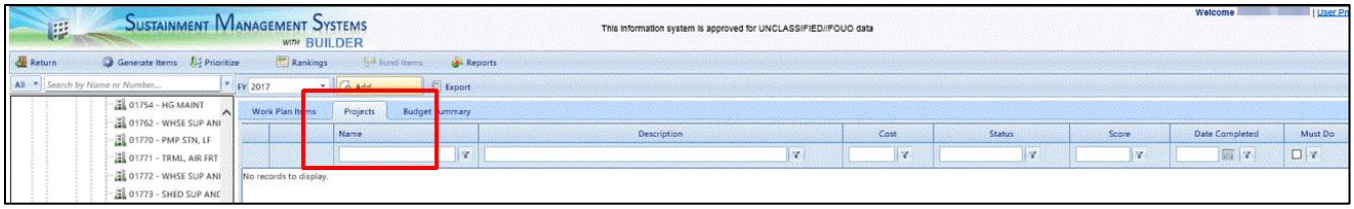
BUILDER has three suggested actions: “Repair”, “Replace”, and “Stop Gap Repair”.

- **Repair** – A major repair significant enough to improve the CI to 95.
- **Replace** – Section has replaced and deteriorates as if it were new, the CI is 100.
- **Stop Gap Repair** – This is the equivalent of an emergency or Band-Aid repair. BUILDER holds the CI constant for 1 year and the unit continues to degrade at the same rate thereafter.

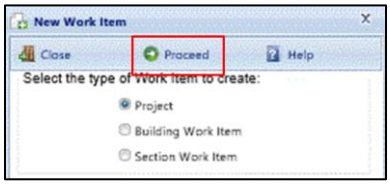
Note the difference in cost, additional service life, and ROI.

You can create “projects” in BUILDER by grouping work items.

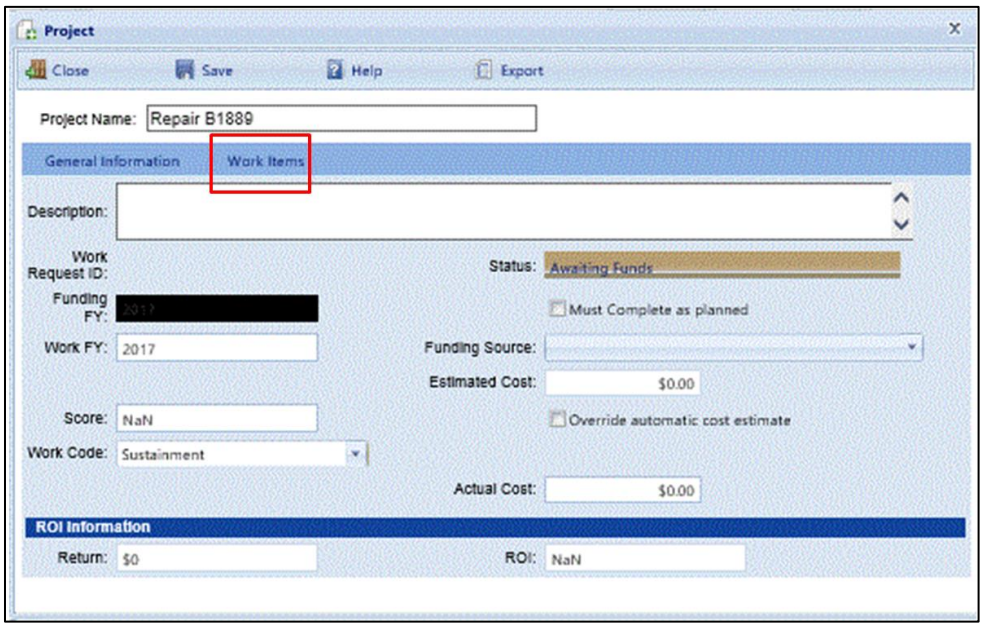
1. Click the projects tab.



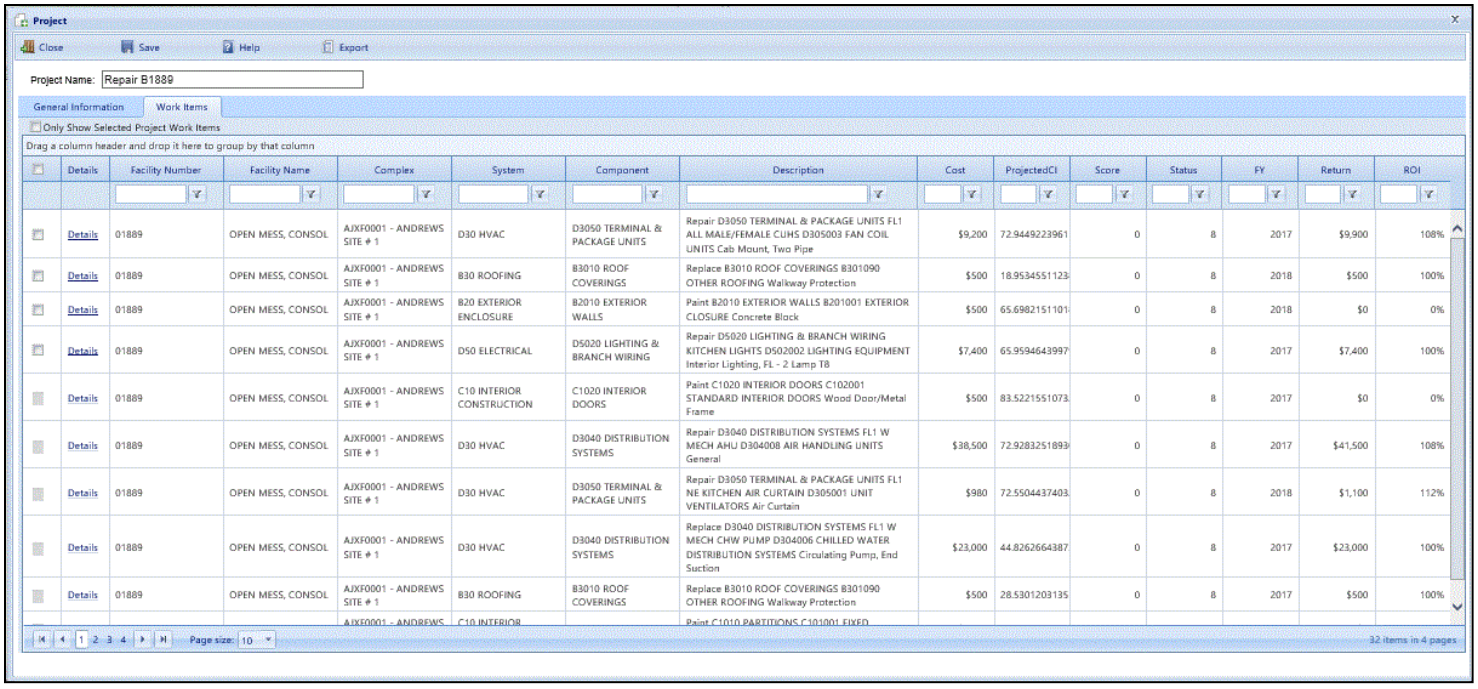
2. Select project, select proceed.



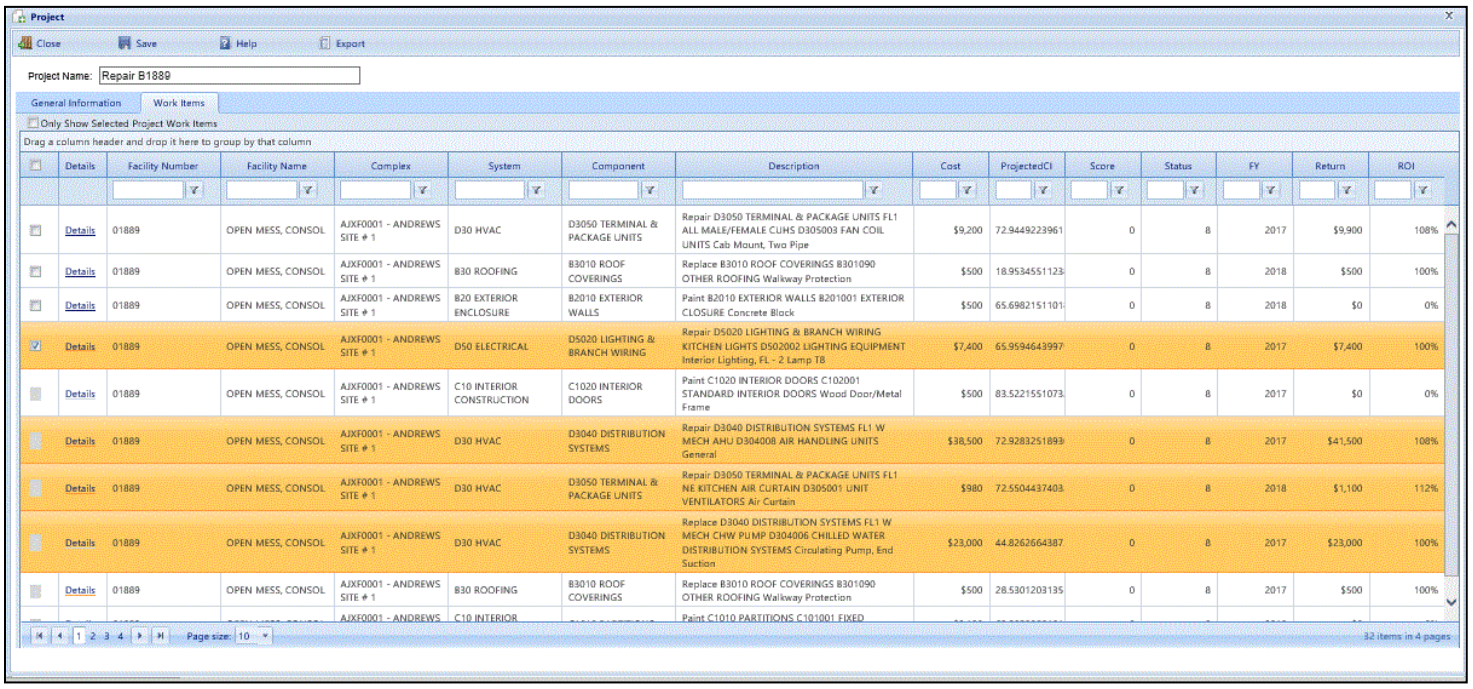
3. Select Work Items.



This takes you to a list of work items to select for your project.



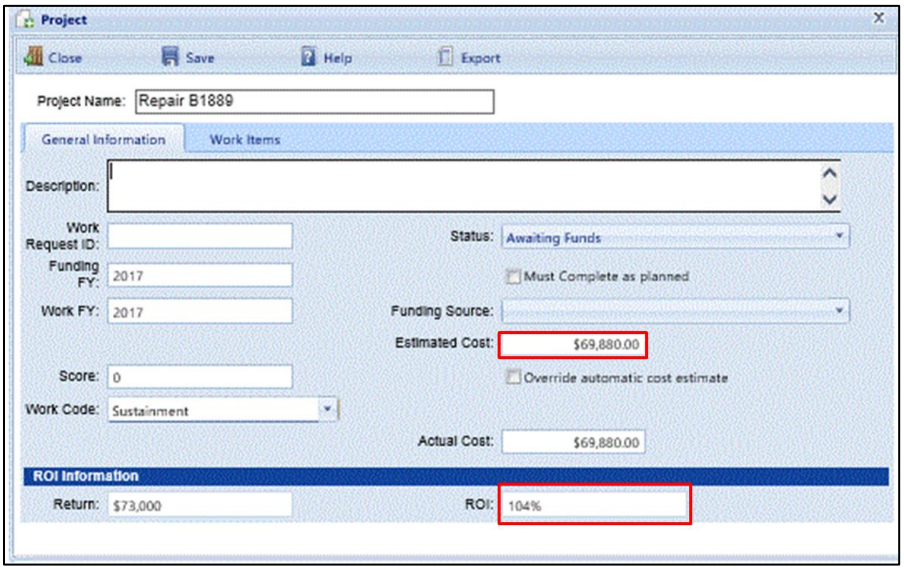
4. Selectively group work items so the project makes sense. For example, if the HVAC ducting requires replacement, this is a great opportunity to install a sprinkler system.



Once the project is saved, the life cycle cost analysis information can be viewed just like a work item.

Remember to be critical of the cost information. All AF uses the same cost information; you need to account for the actual cost. You can modify and provide your own cost information.

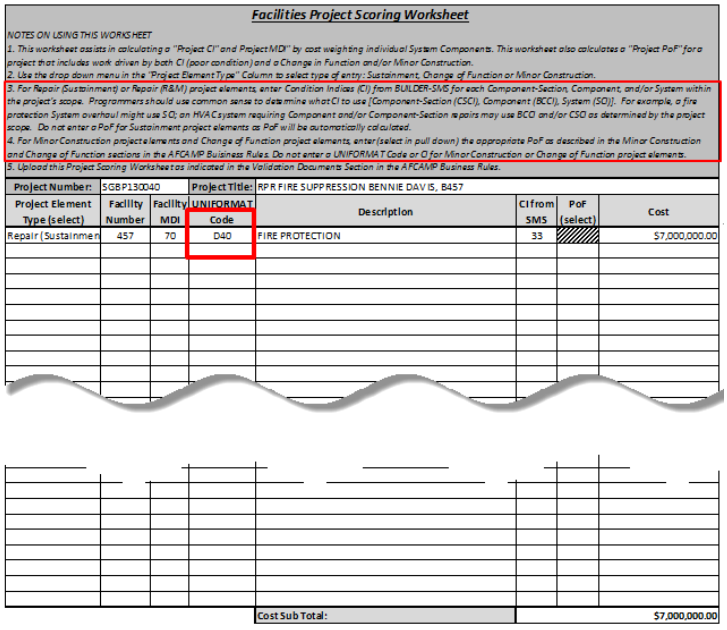
This information can be used to justify funding for the project via the "Savings-Only" project funding avenue.



8.4.3 BUILDER Opportunities/Projects Using the AFCAMP Business Rules

When determining the viability of a project or opportunity in BUILDER, additional calculations are sometimes required. To obtain reliable, repeatable, and valid calculations, the Project Scoring Worksheet is an accepted Tool. For additional guidance on the Project Scoring Worksheet, refer to the Business Rules in the AFCAMP Playbook which is updated annually.

Project Scoring Worksheet



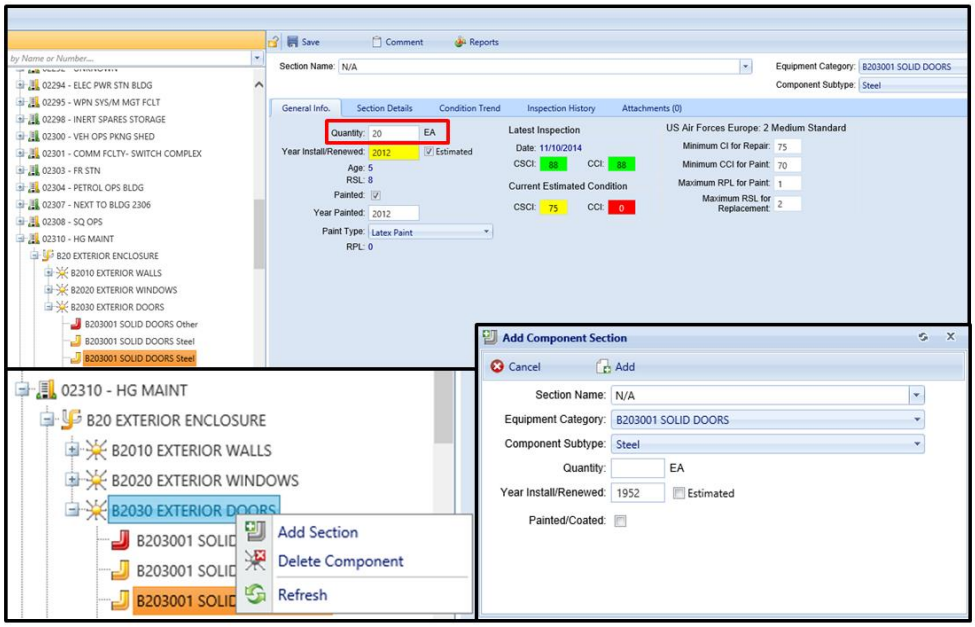
Facilities Project Scoring Worksheet

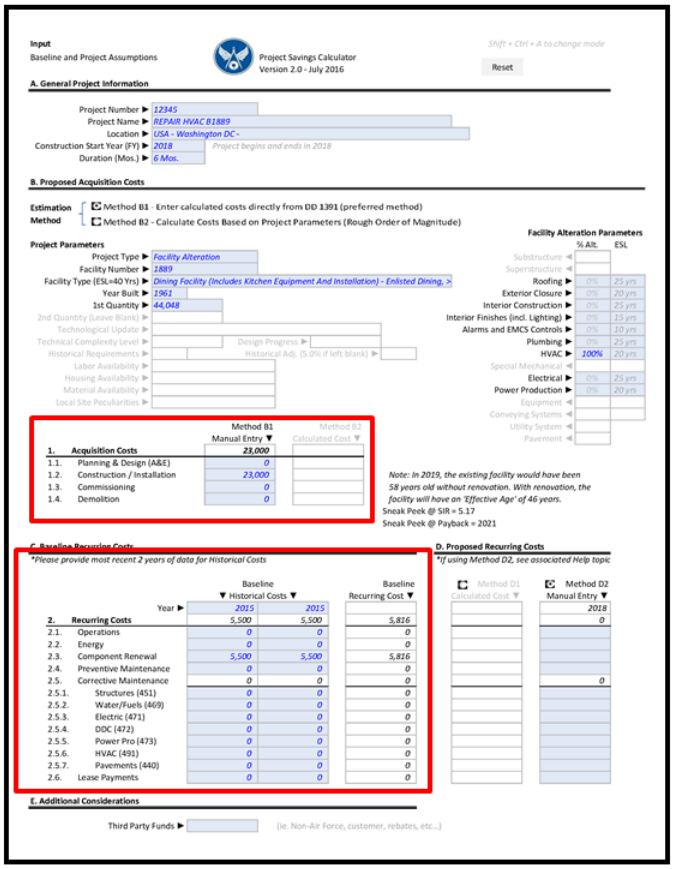
NOTES ON USING THIS WORKSHEET
1. This worksheet assists in calculating a "Project CI" and Project MDI" by cost weighting individual System Components. This worksheet also calculates a "Project PoF" for a project that includes work driven by both CI (poor condition) and a Change in Function and/or Minor Construction.
2. Use the drop down menu in the "Project Element Type" Column to select type of entry: Sustainment, Change of Function or Minor Construction.
3. For Repair (Sustainment) or Repair (R&M) project elements, enter Condition Indices (CI) from BUILDER-SMS for each Component-Section, Component, and/or System within the project's scope. Programmers should use common sense to determine what CI to use (Component-Section (CSCI), Component (BCCI), System (SCI)). For example, a fire protection System overhaul might use SCI; an HVAC system requiring Component and/or Component-Section repairs may use BCO and/or CSO as determined by the project scope. Do not enter a PoF for Sustainment project elements as PoF will be automatically calculated.
4. For Minor Construction project elements and Change of Function project elements, enter (select in pull down) the appropriate PoF as described in the Minor Construction and Change of Function sections in the AFCAMP Business Rules. Do not enter a UNIFORMAT Code or CI for Minor Construction or Change of Function project elements.
5. Upload this Project Scoring Worksheet as indicated in the Validation Documents Section in the AFCAMP Business Rules.

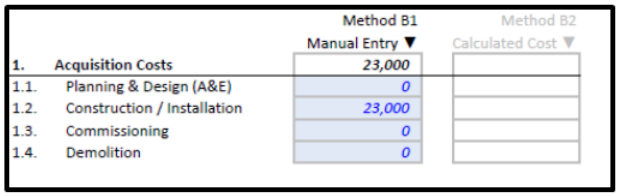
Project Number:	SGBP130040		Project Title:	RPR FIRE SUPPRESSION BENNIE DAVIS, B457			
Project Element Type (select)	Facility Number	Facility MDI	UNIFORMAT Code	Description	CI from SMS	PoF (select)	Cost
Repair (Sustainmen	457	70	D40	FIRE PROTECTION	33		$7,000,000.00
				Cost Sub Total:			$7,000,000.00

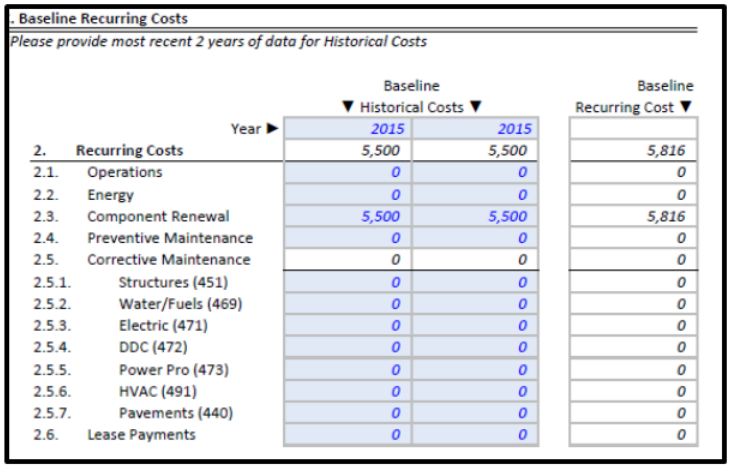
This shows where to put the information in a project savings calculator. It is available for download in the AFCAMP business rules.

Project Savings Calculator

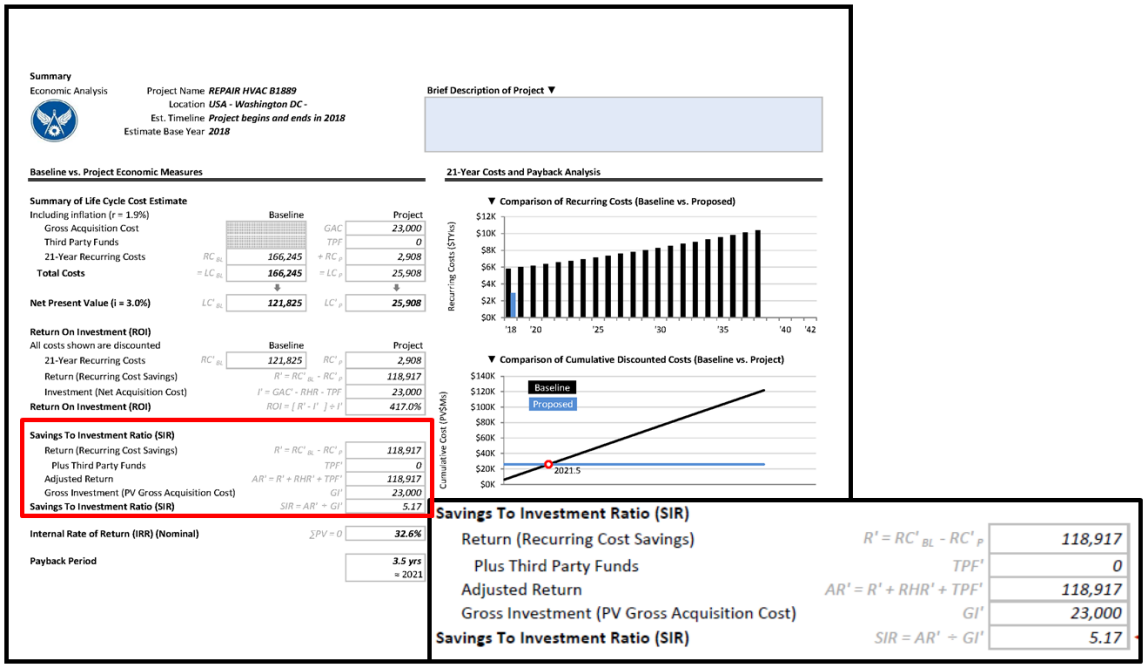








This shows that the result of replacing an HVAC unit that was breaking frequently has an SIR of 5.17. An SIR over 1.2 is considered competitive. That is more than enough to justify funding the replacement.



8.5 AF Institute of Technology Data Analysis Guidance

Data should provide an *accurate* representation of the physical world and be relatively simple/cheap to collect and maintain. It is very important to ensure the cost of collection/analysis is proportional to the value added to the decision that it supports.

The installations are interested in 2 types of data, inventory which *does not* change with time and attributes which *do* change with time. Data Analysis should realize one of two outcomes, support a decision, recommendation or direction, and/or confirm or remove a bias.

8.5.1 The Data Analysis Process

1. Define the Problem.

   This is the single most important step in the data analysis process. The question or definition of the problem must be clear, concise, and measurable. Is the analysis to support a decision, provide a recommendation or confirm a bias?

2. Define the Criteria.

   The criteria determine what data is required to perform the analysis. What kind of analysis is being done? Is it qualitative or quantitative analysis? What criteria will provide value to the decision, problem, or bias? The types of data required in this scenario could be condition, cost, size, MDI, or a combination thereof.

3. Identify Data Requirements.

   Prior to beginning the collection of data, it is imperative to define what data is required. To be effective, answer the question of, “what data do I need” prior to

beginning the data collection. The problem defines the criteria. A criterion defines the data requirements.

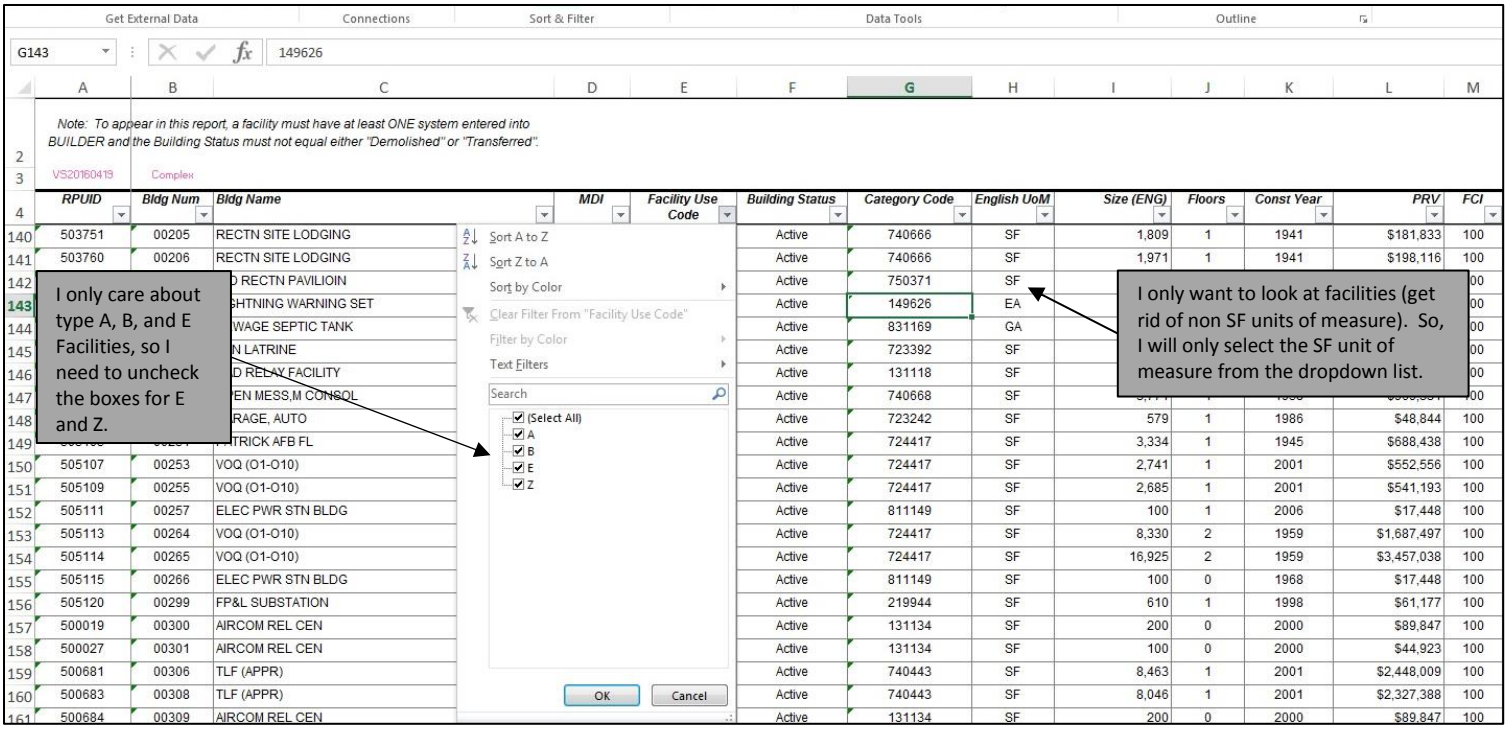
4. Plan the Analysis.

   The chosen methodology and technique must be understood by the person performing the analysis. For accurate, useful, and repeatable analysis, prior to beginning the analysis, plan the approach and method to achieve the results desired. When the data sends the analyst down a rabbit hole, sometimes it requires the removal of a parameter, quality, or specific attribute to remove the unnecessary data. Unnecessary data could hide the real issue or provide data that is not relevant to the question/definition the analyst is trying to answer. For example, condition analysis uncovers a slew of age-based assessments skewing condition values. Is this relevant to the problem being investigated or should this criteria be removed from the dataset?

5. Prepare the Data for Analysis.

   Microsoft Excel is a tool useful to analysis. Spreadsheets can display a huge amount of data without issue. This can be overwhelming. Data trimming is sometimes required to remove information that is unnecessary. Hiding or removing a column has the potential to make the spreadsheet more manageable and understandable. Column or row-based hiding or removal makes data easier to filter, sort, and analyze.

   a. How to Trim Data (Column-Based Hiding or Removal).
      i. Select the entire column you do not want (to see).
      ii. Right Click your mouse.
      iii. Select delete or hide. Be careful with deleting any information.
   b. How to Filter Data (Row-Based Hiding or Removal).
      i. Highlight all cells in the header row.
      ii. Go to the Data tab.
      iii. Select Filter.
      iv. On the column containing the information requiring a filter, click the dropdown arrow.
      v. Select the items to isolate/view.
      vi. Select enter. This should reduce the amount viewed to the specific criterion desired.



6. Execute the Analysis.

   To perform the analysis effectively, it is necessary to remove or highlight outliers and anomalies. Sort and search (also known as abnormality detection) allows the finding of the best and/or worst condition through a sort function. To find the outliers, highlight one of the headers and click sort.

   A Pivot Table is a useful data summary tool for simplifying large quantities of data. To accomplish the creation of a pivot table, the user sets up and changes the summary's structure by "dragging & dropping" fields graphically. The attributes (columns) in data can be made into filters, columns, rows, or values in a summary table of many rows.

   To manually create a PivotTable:

   1. Click a cell in the source data or table range.
   2. Go to Insert > Tables > Recommended PivotTable.
   3. Excel analyzes your data and presents you with several options.
   4. Select the PivotTable that looks best to you and press OK.

7. Prepare and Present the Results.

   The results of the data analysis are reported in a format as required by the users to support decisions and further action. The feedback from the users might result in additional analysis. The data analysts can choose data visualization techniques, such as tables and charts, which help in communicating the message clearly and efficiently to the users. The data visuals should be simple and legible. They should not create more questions than they answer. The

analysis tools should highlight the important information with color and form. Labels and context are essential.

8.5.2 Data Analysis Question and Answer Example

1. Define the Problem:

   What are my "worst" mechanical assets on the installation?

2. Define the Criteria:

   Condition and Age

3. Identify Data Requirements. (What data will I use to evaluate criteria?)

   Component Section Condition Index (CSCI) (or aggregated Condition Index (CI)), Remaining Service Life (RSL), Facility Number.

4. Plan the Analysis. (What are you going to do?)

   Worst D30 (HVAC) Assets.

   a. *Download DIGON QA report from BUILDER.*
   b. *Trim & Filter to only D30 (HVAC).*
   c. *Filter to only direct ratings (no age-based).*
   d. *Generate worst first list. The worst first list is sorted based on the asset that has the "worst" rating in the given criteria as "first" on the list for repair or replacement.*

5. Prepare Data for Analysis.

   a. *Trim: Keep Facility Number, Facility Name, System, Component, Section, Sub-Type, Inspection Type, Expected CI, Current Estimated CI, Replacement Cost, Design Life, Age, RSL.*
   b. *Filter: Using the filters, remove any outliers and anomalies.*

6. Execute the Analysis.

   a. *Sort: Current Estimated CI lowest to highest.*
      i. *Rabbit hole #1: Lots of "general equipment" needs to be inventoried properly (guidance in SMS Playbook Toolbox).*
      ii. *Rabbit hole #2: Found several instances where condition deterioration was inflated due to inoperable equipment (go fix the equipment!!).*
   b. *Using the guidance provided in Step 6, run Pivot Tables to aggregate CI data (unweighted).*

7. Present the Results:

   a. *Found lots of improperly inventoried equipment.*
   b. *Average CI is not adjusted for CRV.*
   c. *D30 data would benefit from some scrubbing to improve reliability.*

d. Some abnormalities between what BUILDER expects and the condition value input to the system.

e. QC3 would have done this much faster.

Worst Facility	Facility #	Facility Name	Avg of Current Est CI
1	00100	MULTIPURP REC BLDG	10
2	00101	RADOME TWR BLDG	10
3	00102	RDR TWR BLDG	10
4	02434	EXCH, SALES STORE	29.58248333
5	01322	SHP CONVL MUN	30
6	02145	PHOTO LAB, RECON	30.99687333
7	24177	SHP JET ENG I / MNT	34.1173
8	01074	OMNI	34.1909
9	02459	MAINT DOCK, FL SYS	37.95095
10	01025	ELEC PWR STN BLDG	38.9551

8.6 Case Studies and Best Practices - Under Construction

8.6.1 Using BUILDER's Work Planning Module Between VAST Cycles

The following process was developed by RAF Lakenheath, GB, to operationalize BUILDER data. VAST provides an annual work plan based on a snapshot in time, but, installations continue to conduct Facility Condition Assessments (FCA) on facilities not previously inventoried and conducting the periodic 5-year updates. This process will potentially change the inventories and condition on 20% of an installation's facilities between VAST iterations.

The process below can be used for individual facilities as a facility's FCA is produced or updated to determine if previously determined work items are still necessary or can be deferred, if a component has deteriorated faster than predicted and needs to be addressed or a facility is receiving its first FCA has defects requiring more immediate attention than waiting for the next year's VAST.

This planning process uses BUILDER reports to determine potential Work Items, validate the Work Items being generated are according to the AF Standards and Policies for a facility's Mission Dependency Index (MDI), validate the current condition of Work Item components, determine an execution method, determine/validate costs, and coordinate for appropriate execution action.

1. Navigate to the facility desired for analysis in BUILDER:
    a. Run a Standard Condition Index Detail Report.
    b. Export the report to an Excel spreadsheet.
    c. Note the MDI of the facility.
2. Go to the Work Configuration tab in BUILDER:
    a. Select Policies/Condition Policies/USAF.
    b. Look up the MDI.
    c. Add a new column to the exported Standard Condition Index Detail Report.
    d. Annotate on the Standard Condition Index Report the Standard for each system.
3. Return to the Work Configuration tab in BUILDER:
    a. Select Standards/AF/Condition Standards.

   b. Annotate in two new columns on the Condition Index Detail Report:
      i. The individual Standards for each system (i.e., Minimum Condition (CI) for Repair).
      ii. Maximum Remaining Service Life (RSL) for Replacement in the added new columns on the Condition Index Detail Report Excel spreadsheet.

4. Review the Standard Condition Index Report to identify suitable work candidates.
   a. Compare the minimum CI for Repair with the column R for each Section CI – Current Estimated). This allows identification of any Component-Section inspections that might be out of cycle (column W – inspection over 5 years ago) or any CSCI that are age based and not condition based (column R with no assessment CI for the Last Insp.).
5. Depending on the Component Section Condition Index (CSCI) score and number of Work Item candidates, decide the best execution method. Some may be singular Work Item candidates for immediate In-House Organic or In-House Contract Work. If there are numerous Work Item candidates of sufficient magnitude, a Project can be programmed for the Integrated Project List (IPL) for the appropriate year. If immediate action is required (i.e. work required within the next 2 years), an a Work Request or AF Form 332 can be developed and processed through the normal Work Requirements Review Board (WRRB) for funding/execution. If a Project is required to be programmed for execution by CEN, proceed to the Work Plan.
6. Once in the Work Plan tab:
   a. Navigate to the required facility.
   b. Generate Items and Prioritize the Work Items in the Work Plan for the current and next Fiscal Years. The Work Items should be checked against the Condition Index Detail Report to ensure the Work Items are correct and following the correct trigger points established by the Standards and Policies.
7. Add a Project to the Work Plan
   a. Select the Work Items from the Generated Items or load them manually through the Add New Work Item process to develop a Project(s).
   b. Open the Detail for each Work Item in the Work Plan.
   c. Conduct a 'Cost Analysis' to identify the best ROI and ensure that the cost is realistic.
   d. Amend the Work Cost, if required.
8. Once all the Work Items are added to a Project(s):
   a. Select the Reports icon.
   b. Run a Work Plan Detail by Year report.
   c. Export the report to Excel.
   d. Filter the report to only show the Work Items for each Project.

9. The Work Plan Detail by Year report:
    a. Print and attach to a Work Request (TRIRIGA) or AF Form 332 (ACES).
    b. Process through the WRRB.
    c. Forward to CEN for programming. Note: The AF Form 332 number should be annotated on the Project General Information tab in the Work Plan section in BUILDER. An electronic copy of the Work Plan can be saved to an appropriate folder in the appropriate share drive for the CEN programmer's to access.

This process requires repeating on all desired facilities between the annual VAST generations.

The process is not hard - just methodical. After running the process on several facilities, it becomes much easier and helps the Data Managers have a better understanding on the processes (Policies, Standards, trigger points, etc.) within BUILDER , apply what was learned in the Data Manager Education and Training Program on Work Planning and, to some extent, how the scenario populating VAST works.

Regardless of how a Work Item is planned for execution, the Work Item needs to be validated as to the current condition of the component.

RESULTS:

RAF Lakenheath used this process after each facility periodic assessment by the Facility Condition Assessment Team (FCAT) on all their mission essential facilities (TIER 1). Work Item candidates were identified for immediate in-house execution or postured for IPL project development. Currently, they have identified, validated, and priced approximately $10M of sustainment work and still have TIER 2, 3 and 4 facilities data to analyze. This process is being utilized to identify potential current mission MILCON projects whereby it is not economical to continue to sustain existing facilities.

Just one example of how they utilized this process: RAF Lakenheath had originally developed a project to repair the HVAC system to a munitions processing facility. However, upon analysis of the BUILDER data, it was apparent a full facility repair project was required. Because of the operational sensitivity of the facility, it was felt that running successive projects wasn't the best option. The facility's repair needs and a recommended way forward was advocated to 48 CES leadership. RAF Lakenheath used available O&M funds to carry out 'Stop gap' repairs to ensure the systems remained operational. 48 CES/CEN engaged with AFIMSC to secure additional funding resulting in a $4.165M full facility repair project.

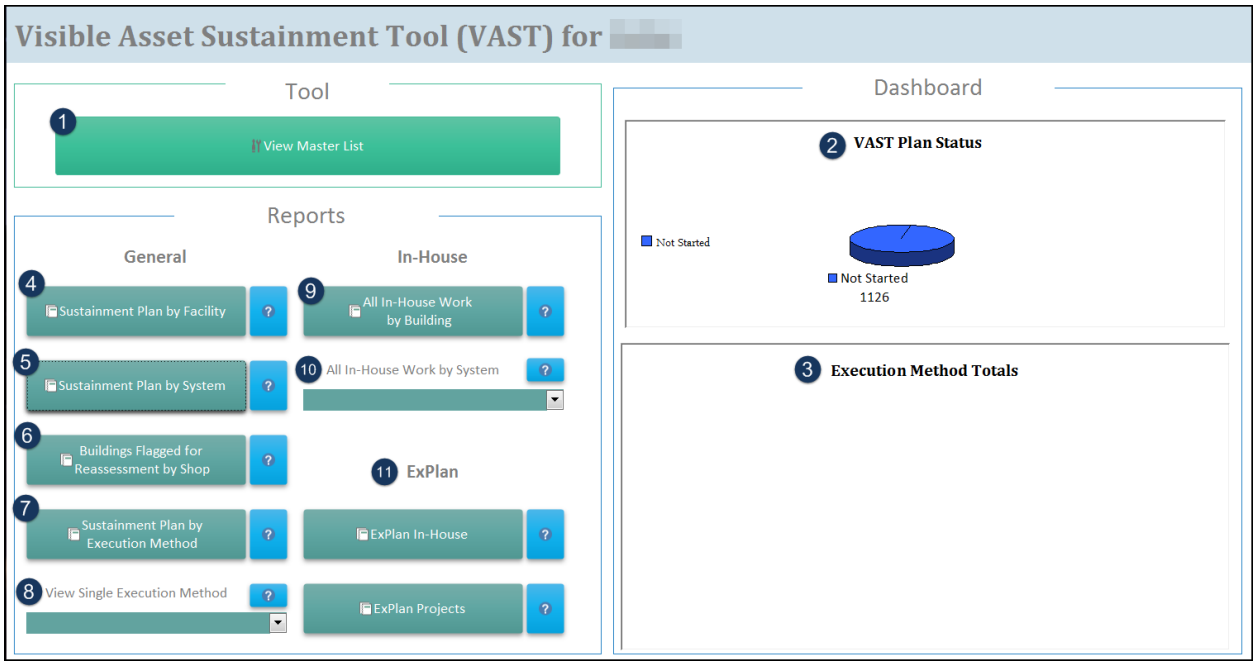
Of note, RAF Lakenheath is not waiting for the VAST cycle before using the data for VAST Work Planning. They are analyzing each facility as they complete the inventory and assessments and using BUILDER to augment the VAST Work Plan and justify requirements.

Note: Additional information on Case Studies and Best Practices can be found on the AFCEC/COA SharePoint site.

VAST Job Aid

This document provides guidance and an overview of Visible Asset Sustainment Tool (VAST).

1 VAST Home Page



This figure illustrates the VAST landing page.

Tool Section:

1. Enables a User to view the Master List and build a 3-year sustainment plan for each asset.

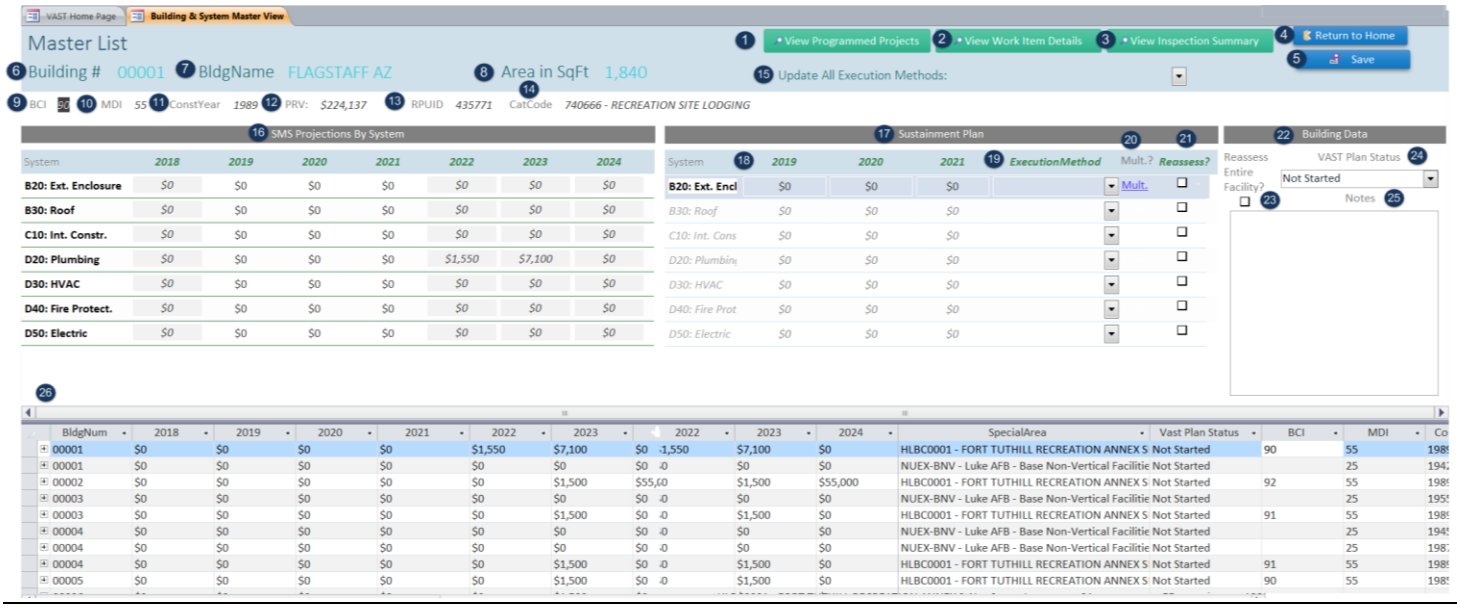
Dashboard Section:

2. VAST Plan Status: Shows the VAST Plan Status percentages for Not Started, In Progress, and Finalized. The statuses can be updated in the Master List to aid in tracking the progress of VAST completion across all assets.
3. Execution Method Totals: Shows a roll-up of the dollars planned for each execution method.

Reports Section:

4. View Sustainment Plan by Facility.
5. View Sustainment Plan by System.
6. View Buildings Flagged for Reassessment by Shop.
7. View Sustainment Plan by Execution Method.
8. View by Selecting an Execution Method from the Dropdown.
9. View All In-House Work by Building.
10. View All In-House Work by System.
11. View ExPlan Reports. Refer to Section 7.

2 Master List and Individual Building View

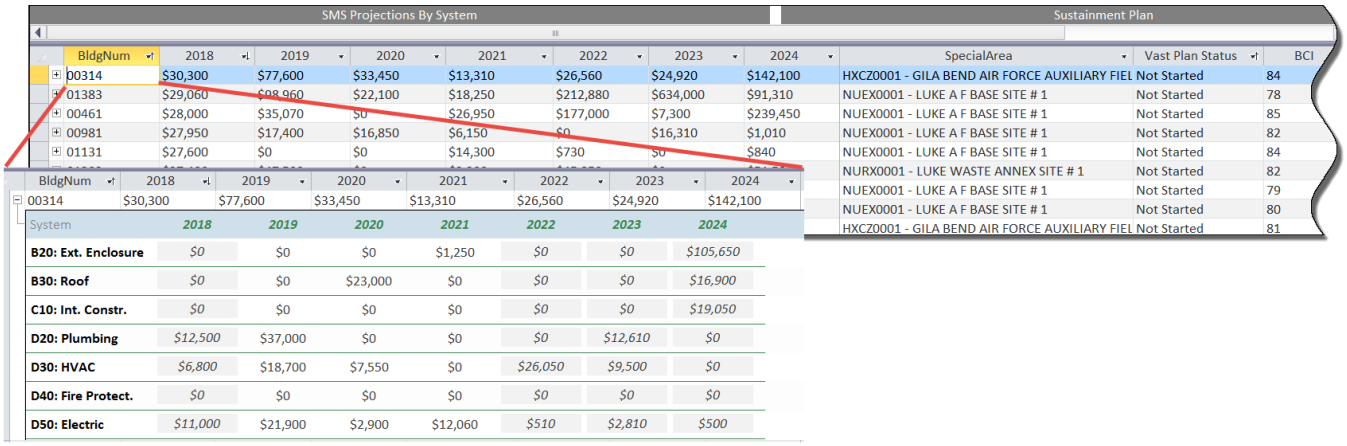


Column Definitions:

1. View programmed projects for the facility being viewed. This project information has been pulled from ACES-PM or TRIRIGA.
2. View work item details from the BUILDER Final 8 report. These work items are the source for the costs in the SMS Projects by System section of this view.
3. View Inspection Summary from the BUILDER Final 5 report.
4. Return to the VAST Homepage.
5. Save the current inputs.
6. Building number.
7. Building name.
8. Area in square feet.
9. Building Condition Index.
10. Mission Dependency Index.
11. Construction Year.
12. Plant Replacement Value.
13. Real Property Unique Identifier.
14. Category Code.
15. Update All Execution Methods. This drop down will change the Execution Methods for all systems to the same value.
16. SMS Projections by System. The numbers in this section come from the BUILDER Final 8 report. The work items have been summed by system and year to provide the totals shown. This is how much BUILDER predicts will need to be spent on this facility in an unconstrained (unlimited money) scenario over the next 7 years.
17. Sustainment Plan. This section is where the most time will be spent.

18. Enter the planned sustainment spending for each system for the years shown.
19. Select the Execution Method from the dropdown menu.
    - No Work Needed - If no work is intended to be performed on that system in the next 3 years.
    - In-House Organic - If the work will be performed by the organic shop personnel.
    - In-House Contract - If an Operations Flight contract vehicle is to be used.
    - In-House Reimbursed - If the funds will be reimbursed by an organization outside of CE (e.g., NAF).
    - Project on the Books - If the work will be completed by a project already programmed.
    - Send to CEN for Project - If the work needs to be programmed into a project by the Engineering Flight.
    - Sustained by Others - If the System or the entire facility is not sustained by CE.
    - Mult. - If one system has multiple Execution Methods (over 3 years or multiple in 1 year), additional guidance will be required from AFCEC.
20. If a system requires multiple Execution Methods over the 3 years or within a single year, hover the mouse under the Multi Column next to the System in question. A button will appear. When the button is selected it allows the input of multiple Execution Methods.
21. Check this box if a system's BUILDER information does not match reality. A report can be run from the VAST Homepage to highlight all of the systems the Facility Condition Assessment Team should target for reassessment.
22. Building Data Section.
23. Reassess Entire Facility. Select this box if the entire facility requires reassessment.
24. VAST Plan Status. The status/progress of the VAST assessment. Three choices are available from the dropdown: Not Started, In Progress, and Finalized. The current status/progress is graphically represented on the Vast Homepage.
25. Notes. Enter pertinent information that was not captured elsewhere, but is relevant to the plan.
26. The lower portion of the Master List is a scrollable list of all buildings the installation has in BUILDER. Scroll to the desired building and select it to have the upper half of the screen show the building's detailed information.

3 Building List



1. The + sign is an artifact in Microsoft Access and cannot be removed, ignore it, the information provided is duplicative.
2. Select the column headings to sort and/or filter the list to target specific facilities more easily.

4 Programmed Projects

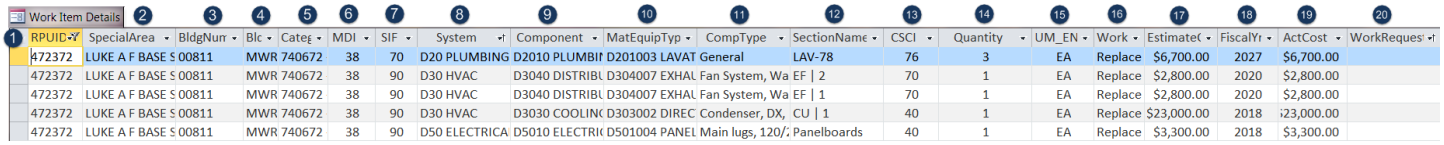
To view the Programmed Projects:

Select the View Programmed Projects button at the top of the Master List. A separate window will appear with the projects associated with this facility in ACES-PM or TRIRIGA as appropriate for the installation. Select the column headings to sort and/or filter the list to target specific facilities more easily.

Column Definitions:

1. Real Property Unique Identifier.
2. Fiscal Year the project is programmed for execution.
3. Program Type Code.
4. Funding Source Code.
5. If the installation is still in ACES-PM, this is the ACES-PM project number. If the installation has transitioned to TRIRIGA, this is the TRIRIGA opportunity number.
6. Project Title.
7. Facility Number.
8. Programmed Amount.
9. Project Status Code.
10. If the installation is still on ACES-PM, this field is blank. If the installation has transitioned to TRIRIGA, this is the legacy ACES-PM project number.

5 View Work Item Details


Work Item Details

1 RPUID	SpecialArea	BldgNum	Blc	Categ	MDI	SIF	System	Component	MatEquipTyp	CompType	SectionName	CSCI	Quantity	UM_EN	Work	Estimatec	FiscalYr	ActCost	WorkReques
472372	LUKE A F BASE S	00811	MWR	740672	38	70	D20 PLUMBING	D2010 PLUMBIN	D201003	LAVAT General	LAV-78	76	3	EA	Replace	$6,700.00	2027	$6,700.00	
472372	LUKE A F BASE S	00811	MWR	740672	38	90	D30 HVAC	D3040 DISTRIBU	D304007	EXHAU Fan System, Wa	EF | 2	70	1	EA	Replace	$2,800.00	2020	$2,800.00	
472372	LUKE A F BASE S	00811	MWR	740672	38	90	D30 HVAC	D3040 DISTRIBU	D304007	EXHAU Fan System, Wa	EF | 1	70	1	EA	Replace	$2,800.00	2020	$2,800.00	
472372	LUKE A F BASE S	00811	MWR	740672	38	90	D30 HVAC	D3030 COOLIN	D303002	DIREC Condenser, DX,	CU | 1	40	1	EA	Replace	$23,000.00	2018	$23,000.00	
472372	LUKE A F BASE S	00811	MWR	740672	38	90	D50 ELECTRICA	D5010 ELECTRI	D501004	PANEL Main lugs, 120/	Panelboards	40	1	EA	Replace	$3,300.00	2018	$3,300.00	

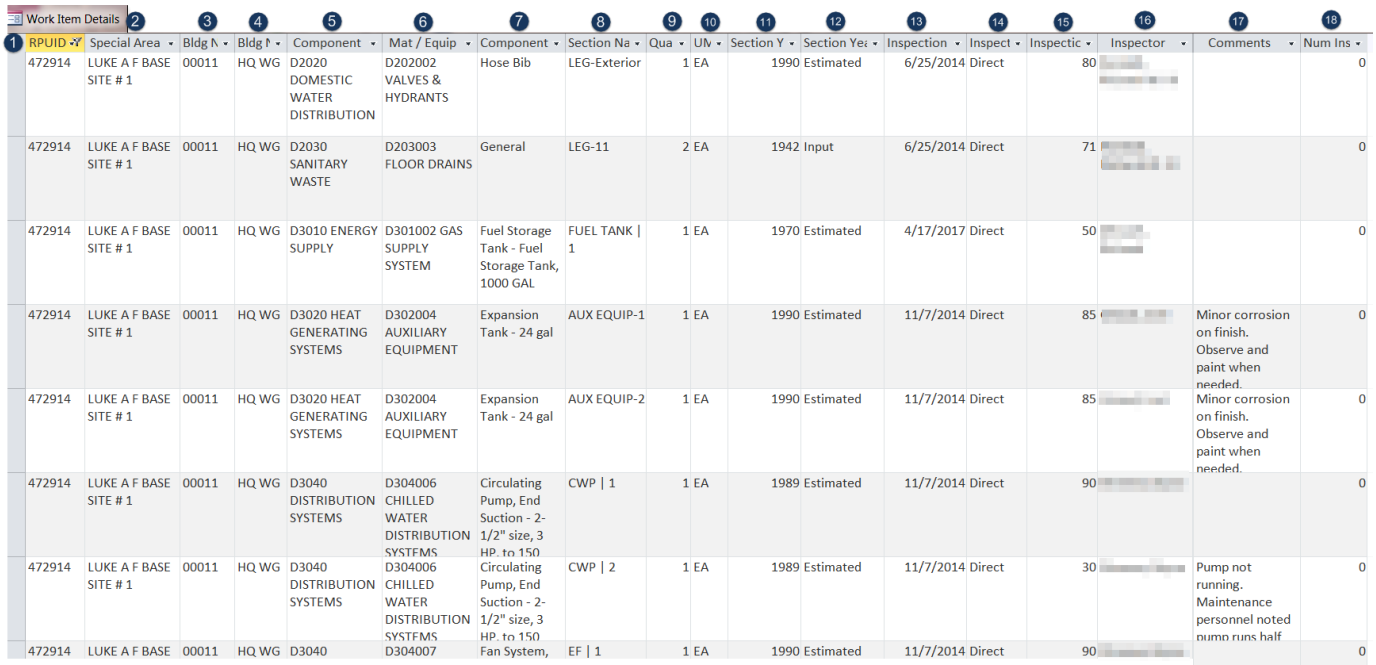
To view the Work Item Details:

Select the View Work Item Details button at the top of the Master List. A separate window will appear with all the work item details from the BUILDER Final 8 report for this building.

Column Definitions:

1. Real Property Unique Identifier.
2. Special Area. This can help the user sort by any Complexes that have been set up in BUILDER.
3. Building Number.
4. Building Name.
5. Category Code.
6. Mission Dependency Index.
7. System Importance Factor.
8. System.
9. Component.
10. Material Equipment Type.
11. Component Type.
12. Section Name.
13. Component-Section Condition Index.
14. Quantity.
15. Unit of Measure.
16. Work Item Description.
17. Estimated Cost.
18. Fiscal Year.
19. Actual Cost.
20. Work Request.

6 View Inspection Summary



Work Item Details

1 RPUID	Special Area	Bldg N	Bldg N	Component	Mat / Equip	Component	Section Na	Qua	UN	Section Y	Section Yea	Inspection	Inspect	Inspectic	Inspector	Comments	Num Ins
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D2020 DOMESTIC WATER DISTRIBUTION	D202002 VALVES & HYDRANTS	Hose Bib	LEG-Exterior	1	EA	1990	Estimated	6/25/2014	Direct	80			0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D2030 SANITARY WASTE	D203003 FLOOR DRAINS	General	LEG-11	2	EA	1942	Input	6/25/2014	Direct	71			0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D3010 ENERGY SUPPLY	D301002 GAS SUPPLY SYSTEM	Fuel Storage Tank - Fuel Storage Tank, 1000 GAL	FUEL TANK | 1	1	EA	1970	Estimated	4/17/2017	Direct	50			0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D3020 HEAT GENERATING SYSTEMS	D302004 AUXILIARY EQUIPMENT	Expansion Tank - 24 gal	AUX EQUIP-1	1	EA	1990	Estimated	11/7/2014	Direct	85		Minor corrosion on finish. Observe and paint when needed.	0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D3020 HEAT GENERATING SYSTEMS	D302004 AUXILIARY EQUIPMENT	Expansion Tank - 24 gal	AUX EQUIP-2	1	EA	1990	Estimated	11/7/2014	Direct	85		Minor corrosion on finish. Observe and paint when needed.	0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 2-1/2" size, 3 HP, to 150	CWP | 1	1	EA	1989	Estimated	11/7/2014	Direct	90			0
472914	LUKE A F BASE SITE # 1	00011	HQ WG	D3040 DISTRIBUTION SYSTEMS	D304006 CHILLED WATER DISTRIBUTION SYSTEMS	Circulating Pump, End Suction - 2-1/2" size, 3 HP, to 150	CWP | 2	1	EA	1989	Estimated	11/7/2014	Direct	30		Pump not running. Maintenance personnel noted pump runs half	0
472914	LUKE A F BASE	00011	HQ WG	D3040	D304007	Fan System,	EF | 1	1	EA	1990	Estimated	11/7/2014	Direct	90			0

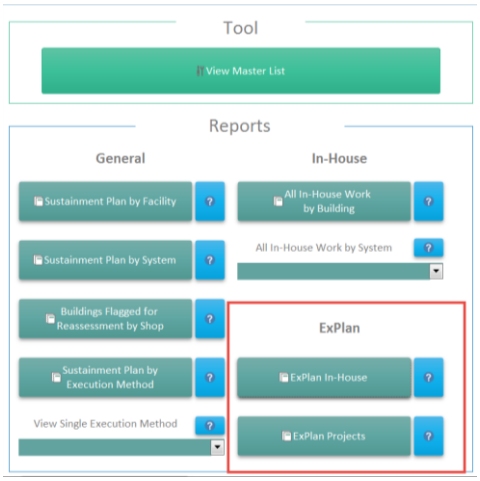
To view the Inspection Summary:

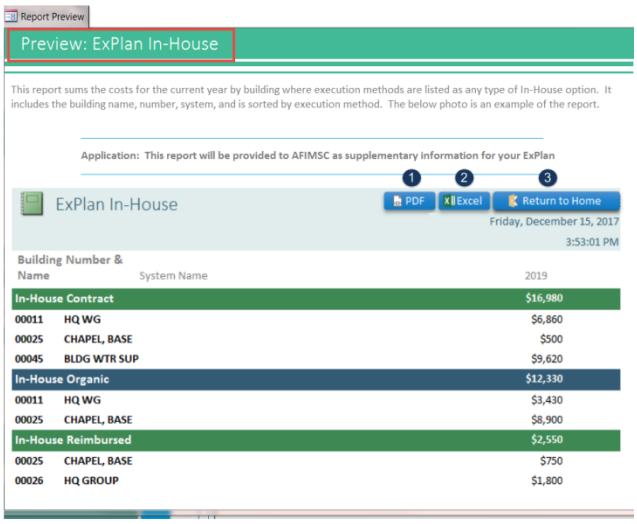
Select the View Inspection Summary button at the top of the Master List. A separate window will appear with the inspection information from the BUILDER Final 5.

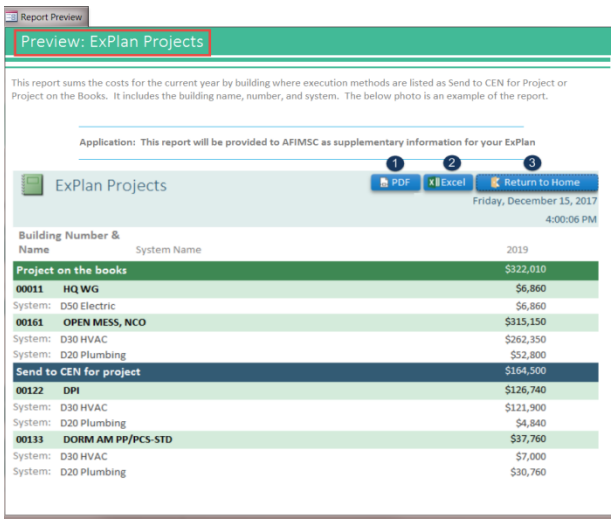
Column Definitions:

1. Real Property Unique Identifier.
2. Special Area. This can help the user sort by any Complexes that have been set up in BUILDER.
3. Building Number.
4. Building Name.
5. Component.
6. Material/Equipment.
7. Component Type.
8. Section Name.
9. Quantity.
10. Unit of Measure.
11. Section Year. When the Section was installed.
12. Section Year Source.
13. Inspection Date.
14. Instpection Type.
15. Inspection Rating.
16. Inspector Name.
17. Comments.
18. Number of Inspection Images.

7 ExPlan Reports







The ExPlan Reports:

The ExPlan In-House report sums the costs for the current year by building where execution methods are listed as any type of In-House option. It includes the building name, number, system, and it is sorted by execution method.

The ExPlan Projects report sums the costs for the current year by building where execution methods are listed as Send to CEN for Project or Project on the Books. It includes the building name, number, and system.

Note: These reports will be provided to AFIMSC as supplementary information for your ExPlan.

1. Select the PDF button to export the report to PDF.
2. Select the Excel button to export the report to Excel.
3. Return to Home closes the window.

8 VAST Training Links

Detailed training videos for VAST can be found at the following locations.

Note: Videos at all 3 locations are identical.

1. milSuite (must be on a CAC device)
    a. Lesson 1: https://www.milsuite.mil/video/18217
    b. Lesson 2: https://www.milsuite.mil/video/18218
    c. Lesson 3: https://www.milsuite.mil/video/18222
2. YouTube (best for non-CAC devices; may not be accessible from an AF computer)
    a. Lesson 1: https://youtu.be/jvmOx78h1eU
    b. Lesson 2: https://youtu.be/GGHi_ehMyB0
    c. Lesson 3: https://youtu.be/I8V21WxtKy4
3. Download (if streaming quality is poor; must be on a CAC device)
    a. All 3 Lessons can be accessed through this link.

Additional Resources
If the SMS Playbook or the VAST Job Aid does not answer your question(s) on how to populate the tool, contact the AFCEC, POC Ben Graf, at ben.graf@us.af.mil.

Sustainment Management Systems (SMS) Playbook Acronyms

A

AAFES	Army Air Force Exchange Service
AAS	Aircraft Arresting Systems
ACC	Air Combat Command
ACES	Automated Civil Engineering System
ACES-PM	Automated Civil Engineering System – Project Management
ACES-RP	Automated Civil Engineering System – Real Property
AETC	Air Education and Training Command
AF	Air Force
AFB	Air Force Base
AFCAMP	Air Force Comprehensive Asset Management Plan
AFCEC	Air Force Civil Engineer Center
AFCEC/CO	Air Force Civil Engineer Center/Operations Directorate
AFCEC/COA	Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division
AFCEC/COAP	Air Force Civil Engineer Center/Operations Directorate – Asset Visibility Division, Airfield Pavement Evaluation Branch
AFCEC/DTS	Air Force Civil Engineer Center/Data Transformation Services
AFMAN	Air Force Manual
AFI	Air Force Instruction
AFRPA	Air Force Real Property Assets
AFWAY	Air Force Way
AHU	Air Handling Unit
AMP	Activity Management Plan
APE	Airfield Pavement Evaluation
AP	Apron
ASRR	Airfield Suitability and Restrictions Report
ASTM	American Society for Testing and Materials
ATL	Acquisition, Technology, and Logistics
ATO	Authority to Operate

B

BCAMP	Base Comprehensive Asset Management Plan
BCCI	Building Component Condition Index
BCE	Base Civil Engineer
BCI	Building Condition Index

BIA	Built Infrastructure Assessment
BIAT	Built Infrastructure Assessment Team
BR	Business Rules
BRED	BUILDER Remote Entry Database

C

CAMP	Comprehensive Asset Management Program
CATCODE	Category Code
CE	Civil Engineer
CEN	Engineering Flight
CERL	Construction Engineering Research Laboratory
CES	Civil Engineer Squadron
CI	Condition Index
CONUS	Continental United States

D

DAA	Designated Approval Authority
DCS	Defense Collaboration Services
DD	Department of Defense form number
DeCA	Defense Commissary Agency
DET	Detachment
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DoD	Department of Defense
DoDEA	Department of Defense Education Activity
DSW	Direct Scheduled Work

E

EA	Engineering Assistants
EMCS	Energy Management Control System
EQ	Environmental Quality
ERDC	Engineer Research and Development Center
ETL	Engineering Technical Letter

F

FAC	Facility Analysis Category
FACID	Facility Identification
FAsT	Fuels Assessment Tool
FCA	Facility Condition Assessment
FCI	Facility Condition Index
FES	Fire Emergency Services
FHWA	Federal Highway Administration
FIAR	Financial Improvement and Audit Readiness
FOA	Field Operating Agency
FoB	Found on Base
F&OTM	Fasteners and Other Track Materials
FUB	Facilities Utilization Board
FYDP	Future Years Defense Program

G

GIS	Geographic Information System
GSU	Geographically Separated Units

H

HAF/A4	Headquarters Air Force/Logistics, Installations and Mission Support
HAF-GIO	Headquarters Air Force Geo Integration Office
HDPE	High-Density Polyethylene
HQ AFSPC/A6S	Headquarters Air Force Space Command/Communications and Information Software
HVAC	Heating, Ventilation, and Air Conditioning
HWD	Heavy Weight Deflectometer

I

ID	Identification
IDIQ	Indefinite Delivery Indefinite Quantity

IE	Installations and Environment
IGIS	Installation Geospatial Information System
IPL	Integrated Priority List
IWIMS	Integrated Work Information Management System
IT	Information Technology

J

K

KPI	Key Performance Indicators
KVA	Kilo Volt Amps

L

LF	Linear Feet
LOS	Levels of Service
LS	Linear Segmentation

M

MAJCOM	Major Command
MDI	Mission Dependency Index
M&R	Maintenance and Repair

N

NAVAIDS	Navigational Aids
NCOIC	Non-Commissioned Officer in Charge
NEX	Navy Exchange

O

OCONUS	Outside the Continental United States

OH	Overhead
OPG	Operation Program Group
OSD	Office of the Secretary of Defense
OSD/IE	Office of the Secretary of Defense/Installations and Environment

P

PAD	Program Action Directive
PCASE	Pavement-Transportation Computer Aided Structural Engineering
PCC	Portland Cement Concrete
PCI	Pavement Condition Index
PCN	Pavement Classification Number
PM	Preventive Maintenance
PMP	Preventive Maintenance Plan
PMTL	Preventive Maintenance Task List
POC	Point of Contact
POM	Program Objective Memorandum
P-Plan	Programming Plan
PVC	Polyvinyl chloride

Q

QC	Quality Control

R

R/A/G	Red/Amber/Green
RCI	Rail Condition Index
RED	Remote Entry Database
RETAI	Real Estate Transactions, Accountability, and Inventory
R&O	Requirements and Optimization
ROI	Return On Investment
ROOFER	Roofing management system
RP	Real Property
RPA	Real Property Accountability
RPAD	Real Property Asset Database

RPI	Real Property Inventory
RPIE	Real Property Installed Equipment
RPIM	Real Property Information Model
RPIR	Real Property Inventory Requirements
RPO	Real Property Office
RPSUID	Real Property Site Unique Identifier
RPUID	Real Property Unique Identifier
RSL	Remaining Service Life

S

SDSFIE	Spatial Data Standard for Facilities, Infrastructure, and Environment
SF	Square Feet
SMS	Sustainment Management System
SMSWIG	Sustainment Management System Implementation Working Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SRM	Sustainment, Restoration, and Modernization
sub-AMP	sub – Activity Management Plan
SY	Square Yards

T

TBD	To Be Determined
TDS	Total Dissolved Solids
TERPS	Terminal Instruments Procedures
TNAP	Transportation Networks and Airfield Pavements

U

UFC	Unified Facilities Criteria
UG	Underground
USC	United States Code
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USAFR	United States Air Force Reserve

V

W

WRRB	Work Requirements Review Board

X

Y

Z
