UFC 3-270-08
19 January 2024

UNIFIED FACILITIES CRITERIA (UFC)

PAVEMENT MANAGEMENT

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UNIFIED FACILITIES CRITERIA (UFC)

PAVEMENT MANAGEMENT

Indicate the Military Department Preparing Activity responsible for the document.

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND

AIR FORCE CIVIL ENGINEER CENTER

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Change No.	**Date**	**Location**

This UFC supersedes UFC 3-270-08, *Pavement Maintenance Management*, dated 16 January 2004.

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FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States, its territories, and possessions is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Military Department's responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Technical content of UFC is the responsibility of the cognizant DoD working group. Defense Agencies should contact the respective DoD Working Group for document interpretation and improvements. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide website https://www.wbdg.org/ffc/dod.

Refer to UFC 1-200-01, *DoD Building Code*, for implementation of new issuances on projects.

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CHAPTER 1 INTRODUCTION

1-1 BACKGROUND.

Pavement management involves determining the quantity of pavement assets on each installation, organizing information on these assets in a well-defined structure known as a pavement inventory, evaluating the condition of these assets, then analyzing the data to predict future condition, determine maintenance and repair (M&R) requirements, and develop a pavement management plan (PMP).

1-2 PURPOSE AND SCOPE.

This UFC provides guidance on pavement management concepts, processes, and standards.

It addresses requirements for both paved and unpaved airfield, heliport, road, and parking pavements. It defines standards for using automated tools, including the PAVER pavement management application and the Pavement Computer Assisted Structural Engineering (PCASE) application, with a focus on standards for collecting, analyzing, and reporting pavement management data as well as how to use products from these applications to prioritize maintenance and/or repair requirements and develop PMPs.

1-3 REISSUES AND CANCELS.

This UFC reissues and cancels UFC 3-270-08, *Pavement Maintenance Management*, dated 16 January 2004.

1-4 APPLICABILITY.

This UFC applies to all Service elements and contractors responsible for managing pavements. This includes Service evaluation teams or contractors performing pavement evaluations as well as personnel at installations responsible for using pavement evaluation data to develop and execute PMPs.

1-5 GENERAL BUILDING REQUIREMENTS.

Comply with UFC 1-200-01, *DoD Building Code*. UFC 1-200-01 provides applicability of model building codes and government-unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high-performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein.

1-6 GLOSSARY.

Appendix B contains acronyms, abbreviations, and terms.

1-7 REFERENCES.

Appendix C contains a list of references used in this document. The publication date of the code or standard is not included in this document. Unless otherwise specified, the most recent edition of the referenced publication applies.

1-8 NATO AIRFIELD AND OPERATIONS STANDARDS.

Comply with NATO STANAG 7131, *Aircraft Classification Number (ACN)/Pavement Classification Number (PCN)*, and NATO Standard AEP-46, *ACN/PCN*, when evaluating/reporting the PCN of airfields used by NATO forces or NATO campaigns. Comply with NATO STANAG 3634, *Runway Friction and Braking Conditions*, and NATO Standard AATMP-13, *Runway Friction and Braking Conditions*, when assessing/reporting the friction characteristic of the airfields used by NATO forces or NATO campaigns. Comply with NATO STANAG 7181, *Standard Method for Airfield Pavement Condition Index (PCI) Surveys*, and NATO Standard AEP-56, *Standard Method for Airfield Pavement Condition Index (PCI) Surveys*, when surveying/reporting the condition of airfields used by NATO forces or NATO campaigns. Comply with TSPWG Manual 3-260-00.NS7210, *Standards for NATO Deployed Air Operations*.

CHAPTER 2 PAVEMENT MANAGEMENT

2-1 DESCRIPTION.

Pavement management is a systematic process used to determine M&R requirements, maintain the safety of operations, and optimize the life cycle cost of paved and unpaved airfield, road, and parking pavement. The overarching concept is to manage pavements to extend life and optimize life cycle cost rather than just repairing or reconstructing pavement when it fails, also known as "worst first."

The pavement management process uses the Pavement Condition Index (PCI) to define the surface condition of the pavement. While the PCI is a key index in pavement management, other indexes developed for other types of evaluations are also used to get a more holistic assessment of the pavement condition, capability, and performance, which is key to developing a PMP and a rational determination of feasible M&R alternatives. Pavement management is implemented at either the network level or project level. The distinctions between the two are the factors considered in the analysis as well as the sampling process/rate used when conducting a PCI survey. This chapter outlines basic concepts and the overall process.

2-1.1 Pavement Condition Index (PCI).

The PCI is a numerical rating based on the type, severity, and quantity of distresses identified during a pavement condition survey. UFC 3-260-16, *O&M Manual: Standard Practice for Airfield Pavement Condition Surveys*, provides instructions for conducting PCI surveys, distress definitions, and PCI computation details. The PCI captures data on the surface condition of the pavement and is used in conjunction with other indexes and considerations to manage pavements.

2-1.2 PAVER Pavement Management Application.

a. Executive Order (EO) 13327, *Federal Real Property Asset Management*, directs efficient and economical use of the federal government's real property assets. The 2013 Under Secretary of Defense (Acquisition, Technology, & Logistics) policy letter mandated a standardized process for facility condition assessments. It also established the Sustainment Management System (SMS) suite of software tools (including PAVER) as the facility and infrastructure condition assessment methodology for DoD to implement EO 13327.

b. PAVER was in use well before OSD mandated its use. It was created to automate the PCI computation process and provide tools used to organize, collect, and analyze pavement management data. PAVER has two versions—a distributed (PC-based) version intended for individual users and a server-based version to provide multiple users access to a central pavement database. Both provide the same engineering functionality but each Service determines whether they use the PC-based, the server-based, or a combination of both versions of PAVER.

c. DoD personnel can download PAVER with a common access card (CAC) from the Tri-Service Pavement Site, https://transportation.erdc.dren.mil/triservice. Installation and activation instructions are also available at this site. Consultants may get PAVER from the Colorado State distribution center, http://www.paver.colostate.edu/, or the American Public Works Association, https://www.apwa.net/store/.

d. Governmental and commercial entities around the world use PAVER. The user can select a language from a list under the **Preferences** drop-down. This capability is useful when dealing with overseas installations or working with NATO partners. Any PAVER database developed for any of the Services will be delivered with preferences set to the English language. Details for using the language option are outlined in the PAVER user manual.

2-1.3 Network-Level Pavement Management.

Fewer samples are inspected for Network-Level Pavement Management, but the samples inspected are representative of the entire section. UFC 3-260-16 defines the required minimum number of inspected samples. In the Network-Level approach, the confidence level in the measured condition is lower. This approach is used when a higher degree of risk is acceptable. Each Service defines when to use Network-Level Pavement Management based on mission requirements.

2-1.4 Project-Level Pavement Management.

Project-Level Pavement Management requires inspecting more samples. UFC 3-260-16 defines the procedure to determine the required number of and the location of the samples based on the systematic random sampling process. The Project-Level approach results in a 95 percent probability that the reported pavement condition index (PCI) is within ±5 points of the true mean PCI (the PCI obtained if all the sample units were inspected), given a defined standard deviation. Use this approach when a higher degree of risk is not acceptable. Each Service determines when to use Project-Level Pavement Management based on mission requirements.

2-2 PAVEMENT INVENTORY ORGANIZATION.

Whether using the Network-Level or Project-Level Pavement Management approach, organize the pavement inventory following the guidance in this UFC to facilitate data collection and analysis for both the PCI survey and other types of evaluations.

The pavement inventory is simply all pavements grouped by their function. Create a separate PAVER database for each pavement inventory at an installation. For example, include all airfield pavements in one database and all road and parking pavements in a separate database.

2-2.1 Inventory Mapping.

Whether doing a PCI survey or structural evaluation and either creating a new inventory or updating an existing inventory, the first step in organizing the inventory is creating a geospatially correct map using a Geographic Information System (GIS) application such as Esri ArcMap or AutoCAD Map 3D. This map defines the geospatial extent of the pavement inventory. It is subdivided into polygons for the networks, branches, sections, and sample units that make up the inventory. Inventory mapping is covered in detail in paragraph 3-2.

2-2.2 Pavement Inventory.

The pavement inventory map imported into PAVER can have inventory attributes included. When it does not, the inventory associated with the map is defined in PAVER. In this case, use the PAVER **Inventory** form to input network, branch, section, and sample unit data, then link the data to the inventory map polygons using the **GIS Assignment** tool. Next, populate the work history for each section and the real property asset information to complete the inventory.

When the GIS is used to create some or all of the inventory as part of the mapping process, the inventory is already linked to the polygon when the map is imported to PAVER.

2-3 PAVEMENT EVALUATION.

Pavement evaluation encompasses activities involving data collection, analysis, and report generation for various aspects of pavement condition, performance, or capability. In addition, two other publications, UFC 3-260-16, *Standard Practice for Pavement Condition Surveys* and UFC 3-260-03, *Airfield Pavement Evaluation*, provide pavement evaluation guidance.

The results of the various types of evaluations provide data on pavement structural capability, surface friction characteristics, roughness, the presence of voids, and the potential for foreign object damage (FOD). While much of this UFC focuses on the PCI and PAVER processes used to define M&R requirements, these other pavement evaluation factors play a significant role in prioritizing requirements, determining courses of action to repair pavement, and developing PMPs.

2-4 DEVELOPING PAVEMENT DETERIORATION MODELS.

PAVER's **PCI Deterioration Families** tool uses PCI and work history data to determine pavement performance. The user groups pavements with similar uses and characteristics into families to develop a deterioration model for each family. This past pavement performance defines the deterioration rate of each family and is used in the PAVER **Condition Performance Analysis** tool and in **Work Planning** to predict the future condition of the pavement in the inventory.

PAVER also uses the family model to generate a **Current Predicted PCI** that provides a real-time estimate of the PCI today. Both the PCI at last inspection and the **Current Predicted PCI** are available in multiple reports and in the **Project Planning** module.

2-5 DEFINE WORK PLANNING PARAMETERS.

PAVER's **M&R Family Model** tools define the parameters used to develop work plans. These parameters are defined for each M&R category: localized operational (aka safety or stopgap), localized preventive, global, and major M&R.

The parameters defined include work types, cost by work type, distress maintenance polices, consequence of maintenance policy, consequent surface, minimum condition, and cost by condition. M&R family models are created for each M&R category then sections are assigned to the appropriate M&R family models.

2-6 DETERMINE WORK REQUIREMENTS.

PAVER's **M&R Work Planning** tool is used to develop work plans based on the PCI deterioration models, M&R family models, and other parameters defined in the **M&R Work Planning** tool based on specific scenarios.

These M&R work plans define near-term and long-term work requirements for each M&R category for each budget scenario. The near-term requirements include specific work types and estimated quantities and costs identified in the year following the latest inspection. The long-term requirements define costs for each M&R category but do not include specific work type or quantity requirements.

2-7 DEVELOP PAVEMENT MANAGEMENT PLANS (PMP).

Work plans generated by PAVER provide a list of repair requirements to develop PMPs. This part of the process involves a person with knowledge of pavement management, design, and construction who uses the PAVER products to prioritize and group requirements into executable tasks and projects.

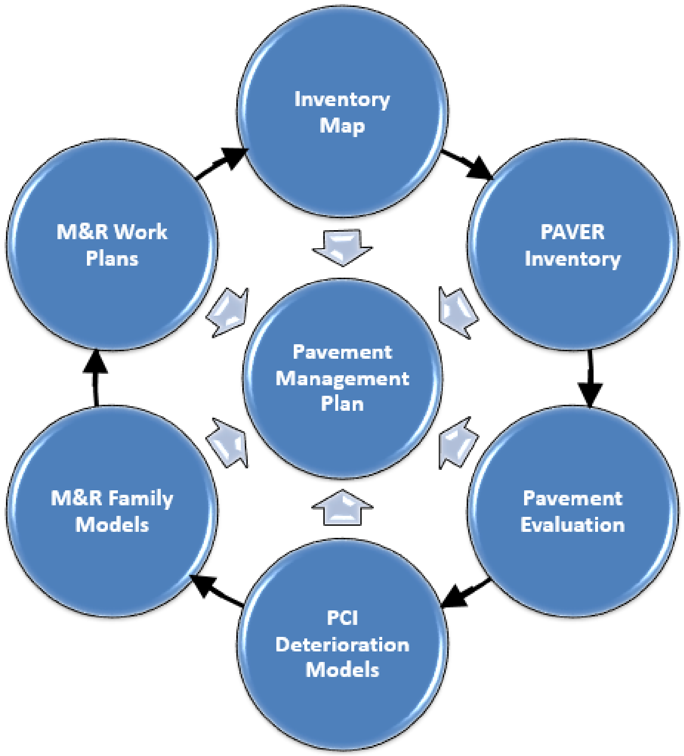
2-7.1 Other Pavement Management Plan (PMP) Considerations.

In addition to the PCI, other important factors such as pavement load-carrying capacity, FOD risk, surface friction characteristics, existing waivers, and operational considerations are used to prioritize and group requirements into executable tasks and projects.

2-7.2 Required Work and Project Planning Tool.

Once requirements are grouped into an executable task for in-house execution or a project for contract execution, they are entered into PAVER using the **Required Project** tool or the **Project Formulation Wizard**. Then rerun the M&R work plan with the required work included to develop a revised work plan. This process may go through several iterations until the entire PMP is defined. The overall process defined above is shown in Figure 2-1.

Figure 2-1 PAVER Pavement Management Process



2-8 STRATEGIC PAVEMENT MANAGEMENT.

Another important aspect of pavement management is the ability to do strategic pavement management analysis. By combining the databases for each installation into a single database, the Services can analyze and generate reports on condition, performance, and M&R requirements at the enterprise level.

This combined database is also known as a “rollup database.” A rollup database is created for airfield pavements and a separate rollup database is created for road and parking pavement. To facilitate enterprise analysis, each PAVER database that is combined in a rollup database must adhere to the standards outlined in this UFC. Services may supplement these standards based on mission-specific requirements.

2-9 SERVICE PAVEMENT EVALUATION PROGRAMS.

Each Service has a centrally managed pavement evaluation program for performing some or all the following evaluation types on a regular cycle: structural pavement evaluations, pavement condition index surveys, friction characteristics evaluations, and void detection surveys.

2-9.1 Airfields.

The types of evaluations performed and the evaluation cycle are determined by Service mission requirements.

2-9.2 Roads and Parking

Road and parking evaluations are typically constrained to PCI surveys but are also performed on a regular cycle as defined by each Service. The organizations listed in paragraph 2-9.3 are responsible for their respective evaluation programs and may be contacted for more information. These organizations are referred to as Service pavement POCs in this UFC.

2-9.3 Points of Contact (POC).

2-9.3.1 U.S. Army.

- Installation Management Command (IMCOM), Army Dams & Transportation Infrastructure in San Antonio, Texas has overall program responsibility.
- Engineer Research and Development Center (ERDC) Geotechnical and Structures Laboratory in Vicksburg, Mississippi performs airfield evaluations.

2-9.3.2 U.S. Navy.

- Naval Facilities Engineering Systems Command (NAVFAC) Atlantic in Norfolk, Virginia has overall program responsibility. NAVFAC/EXWC in Port Hueneme, California provides support to the overall program.
- NAVFAC Airfield Pavement Evaluation Teams perform airfield evaluations.

2-9.3.3 U.S. Air Force.

- The Air Force Civil Engineer Center (AFCEC) at Tyndall AFB, Florida has overall program responsibility.
- The AFCEC Airfield Pavement Evaluation Team performs airfield evaluations.

CHAPTER 3 PAVEMENT INVENTORY

3-1 INTRODUCTION.

Pavement inventory organization is the foundation for pavement management data collection and analysis. When performing a pavement evaluation for airfield or road and parking pavement, use the inventory structure from the previous evaluation as a starting point. Update the inventory to ensure it meets the standards outlined in this UFC but maintain the same inventory structure to the maximum extent possible. The intent of this guidance is to maintain continuity and facilitate analysis between successive evaluations. The following pavement inventory components are used to properly manage pavement assets.

3-2 INVENTORY MAP.

An accurate map showing the location and geospatial extents of pavement on an installation is critical when evaluating and managing pavement assets. These maps must be geospatially correct and are typically created using a geographic information system (GIS) such as Esri's ArcMap or AutoCAD Map 3D.

3-2.1 Mapping Guidelines.

PAVER uses the inventory map to navigate between segments in the inventory and to generate map-based PAVER reports.

a. Pavement mapping for DoD installations uses each installation's GIS data, called the Common Installation Picture (CIP). The CIP must comply with the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE). Each Service has an approved SDSFIE adaptation and each has a Pavement Feature Class with "entities" and "attributes" that align with the required PAVER data structure standards as outlined in the PAVER user manual. Information on the SDSFIE is available at http://www.sdsfieonline.org.

b. At a minimum, the map must subdivide the inventory into polygons for the networks, branches, sections, and sample units. The map may also have attributes associated with these network, branch, section, and sample unit polygons, but if populated with the map data in the GIS, the attributes must align with the PAVER data structure standards as described above.

c. The pavement inventory map is exported from the GIS to a shapefile or table imported into PAVER. If the map is imported into PAVER with just the inventory geometry and without the inventory attributes, these attributes are populated in PAVER and are assigned to the inventory polygons using the **GIS Assignment** tool in PAVER.

3-2.2 Mapping Metadata.

When performing an evaluation, check the CIP metadata to determine if it was developed from surveyed geometry or digitized geometry. If it is the latter, determine the accuracy of the imagery; this dictates the accuracy of the map. Do not use a lower accuracy to change the network, branch, or section polygons.

3-2.3 Coordinate Systems.

Optimally, maps are created using the World Geodetic System (WGS) 84 datum, but the State Plane Coordinate System (SPCS) for bases within the United States or the Universal Transverse Mercator (UTM) Coordinate System for bases outside the United States may be used if that is the datum used to create the CIP.

3-2.4 Use of Imagery.

Imagery can be used to check maps for accuracy and update the map if the imagery is at the same or a higher accuracy than was used to create the original map (the CIP). Environmental Systems Research Institute (Esri) has world imagery on which you can overlay a shapefile to check geometry. Imagery may be imported into PAVER in a Tagged Image File Format (TIFF) as a context map. This imagery is useful when performing pavement evaluations, but when the database is combined into a rollup database, the imagery is removed to reduce file size.

3-2.5 Topology Validation.

Always validate a shapefile using the GIS application or in PAVER using the **GIS Manager** tool. The most important things to check for are that polygons have no gaps and are not overlapping.

> Once topology is validated, **delete** the validation information before exporting a new shapefile. If the topology is not deleted, PAVER will import it and the shapefile is rendered “unassignable.”

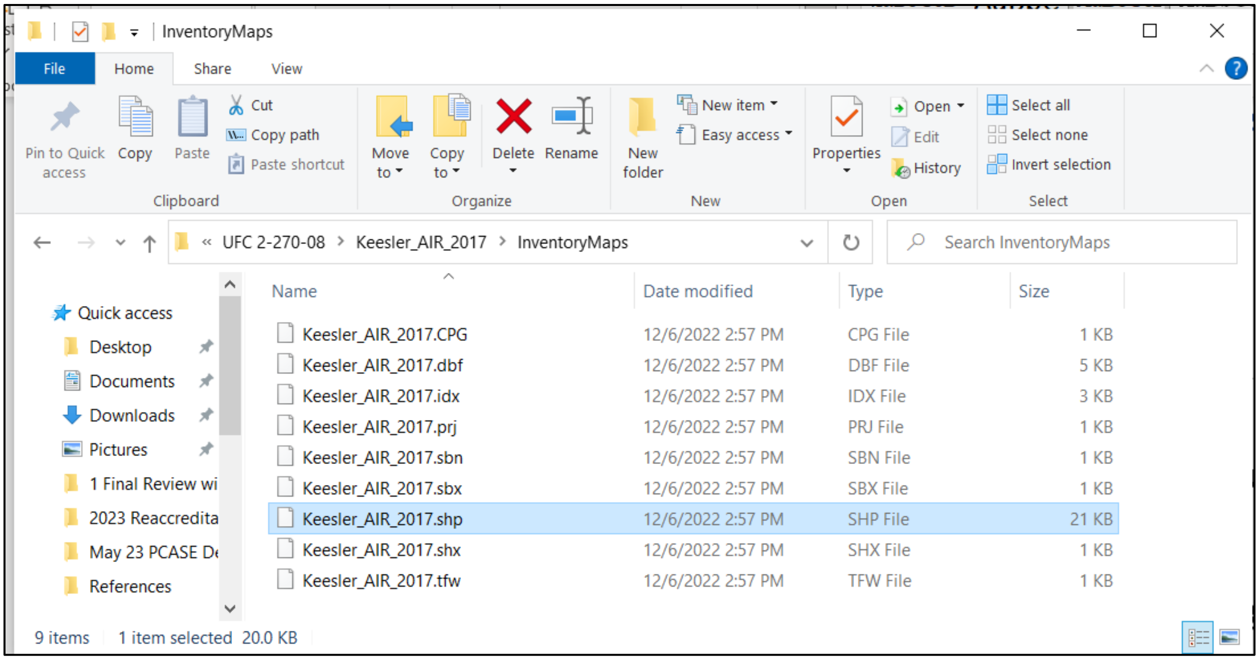
3-2.6 Importing Inventory Maps.

PAVER does have a section split wizard for altering the polygons on a map, but map changes are typically done in a GIS. PAVER uses the **GIS Tabular Import and Update** tools to bring maps into the database. PAVER stores the map data in a folder named **Inventory Maps** within the folder containing all the files associated with the database.

The main files needed in the **Inventory Maps** folder are the *.shp, *.prj, *.dbf, and *.shx files. If any of these files is missing, you will likely get an "unassignable" shapefile error message. There will be other files in this folder if you imported attributes in addition to the polygons. The file name used for each of these files must be the same, with the exception of the extension, and must clearly identify the network so it can be distinguished from other network maps in a rollup database (see Figure 3-1).

- Use **Site Name_Air_Year** for the name of airfield inventory map files.
- Use **Site Name_Road_Year** for the name of roads and parking inventory map files.

Figure 3-1 Inventory Maps



3-2.7 Exporting SDSFIE Data.

Once the attributes associated with the polygons in a database are updated, export the map to a shapefile or other compatible file format outlined in the PAVER User Manual for import into the installation's GIS. When using a shapefile, the field names have a limited length and some PAVER field names must be translated to SDSFIE-compliant field names.

3-3 INVENTORY DATA.

The pavement inventory is simply all pavements grouped by their function. An airfield database has the inventory for all airfield pavements at an installation and a separate database with inventory of all road and parking pavements at an installation. The terms "inventory" and "database" are often used interchangeably; however, the database includes the inventory, condition data, performance data, system tables with M&R policies, and work plans.

3-3.1 Database File Names.

a. Each Service maintains a repository for pavement evaluation databases. Database naming standards facilitate database management in these repositories. The site name/location, inventory type (airfield or road), type of evaluation, and date of the evaluation are required. Services may supplement the requirement with standard conventions for airfield type or type of evaluation to improve clarity.

b. Use **Installation Name_Air_Comp_Year** for the name of an airfield database when the most recent evaluation has both PCASE and PAVER data.

c. Use **Installation Name_Air_Str_Year** for the name of an airfield database when the most recent evaluation just has PCASE data.

d. Use **Installation Name_Air_PCI_Year** for the name of an airfield database when the most recent evaluation just has PAVER data.

e. Use **Installation Name_Road_PCI_Year** for the name of a road and parking database when the most recent evaluation just has PAVER data. Typically, all road and parking databases are for PCI surveys, but the same approach used for airfields is applied to roads if there are structural evaluation data in the database.

3-3.2 Database Properties.

Many government and commercial organizations around the world use the PCI and PAVER. These organization use both standard and user-defined data fields to meet their needs. The DoD limits the use of user-defined fields and uses specific standard data fields not typically used by other PAVER users. Select **File>>Database Properties** to open the form shown in Figure 3-2 to set the **DoD database properties**.

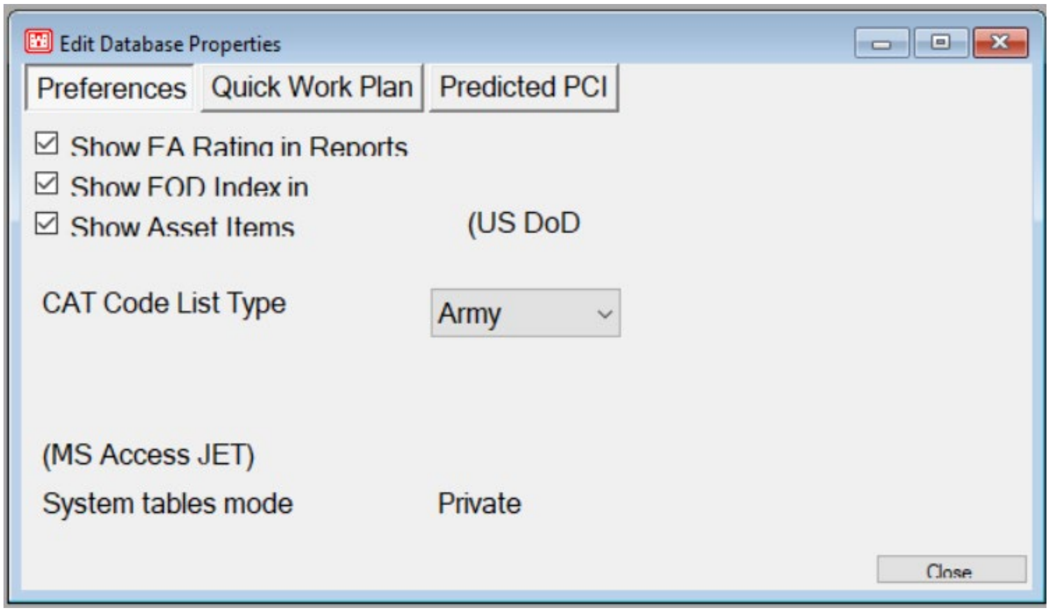
3-3.2.1 Airfield Database Properties.

Once the **Edit Database Properties** form is open, check the boxes for **Show EA Rating in Reports**, **Show FOD Index in Reports**, and **Show Asset Items** Select the appropriate Service from the **Cat Code List Type** drop-down.

3-3.2.2 Road and Parking Database Properties.

For road and parking databases, **Show Asset Items** is checked and both **Show EA Rating in Reports** and **Show FOD Index in Reports** are unchecked. Select the appropriate Service from the **Cat Code List Type** drop-down.

Figure 3-2 Edit Database Properties Form



3-3.3 Network Definition.

An airfield or road and parking pavement inventory will have one or more networks. Following are conventions for creating and naming networks. Note that the same network, branch, and section hierarchy is used for all pavement evaluation types, e.g., a structural evaluation uses the same inventory as a PCI evaluation for a given site.

3-3.3.1 Airfield versus Road and Parking Networks.

Since airfield and road and parking pavements are maintained in separate inventories, there is no need to distinguish between them in the network ID.

3-3.3.2 Multiple Sites on an Installation.

When an installation has multiple sites as indicated by the real property site unique identifier (RPSUID), include sites in the proximity of the main installation in the same inventory but make them separate networks.

If the site is separated from the main installation such that it cannot be legibly shown on the same inventory map, create a separate inventory (database) for the site. For example, create a separate database for an auxiliary airfield or a range complex geographically separated from the main installation.

3-3.3.3 Housing Pavement Networks.

Create a separate network for pavement in housing areas whether the housing is privatized or not. The Services will each establish a standard field in a rollup database to filter housing area pavement for data analysis and reporting purposes. This field may vary based on Service-specific real property regulations and the real property management applications used by each Service. See paragraph A-1 for a recommended procedure.

3-3.3.4 Other Networks Based on Ownership.

Create a separate network for pavements when a different organization has ownership / maintenance responsibility for the pavement. For example, create a separate network for pavements that are maintained by a National Guard or Reserve unit that is collocated on an active duty installation.

3-3.3.5 Paved and Unpaved Surfaces.

Include both paved and unpaved surfaces in an airfield or road and parking network.

3-3.3.6 Network ID Standard.

a. Each network must have a network ID based on the site name. The network ID is the primary field used to navigate between networks in PAVER and must clearly identify the network so it can be distinguished from other networks, particularly those in a rollup database.

b. The network ID field is limited to ten characters, so truncate the site name as required. The recommended approach is to use camel case (capitalize the first letter of each word in the name) when populating network IDs, e.g., ChinaLake or MtHome. If you have multiple networks in a database, truncate the site name and add characters at the end to make the distinction. For example, the landing zone for Little Rock AFB would be LittleRoLZ.

c. Privatized housing will use the truncated site name with a PH suffix (FtRuckerPH) and unprivatized housing will use the truncated site name with a UH suffix (FtRuckerUH).

d. If an asset management system used by a Service, e.g., iNFADS, requires a specific naming convention for network IDs in the future, that requirement will govern for that Service.

3-3.3.7 Network Name Standard.

Each network must have a network name based on the site name. The network name has a 60-character limit, which is more detailed than the network ID and is used to provide more detail about the network. For example, Fort Hood Privatized Family Housing.

3-3.3.8 Other Network-Level Inventory Fields.

A database can have one or more networks in the inventory for a specific installation. The network IDs are used to filter data for analysis and reporting purposes. When working with a rollup database with multiple installations, the network ID has limitations as a filtering tool. The recommended solution is for each Service to create a standard set of network level user-defined fields saved in a system table template. Import this template into each database. This ensures the unique ID for these user-defined fields are the same in every database. This procedure provides a means of filtering networks for analysis and reporting to meet specific mission and pavement management requirements. For example, a user-defined field for a major command provides the ability to generate reports by command and user-defined fields for housing and privatized pavements provides a means of filtering out these networks when running M&R plans.

Once the template is imported, the field remains a part of the database but the value for that field can be modified as required over time. For example, the value of the Major Command field could be updated if it changes, but the “unique ID” for the field will remain the same.

3-3.4 Branch Definition.

A network consists of one or more branches, which are defined by use. For example, a runway, named taxiway, named road, or contiguous parking area would each be a branch. Each branch must have the branch ID, branch name, and branch use fields populated.

3-3.4.1 Branch ID Standard.

The branch ID field is limited to ten characters. It must consist of a prefix indicating the branch use and the short name (truncated) for the branch. For example, RW1028 or RDPerimete. Branch prefixes are related to branch uses which are in turn related to the category codes that define the use of an asset in the real property records.

Each Service has asset types that are similar, whereas others are unique to that Service. Table 3-1 lists the standard branch prefixes for asset types that are similar. Each Service establishes a standard naming convention policy for its unique branch/asset uses consistent with the approach used in Table 3-1. Some Services allow a pavement facility to have multiple category codes. When multiple category codes are allowed, the branch naming convention will use some prefixes as suffixes. For instance, a runway facility consists of the runway, overrun, and shoulder pavement. The branch name for the runway shoulder is RW1028SH and the overrun is RW1028OR. A similar approach would be used with an apron or taxiway shoulder; for example, PAMainSH or TWASH.

Table 3-1 Branch Prefixes

Airfield Branch ID Prefixes	Road and Parking Branch ID Prefixes
RW = Runway	RD = Paved Road
TW = Taxiway	UR = Unpaved Road
PA = Parking Apron	PL = Paved Parking Area
AP = Other Apron	UP = Unpaved Parking Area
OR = Overrun	DW = Paved Driveway
HP = Helipad	UD = Unpaved Driveway
SH = Shoulder	MP = Motor Pool
	SA = Staging Area or Parade Deck

3-3.4.2 Branch Name Standard.

The branch name has a 60-character limit, so it is more detailed than the branch ID and is used to provide more detail about the branch. For example, Runway 10/28 or Perimeter Road.

3-3.4.3 Branch Use.

The branch use field is used to filter data for analysis and reports. It is also used to prioritize M&R work requirements when used in conjunction with the pavement rank. There is also an important relationship between the branch use and the real property category code, which can also be used to filter data and is discussed in more detail in paragraph 3-5.

Table 3-2 has a list of the PAVER default branch use categories used by the DoD. PAVER allows users to create user-defined branch uses, but Services will only use these default categories for DoD pavement evaluations. Services will submit new default branch uses to the PAVER Tri-Service Working Group to add it to the UFC and PAVER.

Table 3-2 Branch Use Categories

Airfield Branch Use		Road and Parking Branch Use	
Use Code	**Description**	**Use Code**	**Description**
APRON	APRON	CLOSED-RD	CLOSED ROADWAY
BLAST PAD	BLAST PAD	DRIVEWAY	DRIVEWAY
CARGO	CARGO	MTRPOOL	MTRPOOL
CLOSED-AF	CLOSED AIRFIELD	OTHER	OTHER
DEICING PAD	DEICING AREA	PARKING	PARKING
HELIPAD	HELIPAD	ROADWAY	ROADWAY
LINE VEHICLE	GROUND EQUIPMENT	ROUND	ROUNDABOUT
OVERRUN	OVERRUN	SHOULDER-RD	ROAD SHOULDER
RUNWAY	RUNWAY	STORAGE	STORAGE
SHOULDER-AF	AIRFIELD SHOULDER		
TAXIWAY	TAXIWAY		

3-3.5 Section Definition.

Each branch consists of one or many sections but the guidance for determining airfield sections varies from guidance for roads.

3-3.5.1 Airfield Sections.

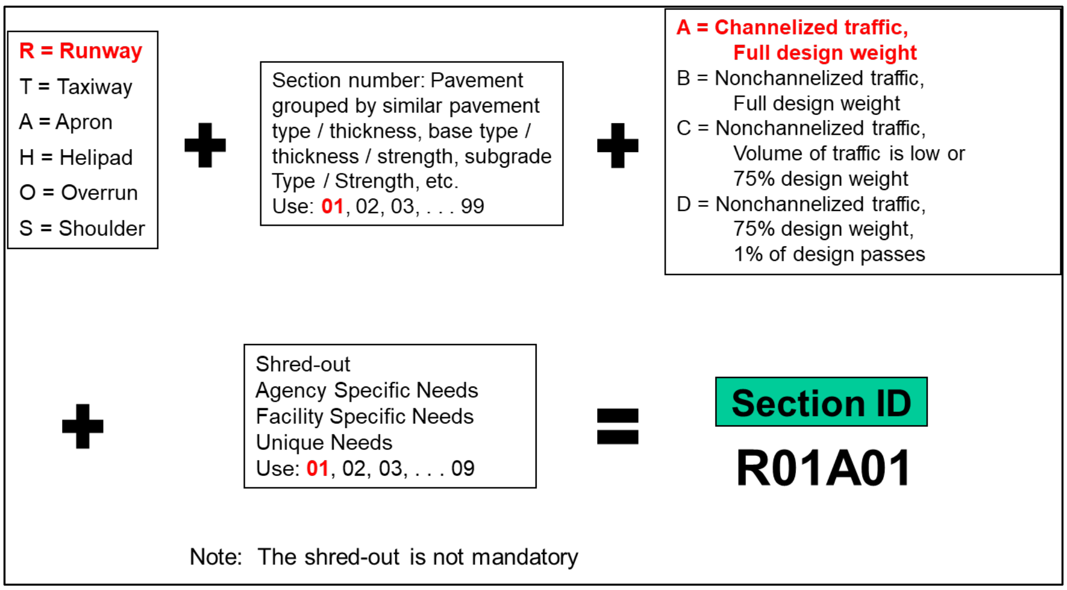
Define airfield sections by physical characteristics such as pavement type or thickness, construction history, or traffic area. Use test data, imagery, UFC standards, pavement design documents, or construction records to determine where to divide sections. Refine the location of section changes or further subdivide sections based on visual changes or structural evaluation. The overall intent is to ensure that all pavement in a section is uniform in terms of surface condition and structural capability.

3-3.5.2 Airfield Section ID Standard.

The airfield section ID consists of a prefix that indicates the use, a number, and a letter that indicates the traffic area. All pavement with a given section ID is structurally the same from an allowable load perspective. See Figure 3-3 for a section ID example.

The section ID may also include an additional number, known as a shred-out. The shred-out is used to distinguish pavements that are structurally similar but need to be segmented further for a specific reason. This may include pavement that is structurally the same but is part of a separate branch or a portion of a section whose surface condition is consistently different from other areas of the section. The prime example of this is the keel section of a runway versus the outer portions of the runway. Note that an airfield section ID for a given installation is unique for that installation.

Figure 3-3 Airfield Section Identification Example



3-3.5.3 Road and Parking Sections.

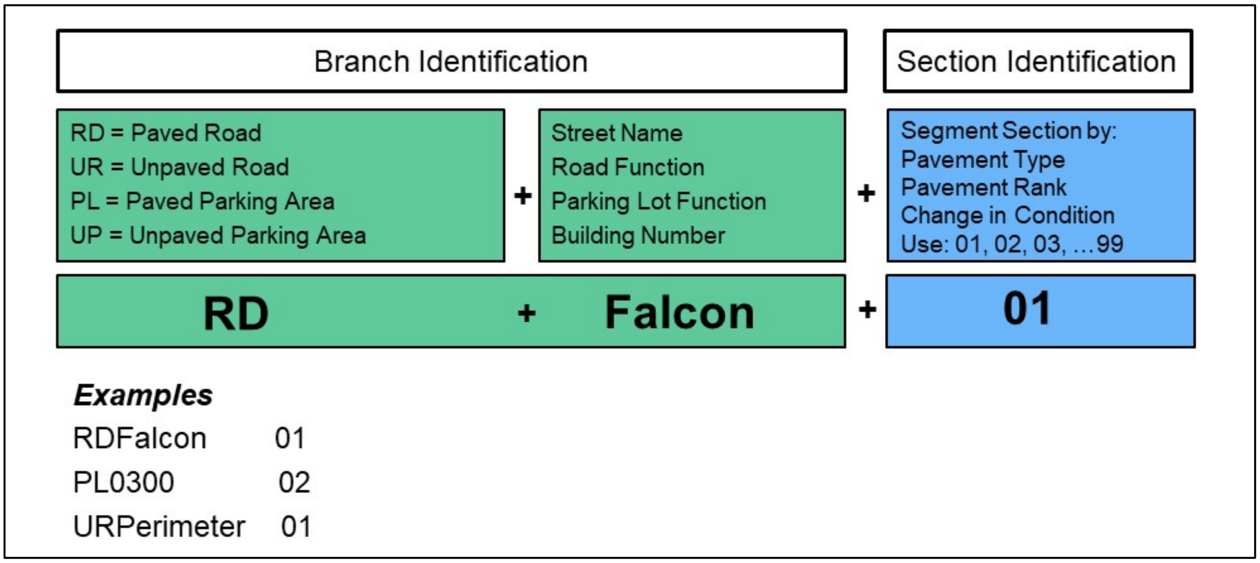
Sections for road and parking pavements must have the same pavement type and are assumed to be structurally similar. Sections for roads can be defined based on other characteristics such as the number of lanes. When the road is consistent along its length, sections are typically defined based on set intervals such as a section break at the edge of each intersection. When intersections are infrequent, sections are defined every 0.25 mile (402 meters) for roads in main installation areas and every 0.5 mile (804 meters) for lower volume roads outside the main installation.

A contiguous parking area (including the pavement to access that parking area) with the same pavement type is considered a section. If other physical characteristics such as thickness, construction history, or subsurface conditions are known, they can be used to better define the section. The overall intent is that all pavement in a section is uniform in surface condition and assumed or known structural capability.

3-3.5.4 Road and Parking Section ID Standard.

Unlike airfield section IDs, road and parking section IDs are not unique for a given installation. They are numbered sequentially for a given branch. To uniquely identify a road and parking section, use the concatenation of the branch ID and the section ID. Table 3-1 gives a complete list of branch prefixes and Figure 3-4 provides an example of how they are used to identify a section.

Figure 3-4 Road and Parking Section Identification Example



3-3.5.5 Mandatory Section Fields.

There are five mandatory section fields for asphalt concrete (AC) pavements and five mandatory section fields for portland cement concrete (PCC) pavements. These fields are mandatory for both airfield and road and parking pavement. PCC pavement has two additional fields required by DoD policy: slab length and slab width. Table 3-3 lists the mandatory fields. When updating a database, change any user-defined fields to default (standard) PAVER fields and delete the user-defined fields from the database.

Table 3-3 Mandatory Section Fields for PCC Pavement

Field	Description
Section ID	Identifies a specific area of pavement within a branch. The entire section must have the same pavement type.
Surface Type	PAVER has a list of default surface types that must be used. User-defined surface types are not allowed. The list of surface types is available in PAVER at **System Tables and Tools**>>**Edit Inventory Picklists**>>**Engineering Fields** and in the PAVER user manual.
Rank	Pavement rank is used to prioritize work requirements. PAVER has a list of default pavement ranks, but the only ones used by DoD are primary (P), secondary (S), tertiary (T) and unused (U). Rank definitions are in paragraph 3-3.5.6.
Last Construction Date	The last construction date is the last date that major M&R was performed that brought the PCI back to 100.
True Area	The section area is measured or determined from the GIS mapping application.
Slab Length	The representative measured longitudinal length of the slabs in the section. This field only applies to PCC pavement.
Slab Width	The representative measured transverse length of the slabs in the section. This field only applies to PCC pavement.

3-3.5.6 Section Rank Definitions.

Pavement ranks are listed on the section rank tab in PAVER at **System Tables and Tools**>>**Edit Inventory Picklists**>>**Engineering Fields**. When developing PMPs, use the section rank in conjunction with the branch use priority to prioritize M&R requirements at the section level.

Following are definitions for airfield and road and parking pavement section ranks. The rank definitions for roads are derived from Army SDDCTEA Pamphlet 55-17, *Better Military Traffic Engineering.*

Table 3-4 Pavement Section Rank

Airfield Section Rank		
Rank	**Code**	**Description**
Primary	P	Primary pavements are mission-essential pavements such as runways, parallel taxiways, main parking aprons, arm-disarm pads, alert aircraft pavements, and overruns (when used as a taxiway or for takeoff). In general, only pavements that have aircraft use on a daily basis or frequently used transient taxiways and parking areas are considered primary.
Secondary	S	Secondary pavements are mission-essential but occasional-use airfield pavements, including ladder taxiways, infrequently used transient taxiway and parking areas, overflow parking areas, and overruns (when there is an aircraft arresting system present). In general, any pavements that do not have daily use by aircraft are secondary.
Tertiary	T	Tertiary pavements include pavements used by towed or light aircraft, such as maintenance hangar access aprons, aero club parking, wash racks, and overruns (when not used as a taxiway or to test aircraft arresting gear). Paved shoulders are classified as tertiary. In general, any pavement that does not support aircraft taxiing under their own power or is used only intermittently is considered a tertiary pavement.
Unused	U	Unused pavements include any pavements that are abandoned (not maintained) or scheduled for demolition.
Road and Parking Section Rank		
Rank	**Code**	**Description**
Primary	P	Primary pavements include installation roads and streets that serve as the main distributing arteries (arterials) for traffic originating outside or within an installation. These pavements have high traffic volumes and speeds of 35 to 55 mph, but may include collector or local streets that service mission-critical facilities. Primary vehicle parking areas are restricted to those areas associated with access to mission-essential facilities, such as alert facilities, munitions facilities, and medical facilities.
Secondary	S	Secondary pavements include collector streets that gather and disperse traffic between arterials and local streets. They will have lower traffic volumes than primary pavements and speeds of 25 to 40 mph. Most parking areas that support daily traffic on a base are considered secondary pavements unless a specific mission dictates otherwise.
Tertiary	T	Tertiary pavements include local streets that provide access from collector roads to individual facilities. Unsurfaced roads are also typically classified as tertiary. Any parking area that is not used on a daily basis or is excess to the standard facilities requirements is considered a tertiary pavement.
Unused	U	Unused pavements include any pavements that are abandoned (not maintained) or scheduled for demolition.

3-3.6 Sample Unit Definition.

Subdivide each section into one or many sample units. A sample unit is a defined portion of a pavement section designated only for the purpose of pavement inspection. The number of samples inspected in a PCI survey is dictated by whether a network- or project-level inspection is called for.

Sample unit size requirements and the number of sample units inspected for both network- and project-level inspections are outlined in UFC 3-260-16. Use PAVER's **Inspection Report/Forms/Setup Wizard** to create a new inspection using the same samples inspected in the previous inspection. Add any new sections to the inspection. Specify the requirements in the contract statement of work if a higher sampling rate or a 100 percent inspection is required to better define the scope of a project.

3-4 WORK (CONSTRUCTION) HISTORY.

The term "work history" is often used interchangeably with the term "construction history." Both mean the same thing: a record of the type of work performed on each section and the date it was performed. Accurate work history dates play a critical role in creating PCI family models and defining the deterioration rate of a pavement. Use Paver's **Work History** tool or **Work Entry Wizard** to populate the work history. When work history is updated in a GIS application, use the PAVER **Add Work History from GIS or Tabular Data** tool. Details on these tools are outlined in the PAVER User Manual.

3-4.1 Last Construction Date.

Update the PAVER work history with the last major M&R date for each section. This is known as the Last Construction Date (LCD) and indicates the last work performed that brought the PCI of the pavement to 100. PAVER uses the LCD to determine the pavement deterioration rate, which in turn is required to predict the future condition of the pavement and generate future M&R requirements.

3-4.2 Unknown Last Construction Date.

When no construction records are available to indicate the last construction date, use the **Last Construction Date Wizard** to backcalculate a construction date based on the current PCI, using either a fixed rate of deterioration or using a deterioration family generated for similar sections at the installation with known LCDs.

3-4.3 Complete Work History Record.

In addition to the LCD, document any other M&R actions in the work history. This includes any localized preventive M&R such as crack sealing or global M&R such as applied surface treatments. An accurate construction history helps users determine the effectiveness of M&R strategies, better understand the development of pavement distresses, and develop better courses of action for future M&R.

3-5 REAL PROPERTY ASSET DATA.

When OSD mandated the use of PAVER, the primary driver was to get accountability of pavement assets from a real property perspective. This mandate created a requirement for PAVER to report pavement inventory in terms of each asset (facility) as outlined in GSA *Guidance for Real Property Inventory Reporting*.

From a pavement management perspective, DoD pavement inventories were historically segmented into networks, branches, sections, and sample units, but not facility. So, while PAVER pavement management inventories for DoD installations provide accurate information on location, area, type, and condition of pavements, the segmentation was historically not related to real property facilities in the Real Property Asset Database (RPAD). Linear segmentation resolves that issue.

3-5.1 Linear Segmentation.

Create a map showing the location and geospatial extents of each pavement asset (facility) on an installation as the first step in aligning pavement management data with the RPAD pavement assets (facilities). **Note:** This is not the same as a map from an earlier pavement evaluation that shows networks, branches, and sections because these maps give no indication of the location or geospatial extent of each real property pavement facility. Creating a pavement facility map requires the participation of real property, engineering, and GIS personnel and can be complicated, depending on the level of detail available in the real property record. Once the pavement facility map is completed, each real property pavement asset can be associated with a branch in the PAVER inventory allowing an installation to meet OSD requirements to account for pavement assets via the regularly scheduled pavement evaluations performed by the Services.

DoD Guide for Segmenting Types of Linear Structures provides guidelines for segmenting pavements. The Services implemented linear segmentation initiatives but gaps still exist in completing the effort to identify the location and geospatial extent of pavement facilities (pavement facility maps) and then linking the facilities to pavement management data; the effort is ongoing. Following are terminology and guidelines for linear segmentation that supplement *DoD Guide for Segmenting Types of Linear Structures* and the PAVER user manual.

3-5.2 Populating Real Property Asset Data in PAVER.

There are several ways to import pavement real property asset data into PAVER. These include manually entering each asset for an installation into PAVER, using the **Inventory**>>**Asset Management**>>**Import/Assign Asset Items Using GIS/Tabular Import** tool or using the **Inventory**>>**Centralized Asset Management**>>**asset file** tool.

Details for each of these procedures are outlined in the PAVER User Manual. The following sections describe required fields. Importing and assigning pavement asset data can be done as a one- or two-step process.

3-5.2.1 One-step Asset Assignment Process.

When the GIS or tabular data file has both inventory (network, branch, and section) fields populated and the required asset data fields populated when it is imported into PAVER, all asset data will appear in the appropriate tables and the assignment is complete.

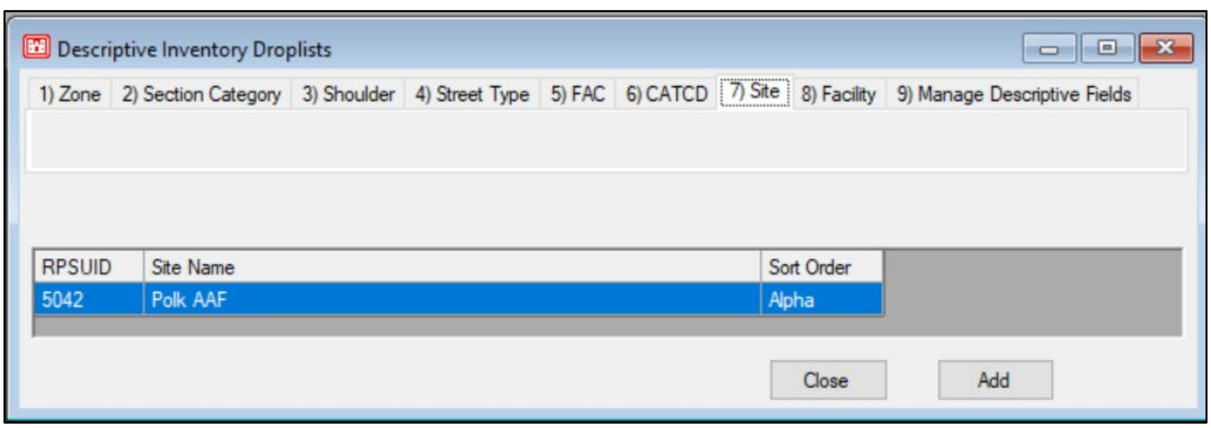
3-5.2.2 Two-step Asset Assignment Process.

When the GIS or tabular data file just has the map or the map with the inventory (network, branch, and section) fields included, but does not have the required asset data fields populated, the asset data must be entered manually or imported into PAVER and the assets must be assigned to the appropriate branch using the **Inventory**>>**Asset Management**>>**Assign/Unassign Asset Items** tool.

3-5.3 Real Property Site Unique ID (RPSUID).

The RPSUID is a code assigned by OSD to define a site permanently and uniquely. An installation can have multiple sites associated with it. Each will have its own RPSUID. If manually entering the field into PAVER, get the correct RPSUID for each site from the RPAD. Enter the RPSUID into PAVER using **System Tables and Tools**>>**Edit Inventory Picklists**>>**Descriptive Fields**>>**7) Site** (see Figure 3-5). If there is preexisting data in the database, add missing RPSUIDs and site names from the RPAD for all sites included in the installation database and delete any RPSUIDs not associated with the installation.

Figure 3-5 Adding a Real Property Site Unique ID (RPSUID)

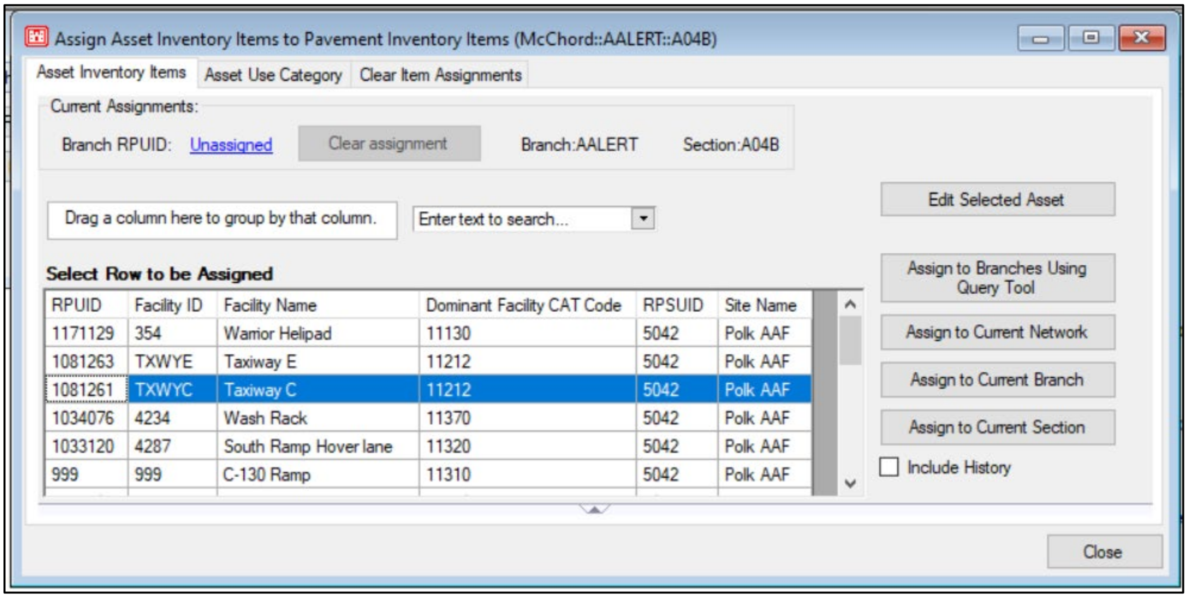


3-5.4 Real Property Unique ID (RPUID).

The RPUID is a code assigned by OSD to define a DoD real property asset (facility) permanently and uniquely. The RPUID is the key field used to link the real property pavement asset (facility) data to pavement management data. While PAVER allows the RPUID to be assigned at the network, branch, or section level in the event of future policy changes, the current policy is to assign the RPUID to the branch.

To assign the RPUID to a branch, navigate to the branch you want to update, then select **Inventory**>>**Define Inventory**. Select the **Assign Asset Items** button on the branch tab to open the assign asset items form. On the **Asset Inventory Items** tab, select the correct RPUID row for the current branch and assign it to the current branch. See Figure 3-6.

Figure 3-6 Assigning a Real Property Unique ID (RPUID)



3-5.5 Facility Number / ID.

The facility number is a code assigned by the installation or Service to define a real property asset. This code may or may not be unique to the enterprise and may change over time. However, this number will correlate to an RPUID and is often used when developing pavement facility maps. It is associated with the RPUID when asset data is imported into PAVER but can also be entered/updated manually at **System Tables and Tools**>>**Edit Inventory Picklists**>>**Descriptive Fields**>>**8) Facility**. When the RPUID is assigned to a branch, the facility number/ID is also assigned as shown in Figure 3-6.

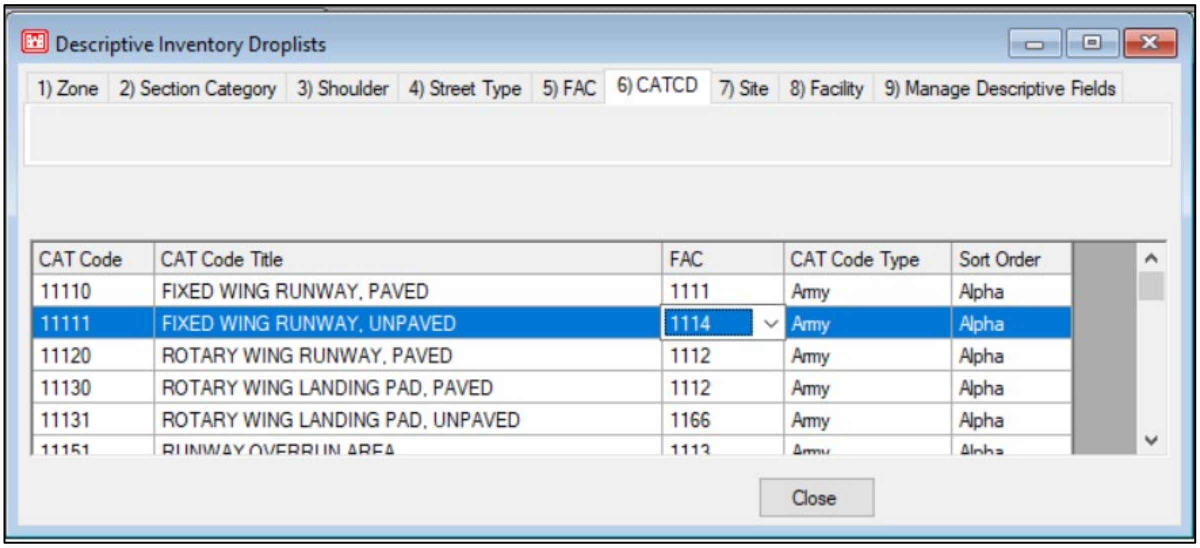
3-5.6 Facility Analysis Code (FAC).

The FAC is a classification of real property types within a “Basic Category,” represented by a four-digit code. DoD FACs aggregate Military Department categories into common groupings based upon commonality of function, unit of measure, and unit costs. FACs are used in UFC 3-701-01, *DoD Facilities Pricing Guide*, to define replacement unit costs (RUC) and sustainment unit costs (SUC). RUCs form the basis for calculating plant replacement value (PRV) and SUCs serve as the basis for projecting OSD sustainment budget requirements.

The FAC is populated in PAVER in the **System Tables and Tools**>>**Edit Inventory Picklists**>>**Descriptive Fields**>>**6) CATCD** in association with the Category Code (see

Figure 3-7). It is assigned when the Category Code is assigned at the branch (or section) level.

Figure 3-7 Adding a Facility Analysis Code (FAC)

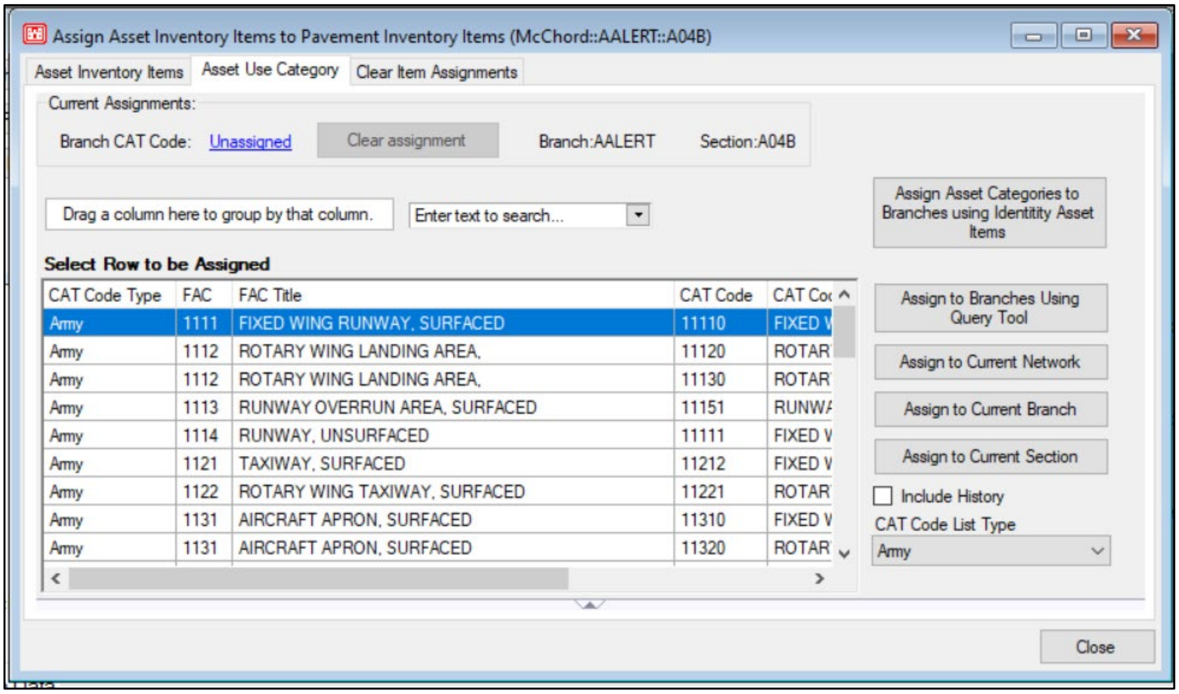


3-5.7 Category Code (CAT Code).

The FAC is further broken into Category Codes (CAT Codes) as shown in Figure 3-7. The CAT Code is the most detailed classification of real property that describes a specific real property type and function. It is represented by a numerical five- (Army and Navy) or six- (Air Force) digit code. CAT Codes are established by the Military Departments, so the CAT Code for a respective asset type may be different for each Service. Standard practice is to assign the CAT Code at the branch level.

From the **Inventory**>>**Define Inventory** form, open the **Assign Asset Items** form. On the **Asset Use Category** tab, select the correct CAT Code row for the current branch and then assign it to the current branch. When Service real property guidance allows for a facility to have more than one CAT Code, the predominant CAT Code for the branch must also be populated. See Figure 3-8.

Figure 3-8 Assigning a Category Code (CAT Code)

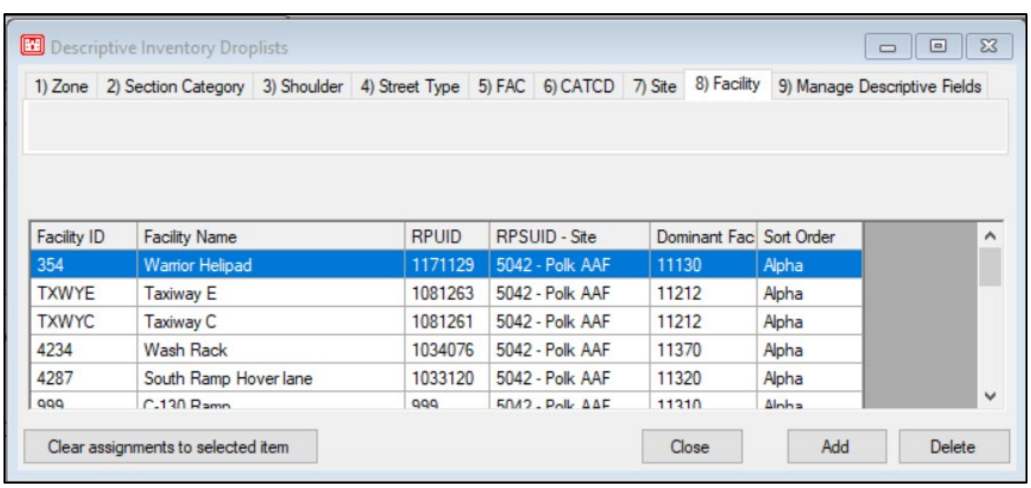


3-5.8 Predominant Facility CAT Code.

"Predominant use" is the term to describe the primary use of a real property asset based upon the largest quantity of usage for a specific activity or function. If there is only one CAT Code for a facility, leave the Dominant Facility CAT Code field in PAVER blank. If a pavement facility has more than one CAT Code, populate the Dominant Facility CAT Code field in PAVER based on the CAT Code with the greatest area.

Use the **System Tables and Tools**>>**Edit Inventory Picklists**>>**Descriptive Fields** form. Select **8) Facility**, then select the dominant facility CAT Code field for a row using the drop-down to select the predominant CAT Code as shown in Figure 3-9.

Figure 3-9 Assigning a Category Code



3-5.9 Facility Condition Index.

The DoD regularly collects data on the condition of every DoD facility to assess the health of its facility infrastructure. GSA *Guidance for Real Property Inventory Reporting* requires a Condition Index (CI) data element for all real property assets. The CI is defined as "a general measure of the constructed asset's condition at a specific point in time."

From the pavement management perspective, DoD uses the weighted area average of all the sections in a facility to define the facility PCI. This is not the same as the real property Facility Condition Index (FCI). The FCI is calculated as the ratio of the M&R requirement cost to the plant replacement value (PRV) cost, expressed in dollars. It is considered a critical metric for real property professionals who require accurate and consistent FCI data. PAVER does not compute the FCI at this time but is used to compute the M&R cost for each section in a facility. The sum of these section costs can be used to define the M&R cost for the facility for the FCI computation. To compute the FCI, these M&R costs are entered in the respective Service asset management programs, e.g., iNFADS for the Navy and Tririga for the Air Force.

CHAPTER 4 PAVEMENT EVALUATION

4-1 INTRODUCTION.

Pavement evaluation encompasses several different assessment types. Each is conducted to gather data on a different aspect of the properties or physical characteristics of the pavement. This data is used to analyze performance, define current capability, and predict future condition. The result of each is typically an index or metric that defines the condition, performance, or capability regarding the focus of the evaluation. Some or all of these evaluation types may be performed and, when results are taken together, they paint a more complete picture of condition, capability, and performance. This is key to developing a PMP and making a rational determination of feasible M&R alternatives.

In addition to the PCI survey, other evaluation types include structural, surface friction characteristics, void detection, and roughness evaluations. Details on these evaluation types are covered in UFC 3-260-03, commercial standards, and other Service-specific criteria. Following is a summary of evaluation types and a discussion of the indexes and products generated.

4-2 PAVEMENT CONDITION INDEX SURVEYS.

4-2.1 PCI Survey Process.

4-2.1.1 PCI Survey Mapping and Inventory.

PCI surveys involve collecting data on the type, quantity, and severity of distresses to determine the surface condition (PCI) for each section. Before conducting a PCI survey, create the mapping and inventory as outlined in Chapter 3. Note that the terms “PCI survey” and “inspection” are used interchangeably.

4-2.1.2 PCI Survey Planning.

After establishing the mapping and inventory, determine whether the inspection is network or project level. This defines the sampling requirements as outlined in UFC 3-260-16. A network-level survey requires the team to identify representative samples in the field. For a project-level survey, the team can plan the specific samples to be inspected before starting the survey. When a project-level PCI Survey has not been previously conducted, use the systematic random process described in UFC 3-260-16 to select the specific samples to be inspected. When a PCI Survey was previously conducted, inspect the same sample units inspected in the previous PCI Survey. Services may define more stringent sampling rates based on mission requirements.

Whether performing an initial inspection or a re-inspection, use PAVER’s **Inspection Report**>>**Forms**>>**Setup Wizard** to plan the inspection. This wizard generates inspection records and inspection forms to collect data and, if previously inspected, generates a re-inspection report for quality checks. The PAVER user manual has details on using this wizard.

4-2.1.3 PCI Survey Field Work.

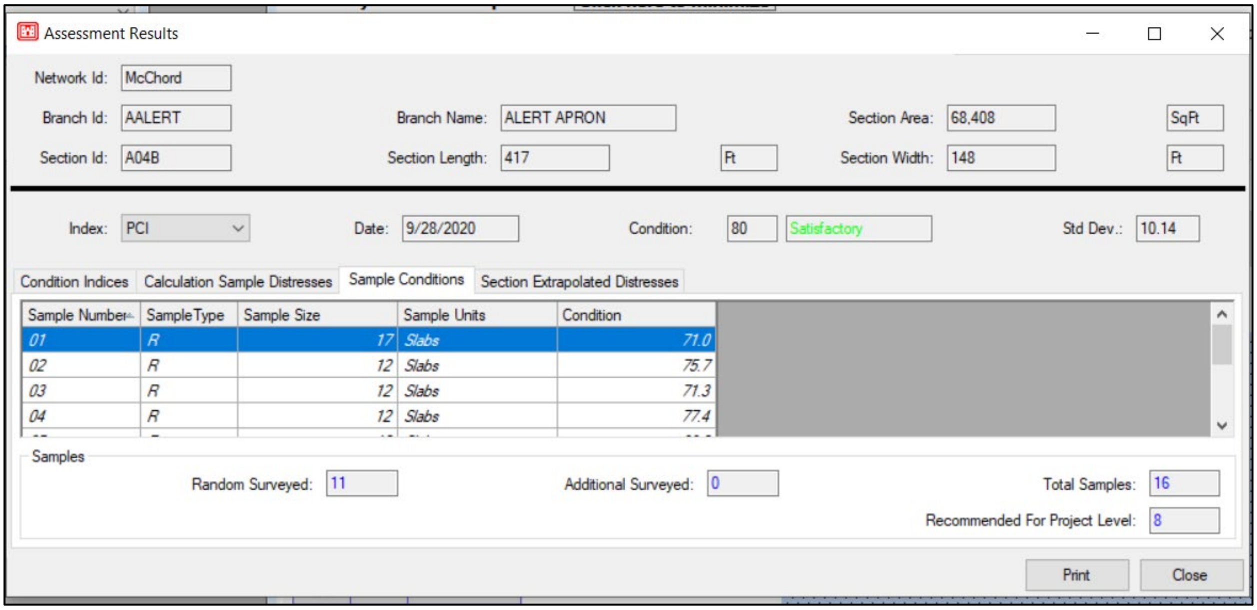
a. PCI surveys involve collecting data on the type, quantity, and severity of distresses to determine the surface condition (PCI) for each section. Before conducting a PCI survey, the mapping and inventory must be created as outlined in Chapter 3. Note that the terms "PCI survey" and "inspection" are used interchangeably.

b. A best practice is to perform the PCI survey with a GPS-enabled tablet, but it can also be performed using paper forms. If using paper forms, a tablet that is not GPS-enabled, or if you have poor GPS coverage, mark the sections and sample unit designations on the ground using paint, chalk, or a lumber crayon before performing the inspection. This allows inspectors and quality control personnel to easily locate them. A best practice is to perform the layout ahead of the inspection team(s).

c. Survey tools include a measuring wheel that measures to 0.1 foot (30 mm), a 10-foot (3 m) straightedge or string line, a scale or tape measure that reads to 1/8 inch (3 mm), a map of the pavements being inspected, and PCI distress handbooks. Handbooks for asphalt and concrete airfield or road and parking pavements are available at https://transportation.erdc.dren.mil/paver/Manuals.htm. The information in the handbooks is also available when entering data in the PAVER **Edit Inspection** tool.

d. Whether performing the survey using a tablet or paper forms, enter the distress data into PAVER using the **Edit Inspection** tool. Once the distress data is entered for each sample unit, PAVER computes the PCI for that sample unit. Once the distress data for all inspected sample units is complete, PAVER computes the section PCI. Record any sample units that are not representative of the section (for a project-level survey) as "Additional" sample units. "Additional" sample units are handled differently in the computation than random samples.

Figure 4-1 PAVER Sample Conditions Tab



e. Select the **Show Conditions** button on the **Edit Inspection** form once the selected sample units have been inspected, then select the **Sample Conditions** tab on the **Assessment Results** form to determine if enough samples were inspected to get a 95 percent confidence level for a project-level inspection as shown in Figure 4-1. If the **Recommended for Project Level** field indicates that more samples are needed, inspect more random samples to achieve the required confidence level.

f. Repeat this inspection process for each section. UFC 3-260-16 outlines PCI inspection and computation details. PAVER also calculates other condition index values based on the PCI Survey.

4-2.2 Structural Condition Index.

Pavement distresses are categorized as load related, climate/durability related, and other. The other category includes distresses caused by material or construction issues or related to repairs. The Structural Condition Index (SCI) is based on the deduct values for only the load-related distresses, as shown in Equation 4-1. So, like the PCI, 100 is a good rating and 0 is a bad rating. The PAVER user manual identifies load-related distresses.

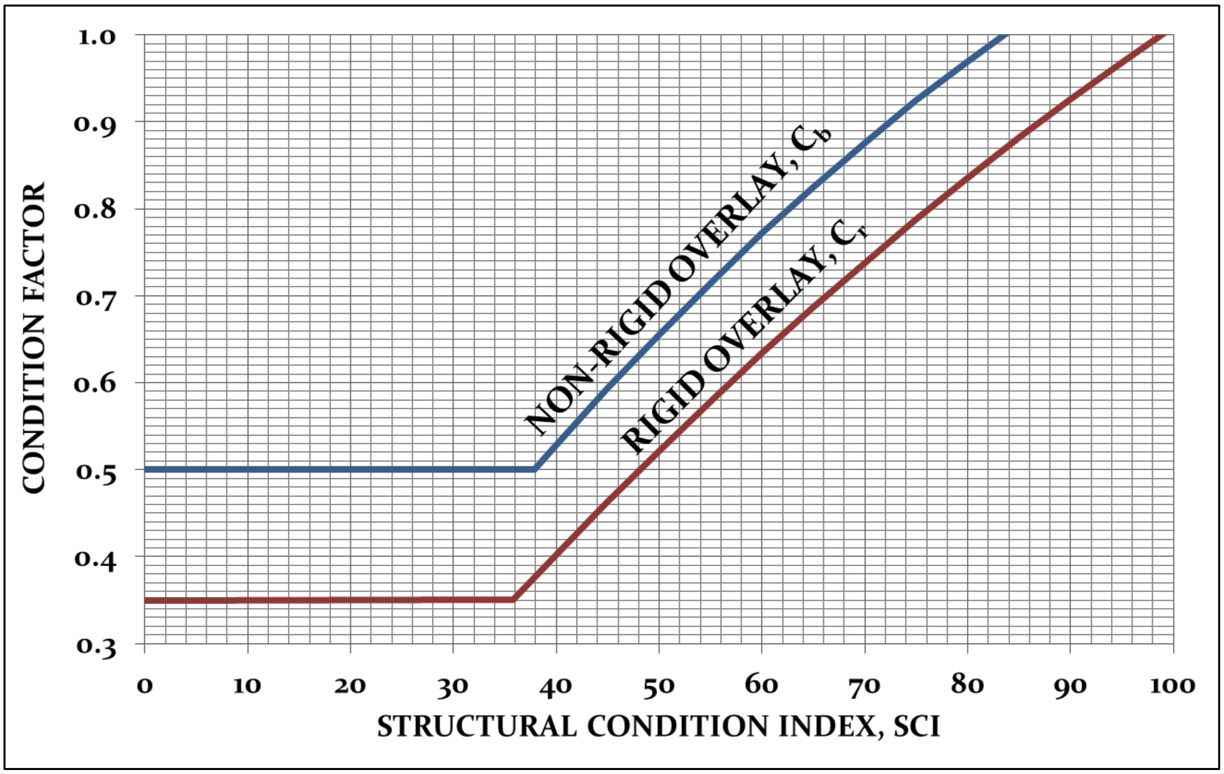
Equation 4-1. Structural Condition Index

$$SCI = 100 - CDV_{LR}$$

Where:
SCI = Structural Condition Index
CDV = Corrected Deduct Value
LR = Load Related

The SCI is used in the layered elastic analysis procedure to define failure in rigid pavements. This prediction is based on a relationship between design factor and stress repetitions as related to crack formation in the PCC slabs due to load. Details are found in UFC 3-260-02, *Pavement Design for Airfields*, and UFC 3-260-03, *Airfield Pavement Evaluation*. The SCI is also used to determine overlay requirements for rigid pavements by relating the SCI to the condition factor for bituminous overlays (C_b) and rigid overlays (C_r), as shown in Figure 4-2. UFC 3-260-02 and UFC 3-260-03 provide guidance for determining an appropriate overlay type based on the condition factor.

Figure 4-2 Using SCI to Determine Condition Factors



4-2.3 Foreign Object Damage (FOD) Index.

The FOD Index is also determined using PCI survey data but is calculated by considering only the distresses/severity levels capable of producing FOD. Table 4-1 lists the FOD-producing distresses and severities for AC pavement and Table 4-2 lists them for PCC pavement.

When calculating the PCI for determining the FOD Index (see Equation 4-2), note that a multiplier, or modification factor, of 0.6 is applied to the deduct value for alligator cracking and a multiplier, or modification factor, of 4.0 is applied to the deduct value for joint seal damage. The computation results in a value from zero to 100, but, unlike the PCI and the SCI, a low FOD Index value is good and a high value is bad. PAVER calculates the FOD index at the same time as the PCI.

Equation 4-2. Foreign Object Damage (FOD) Index

$$FOD\ Index = 100 - PCI_{FOD}$$

Where:
FOD = Foreign object damage
PCI = Pavement Condition Index

Table 4-1 FOD-Producing Distress List for AC Pavements

Distress Type	Severity Levels (L = Low, M = Medium, H = High)
Alligator cracking (modification factor: 0.6)	L, M, H
Block cracking	L, M, H
Jet blast erosion	N/A
Joint reflection cracking	L, M, H
Longitudinal and transverse cracking	L, M, H
Oil spillage	N/A
Patching	M, H
Raveling and weathering	L, M, H
Shoving	M, H
Slippage cracking	N/A

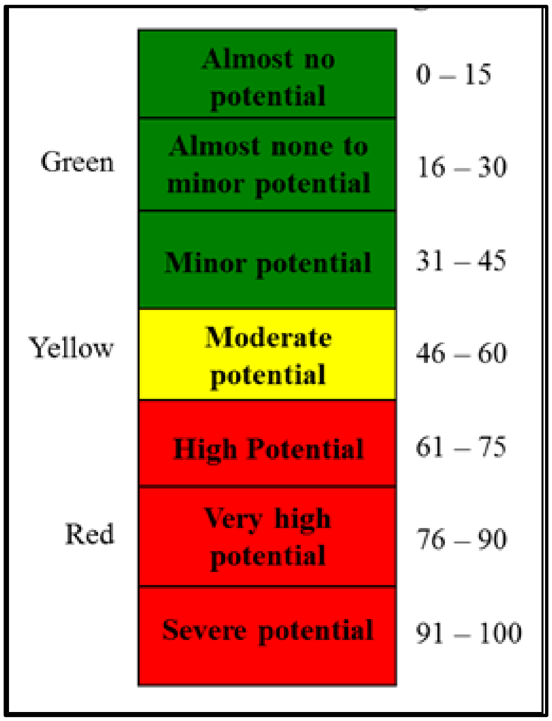
Table 4-2 FOD-Producing Distress List for PCC Pavements

Distress Type	Severity Levels (L = Low, M = Medium, H = High)
Blow-up	L, M, H
Corner break	L, M, H
Durability cracking	M, H
Linear cracking	L, M, H
Joint seal damage (modification factor: 4.0)	L, M, H
Small patching	L, M, H
Large patching	L, M, H
Popouts	N/A
Pumping	N/A
Scaling	L, M, H
Shattered slab	L, M, H
Joint spalling	L, M, H
Corner spalling	L, M, H

4-2.4 FOD Potential.

a. The FOD potential relates the FOD Index to the FOD susceptibility of three aircraft groups. A FOD potential scale ranging from 0 to 100 is used to indicate the potential for FOD problems. Figure 4-3 shows the numerical FOD potential scale and corresponding descriptive categories.

Figure 4-3 FOD Potential Scale



b. The FOD potential depends on the type of aircraft using the pavement, the type of pavement surface (asphalt or concrete), and the FOD Index. The FOD Index and the FOD potential rating are determined from the most current PCI survey.

c. Relationships between FOD indexes and FOD potential were developed for three aircraft groups: F-16, KC-135, and C-17. These three aircraft were selected as a representative cross-section due to engine height above the pavement surface and engine susceptibility to FOD (e.g., engine type, size, air flow, thrust). Table 4-3 provides recommendations on which standard aircraft group curve (F-16, KC-135, or C-17) to use when determining the FOD potential for other aircraft.

Table 4-3 FOD Potential Aircraft Groups

Standard Aircraft	For Aircraft Listed Below, Use FOD Index/FOD Potential Relationship Curve for Standard Aircraft (Left Column)
F-16	A-37, AT-38, F-15, F-22, F-35, T-37, T-38
KC-135	A-300, A-310, A-320, A-321, A-330, A-340, A-380, AN-124, B-1, B-2, B52, B-707, B-720, B-737, B-747, B-757, B-767, B-777, C-21, C-32, C38, C-40, C-135, DC-8, DC-10, E-3, E-4, E-8, EC-18, EC-135, IL-76, KC-10, L-1011, MD-10, MD-11, P-8, T-1A, T-43, VC-25, VC-137
C-17	A-10, B-717, B-727, C-5, C-9, C-12*, C-20, C-22, C-23*, C-27, C-37, C38, C-41, C-130*, C-295, CN 235, CV-22, DC-9, MC-12, MD-81, MD82, MD-87, MD-90, MV-22*, P-3*, RC-26, RQ-4, T-6*
* Denotes turboprop or turboshaft-equipped aircraft	

d. Figures 4-4 and 4-5 show the relationship between the FOD Index and FOD potential for asphalt and concrete pavements, respectively.

Figure 4-4 FOD Index and FOD Potential Relationship for AC

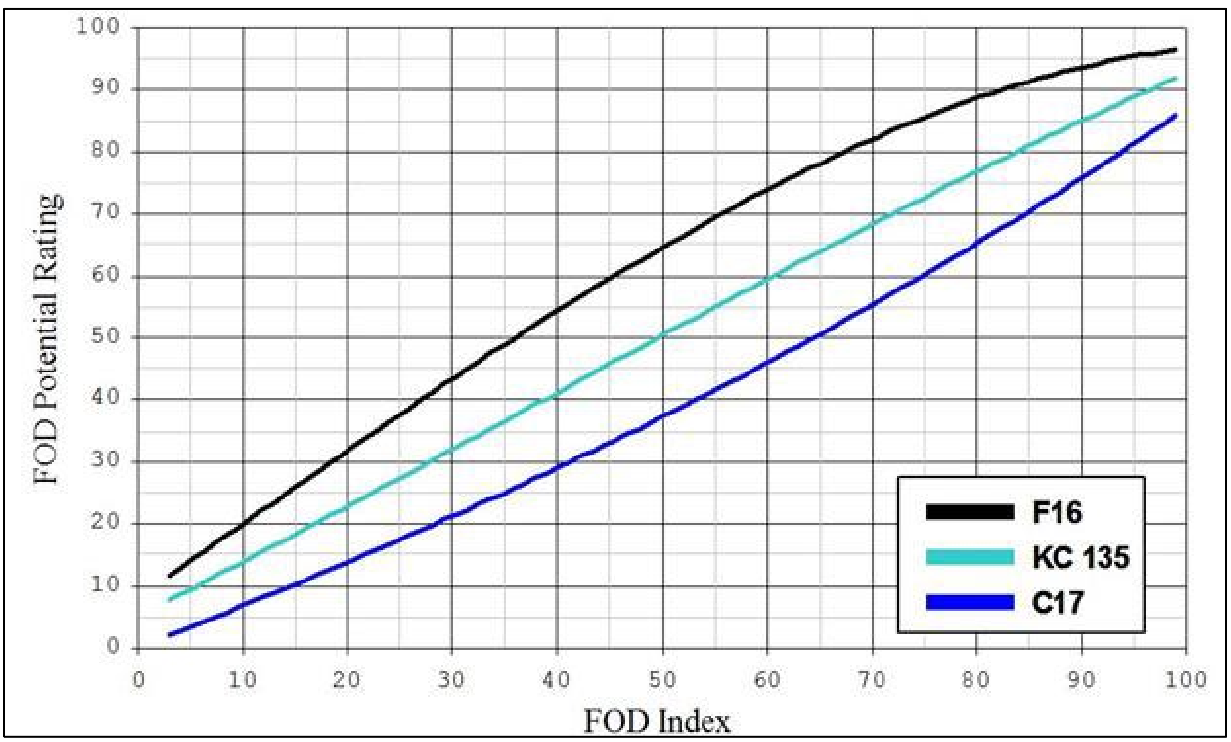
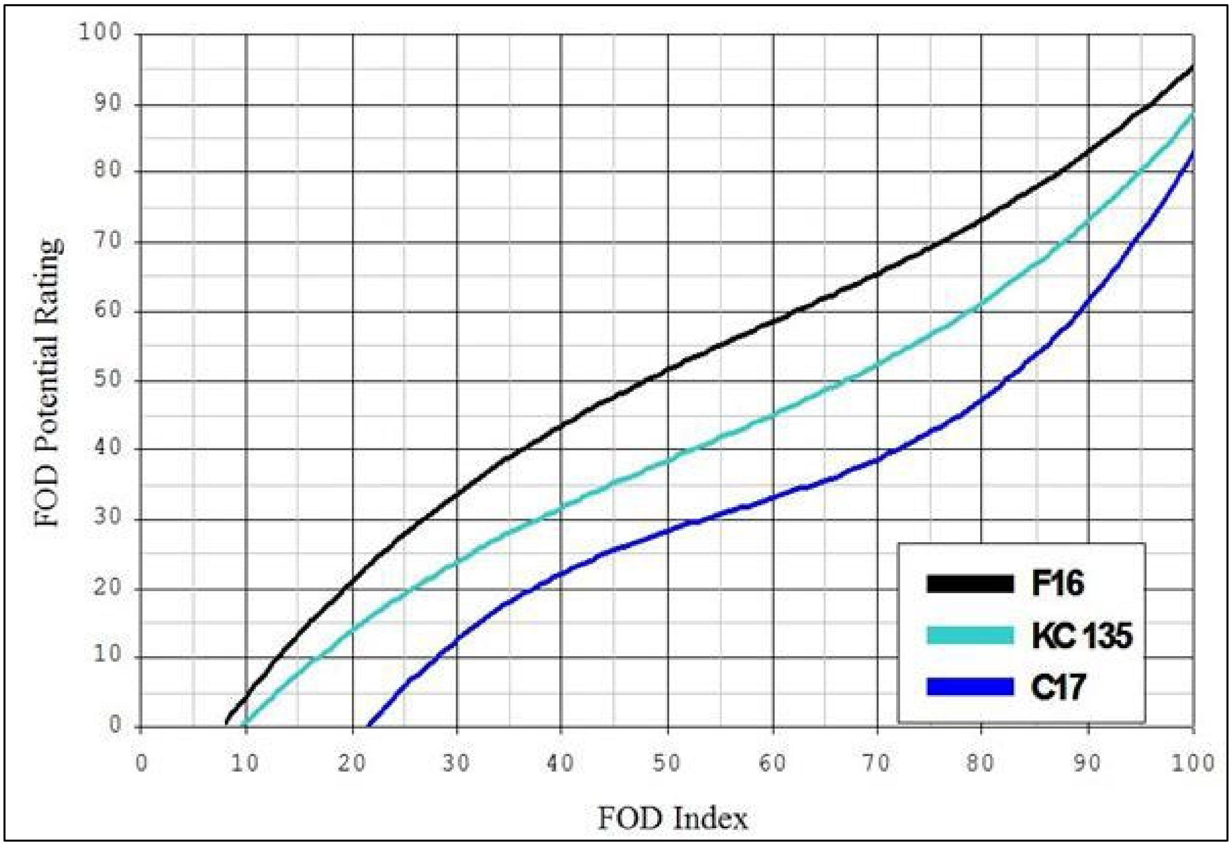


Figure 4-5 FOD Index and FOD Potential Relationship for PCC



e. The aircraft group curves in Figures 4-4 and 4-5 were used to determine the FOD potential risk levels in Table 4-4. The FOD Index and the FOD potential group for a section corresponds to the low, medium, and high FOD potential risk for that section. The FOD potential can be displayed on a color-coded airfield layout map, using green for the corresponding rating of low, yellow for medium, and red for high.

Table 4-4 FOD Potential Risk Level

FOD Potential Risk Level		**FOD Index**					
		F-16		**KC-135**		**C-17**	
		AC	**PCC**	**AC**	**PCC**	**AC**	**PCC**
Low	0–45	0–32	0–41	0–44	0–60	0–59	0–77
Medium	46–60	33–45	42–62	45–60	61–78	60–75	78–89
High	61–100	46–100	63–100	61–100	79–100	76–100	90–100

4-3 STRUCTURAL PAVEMENT EVALUATIONS.

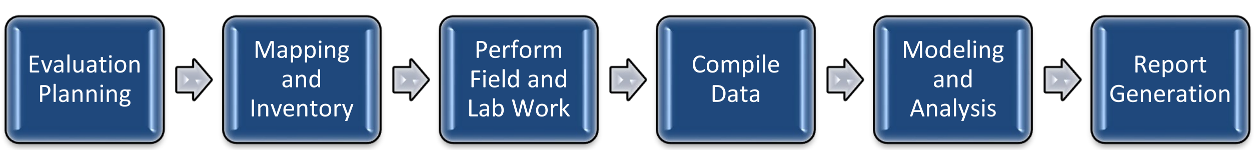
a. The objective of a structural evaluation is to determine the allowable load, allowable passes, and the Pavement Classification Number (PCN) (for airfields only) for a specific mix of traffic. UFC 3-260-03 uses the terms "nondestructive testing" and "direct sampling" to describe the two approaches to structural evaluation testing procedures. Both approaches determine the layer types and thicknesses and characterize the material properties of each layer.

b. Specifically, nondestructive testing uses tools such as the falling weight deflectometer (FWD) to determine modulus of elasticity or ground penetrating radar (GPR) to determine pavement thickness, whereas direct sampling uses test methods such as coring to determine pavement thickness, the dynamic cone penetrometer (DCP) to determine the California Bearing Ratio (CBR) for flexible pavements, or the Modulus of Subgrade Reaction (K) for rigid pavement. Each approach also uses different performance models for analysis.

c. Like PCI surveys, structural evaluations are performed on a section-by-section basis using the same inventory structure used for the PCI survey. Structural pavement evaluation data is often used to delineate pavement sections since each section represents a unit of the pavement network that is uniform in structural composition and subjected to consistent traffic loadings.

d. Service evaluation teams perform regularly scheduled airfield structural evaluations. Consultants may perform structural evaluations or geotechnical investigations in conjunction with specific project designs. Service evaluation teams or consultants may also perform structural evaluations for roads and parking pavement on an as-needed basis. Evaluations follow the general process shown in Figure 4-6. More details are provided in UFC 3-260-03.

Figure 4-6 Structural Evaluation Process



4-3.1 Structural Evaluation Planning.

Planning involves gathering data from the installation and doing a records review of the historical data from previous evaluations and other sources to develop a test plan. The test plan will vary depending on the type of testing and the availability of construction history and previous test data.

4-3.2 Structural Evaluation Mapping and Inventory.

The data gathered in planning is used to create/update maps and inventory as discussed in Chapter 3. The same maps and inventory used for PCI surveys are also used for structural evaluations. Update the maps and inventory to the maximum extent possible before conducting a structural evaluation. Maps and inventory may be adjusted in the field based on testing results. If testing includes coring or DCP testing, the test plan will include a map showing the test locations. The map helps communicate testing requirements and timing to installation personnel and is used to process work clearance requests for the evaluation.

4-3.3 Structural Evaluation Field/Laboratory Data Collection and Testing.

4-3.3.1 Structural Evaluation Field Testing.

Field work involves collecting data regarding traffic, pavement use, temperature, climate, water table, and geology as well as test data to determine layer types, thicknesses, and properties. When doing a nondestructive evaluation, use one or more of the test methods shown in paragraph 4-3.3.2 to determine layer types and thickness. Use the FWD to gather data for the backcalculation procedure to determine the modulus of each layer. The direct sampling evaluation will use one or more test methodologies shown in paragraph 4-3.3.2 to determine layer types and thicknesses as well as CBR (for flexible pavement) or K (for rigid pavement) values. UFC 3-260-03 and Service-specific guidance outline details for the test methods shown in paragraph 4-3.3.2. Any samples collected that cannot be tested in the field are returned to the laboratory for additional testing.

4-3.3.2 Structural Pavement Evaluation Test Methods.

- California Bearing Ratio (CBR)
- Concrete split tensile testing
- Dynamic cone penetrometer (DCP)
- Falling weight deflectometer (FWD)
- Ground-penetrating radar (GPR)
- Pavement coring
- Plate bearing
- Soil laboratory testing
- Ultrasonic testing (MIRA)

4-3.4 Compile Structural Evaluation Data.

Compile the field and laboratory test data in the physical property data (PPD) table. If a previous structural evaluation was done, use the PPD from the previous evaluation as a starting point. The PPD content may vary based on the type of evaluation performed and mission requirements, but, at a minimum, must have the information in Table 4-5.

Table 4-5 Physical Property Data

<table>
<tr><th colspan="2">Physical Property Data Table Requirements</th></tr>
<tr><td>Section ID</td><td>Thickness of each soil layer</td></tr>
<tr><td>Section name</td><td>Description of each soil layer</td></tr>
<tr><td>Thickness of each pavement layer</td><td rowspan="3">Modulus, CBR, or K for each layer depending on analysis procedure</td></tr>
<tr><td>Description of each pavement layer</td></tr>
<tr><td>Flexural strength of PCC layers</td></tr>
</table>

4-3.5 Data Modeling and Analysis.

Import the field test data into the PCASE application. Define the section properties for each section in the inventory, including the evaluation type (airfield or road/parking), traffic area (A, B, C, or D), PCI, traffic pattern, and analysis type (layered elastic or CBR/K). The process varies from this point depending on the analysis type: layered elastic analysis using FWD data or a conventional analysis using CBR/K evaluation procedures.

4-3.5.1 Layered Elastic Modeling and Analysis.

a. The first step in Layered Elastic Analysis is reviewing the test data (known as deflection basins). Use the PCASE Nondestructive Test **FWD Data** tool when one file has test data for multiple sections. Parse out the test points and assign them to the appropriate sections. When a file only has test data for a specific section, just assign the test data to the section without any parsing.

b. Next, use the layer structure data compiled in the PPD to create a layer model in PCASE for each section and select basins for backcalculation for each of these sections. This process involves reviewing the basin data to eliminate outliers to achieve a coefficient of variation below 20 for the data set.

c. The PCASE backcalculation procedure determines modulus values for each basin in the test data as well as the convergence error for each basin. PCASE also performs representative basin computations and selects a representative basin for the data set. A low percent error for either the convergence error or the representative basin computation does not necessarily indicate a good result. Review the results to determine whether they are reasonable. If not, re-evaluate the input parameters, adjust the model, and repeat the process until the results are reasonable. The reasonableness of results is typically determined based on published modulus ranges for different material types and the other evaluation test results.

d. After determining a reasonable set of modulus values for the layer model, run the analysis to determine the allowable load, allowable passes, and

Pavement Classification Number (PCN). Based on the results, the user may re-evaluate the model parameters and repeat the process. Details for both the layered elastic backcalculation and analysis procedures are outlined in UFC 3-260-03 and the PCASE User Guide.

4-3.5.2 Conventional Analysis Using CBR/K Analysis Procedures.

While field testing may be less complicated with the CBR/K procedure, the analysis is not as robust as the layered elastic procedure, especially when dealing with non-standard pavement structures. With that said, the CBR/K procedures have served well for many years and are especially useful for contingency evaluations.

Once section properties are defined in the PPD based on the test results, use the data compiled for each section to create a layer model in PCASE. Like the layered elastic procedure, the layer model may combine similar layers to facilitate analysis. Run the analysis to determine the allowable load, allowable passes, and PCN for each section. Based on the results, the user may re-evaluate the model parameters and repeat the process.

4-3.6 Report Generation.

PAVER and PCASE both generate a variety of reports. These reports are typically Excel spreadsheets that the user incorporates in their design analysis or pavement evaluation report.

4-3.7 Aircraft Classification Number (ACN).

The ACN number expresses the relative structural effect of an aircraft in terms of a standard single-wheel load on flexible or rigid pavement types for four specified standard subgrade strengths. UFC 3-260-03 discusses the standard procedures for determining the ACN of an aircraft. The specifics of the computation are given in the International Civil Aviation Organization (ICAO) *Aerodrome Design Manual, Part 3, Pavements*. The rigid pavement ACN algorithm used by the DoD considers all loads (tires) within eight times the radius of stiffness as opposed to three times, which is used in the ICAO *Aerodrome Design Manual*. Aircraft manufacturers publish ACN values for each aircraft using the ICAO procedure. The PCASE application also calculates ACNs using the ICAO procedure but uses a linear relationship between the minimum and maximum load that can vary slightly from the manufacturer's ACN values.

4-3.8 Pavement Classification Number (PCN).

The PCN number expresses the relative load-carrying capacity of a pavement in terms of a standard single-wheel load on flexible or rigid pavement types for four specified standard subgrade strengths. The numerical PCN value for a pavement is determined from the allowable load for a defined aircraft at a specified number of passes on the pavement. Once the allowable load is established, determine the PCN value by converting that load to a standard single-wheel load and then to a standard relative value. PCNs are discussed in more detail in UFC 3-260-03 and the criteria for converting allowable loads to PCN values are presented in the ICAO *Aerodrome Design Manual, Part 3, Pavements*.

4-3.8.1 Publishing PCNs.

An airfield pavement structural evaluation report publishes a PCN for each section in the inventory and may publish a limiting PCN for each branch (runway, taxiway, and apron). The Air Force Air Mobility Command (AMC) publishes PCNs in their Airfield Site Suitability Reports for installations used by the Services in the U.S. and overseas. The "Giant Report" is a summarized compilation of the information in the Site Suitability Reports and includes the PCN. In addition, the National Geospatial Intelligence Agency publishes the PCNs for runways, taxiways, and aprons generated by these airfield pavement evaluations in Flight Information Publications (FLIP) used by the military and civil aviation community.

4-3.8.2 PCN Based on Standard versus Controlling Aircraft.

The PCN is based on the allowable load of an aircraft at a specified number of passes. There are two alternatives for selecting the aircraft the PCN is based on for a specific airfield. The first uses the controlling aircraft at a specified number of passes based on the traffic mix for that specific installation. The second uses a standard aircraft at a set number of passes established by the Service. The PCN computed using either alternative is used to compute the ACN/PCN ratio. Each Service can use one or both procedures when publishing PCNs in their reports.

The procedure using the specific traffic mix for the installation relies on information from the installation regarding the types of aircraft that use the airfield as well as the number of operations of each. When the information provided is accurate, this approach provides greater fidelity for managing aircraft traffic on pavements at the local level but does not work as well when comparing capability between installations. Note that the controlling aircraft and passes can vary between sections on an installation. While the controlling aircraft and passes used to compute the PCN are published in the pavement evaluation report, just the PCN is published in the Giant Report or FLIP. The standard aircraft procedure can be used to manage traffic on pavements at the local level but has the inherent benefit of knowing the controlling aircraft and number of passes when looking at capability between sections and between installations since the controlling vehicle does not vary. The controlling aircraft and passes are published in the structural evaluation report, the AMC Site Suitability Report, and the Giant Report, but this detail is not published in the FLIP.

4-3.9 ACN/PCN Ratio.

The ACN/PCN is a method for reporting weight-bearing capacity intended to provide planning information for individual flights or multi-flight missions to avoid overloading pavement facilities. While it was not originally intended as an evaluation procedure, it is used this way. The ACN/PCN procedure provides a means to compare the ACNs published by aircraft manufacturers to the PCNs published in evaluation reports and the

FLIP. The system is structured so that a pavement with a PCN value greater than or equal to the aircraft ACN value can support that aircraft without weight restrictions.

4-3.9.1 Structural Index (SI).

The DoD pavement community applies the ACN/PCN ratio as a pavement management metric and uses the term “structural index” (SI) in this context. This metric compares the ACN of the critical aircraft at a specified load for each section to the published PCN for that section. See Equation 4-3.

Equation 4-3. Structural Index (SI)

$$SI = ACN/PCN$$

Where:
ACN =Aircraft Classification Number
PCN = Pavement Classification Number

4-3.9.2 ACN Critical Aircraft.

The critical aircraft used to determine the ACN varies based on the traffic using the pavement. For example, the critical aircraft for the runway at an installation may be the P-8 but aprons or taxiways that the P-8 does not traffic will use a different critical aircraft to determine the ACN.

The critical aircraft used to determine the ACN can be the same as the controlling aircraft used to determine the PCN for a given section, but when using the standard aircraft alternative to determine the PCN, the primary assigned mission aircraft using respective sections at that installation are used as the critical aircraft to determine the ACN. Adjust the aircraft load used to compute the ACN such that the results of SI computation align with the allowable gross loads (AGL) published in the report. For example, you do not want the SI as defined in the next paragraph to indicate load restrictions when the AGL report showed that there were no load restrictions.

4-3.9.3 Structural Index (SI) Ratios.

The SI is used differently in Service-specific pavement management processes based on mission requirements, but in all cases when used for pavement management, the SI is interpreted as outlined in Table 4-6.

Table 4-6 Structural Index (SI) Ratios

Structural Index (SI)	Description
SI ≤ 1.1	The pavement structure for the section is adequate to support the mission traffic for the defined design life.
1.1 < SI ≤ 1.4	The pavement structure for the section will not support the mission traffic for the defined design life. Aircraft loads or the number of passes may be limited to extend the life of the pavement.
SI > 1.4	The pavement structure for the section will not support the mission traffic for the defined design life. Aircraft traffic must be closely monitored. Overlay or reconstruction must be performed if the pavement is required to support mission traffic for the defined design life.

4-3.9.4 Structural Index (SI) versus Critical PCI.

An SI ≥ 1.1 indicates that the section is structurally inadequate to support the mission traffic for the defined load and passes, but this fact alone will not typically drive overlay or reconstruction unless the pavement capability must be increased due to a mission change. If the pavement is above the critical PCI, continue preventive maintenance (PM), and when the pavement drops below critical, incorporate an increase in structural capability in your repair solution.

4-4 SURFACE FRICTION CHARACTRISTICS EVALUATIONS.

Surface friction characteristics evaluations are typically performed on runways but may be performed on taxiways in certain circumstances. They are used to determine the hydroplaning potential of a surface under standardized wet conditions. They are carried out on multiple sections, but the results for each section can be extrapolated.

The procedure includes friction tests using continuous friction measuring equipment (CFME), slope measurements, and texture measurements. Procedures and equipment generally correspond to those outlined in FAA Advisory Circular (AC) 150/5320-12C, *Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces*.

4-4.1 Mu (Friction) Values.

Mu (μ) numbers (friction values) measured by CFME operated at 40 and 60 mph (65 and 95 km/h) test speeds are used as guidelines for evaluating the surface friction deterioration of runway pavements, prioritizing M&R requirements when developing a PMP, and for identifying the appropriate corrective actions necessary for safe aircraft operations.

4-4.2 Friction Level Classification.

The friction value use varies in Service-specific pavement management processes based on mission requirements, but in all cases the friction level classification will correspond to the friction values defined in FAA AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces*. When used for pavement management, interpret the friction classification level as outlined in Table 4-7. According to these guidelines, poor friction conditions for short distances on the runway do not pose a safety problem to aircraft, but long stretches of “slippery” pavement are a serious concern and require prompt remedial action.

Table 4-7 Friction Level Classification

Friction Level Classification	Description
Minimum	When the averaged Mu value on the wet pavement surface is below the minimum friction level for a distance of 500 feet (152 m), and the adjacent 500-foot (152 m) segments are below the maintenance planning friction level, take corrective action immediately after determining the cause(s) of the friction deterioration.
Maintenance Planning	When the averaged Mu value on the wet pavement surface is less than the maintenance planning friction level for a distance of 1000 feet (305 m) or more, determine the cause(s) and extent of the friction deterioration and take appropriate corrective action.
New Construction	The averaged Mu value on the wet pavement surface for each 500-foot (152 m) segment is no less than the new design/construction friction level shown in the FAA AC 150/5320-12C friction level classification for runway pavement surfaces.

4-5 VOID DETECTION SURVEYS.

Void detection surveys determine the existence and extent of voids under pavements as well as their effect on the load-bearing capability of the pavement. They are typically conducted on a portion of a section or sections where there are indications of issues such as localized cracking or in areas with a greater potential for voids, such as near drainage structures or in areas where karst formations are present.

4-5.1 Void Detection Tools.

These surveys use some or all of the following tools: ground penetrating radar (GPR), falling/heavy weight deflectometer (FWD/HWD), coring, and dynamic cone penetrometer (DCP) testing. UFC 3-260-03 outlines void detection testing procedures.

While GPR can locate potential voids, the HWD is the primary tool for identifying weak areas. Coring and DCP testing are used to verify the existence of a void or weak subgrade area.

4-5.2 Impulse Stiffness Modulus (ISM).

HWD testing produces a value termed the impulse stiffness modulus (ISM) to assess the relative pavement strength at a test location. Determine ISMs by dividing the load by the deflection at the respective deflection sensor (typically D1 through D7). Manually compute or use the PCASE FWD module to determine ISMs for sensors D1 through D7.

The deflection at sensor D1 reflects the state of the pavement, whereas D7 reflects the state of the subgrade. Using D1 alone is not sufficient to successfully detect voids under the pavement. Analyze the data by plotting the ISMs for sensors one through seven. If required, normalize the data by dividing each plot by the highest value in the plot to determine relative effects of pavement weaknesses on each sensor.

4-5.3 ISM Interpretation.

Once the data are plotted, use the following rules to determine potentially weak areas:

- An ISM value below 1000 kips per inch on a concrete pavement is of concern
- An ISM value below 300 kips per inch on an asphalt pavement is of concern
- Relative ISM decay indicates an unexpected weakness
- Weakness in ISM1 indicates it is shallow (less than 3 feet [0.9 m])
- Weakness in ISM7 indicates it is deep (3 to 20 feet [0.9 to 6 m])
- Weakness in both ISM1 and ISM7 indicates a general lack of support

4-5.4 Void Verification.

The DCP is the primary tool used to verify the existence of near-surface voids and determine the void's depth and extent. UFC 3-260-03 and TM 3-34.48-2, *Theater of Operations: Roads, Airfields, and Heliports – Airfield and Heliport Design*, describe the DCP and how to use it. The DCP is designed to reach a depth of 4 feet (1.2 m), but extensions can increase testing depth for voids.

Plot DCP results as CBR versus depth at each test location. The CBR indicates the strength of the underlying soil. Soil with CBR values below 8 are marginal and CBR values below 4 are of concern. CBR values approaching 1 indicate no strength, very loose soil, or an actual void (sinkhole). Since the main concern is the effect on load-carrying capacity, no distinction is made between very loose soil and actual voids if their effect on load-carrying capacity is equal.

4-5.5 Void Risk Categories.

Table 4-8 Risk Categories

Risk	Description
Low	No weakness or voids detected. No action required.
Moderate	Test results did not definitively determine the presence of a weak area or void. Take action to conduct additional testing, perform maintenance or repair, or monitor section for changes, depending on the situation. **Additional Testing:** When GPR scan encounters suspect areas deeper than DCP testing can reach or DCP results indicate soft pockets of soils, perform a video scan of drainage structures. If GPR test results are inconclusive and standing water was noted in structures, indicating a loss of drainage, conduct a drainage study to identify drainage paths and determine if drainage structure connections and sizes are adequate. **Perform Maintenance:** Testing did not indicate a structural weakness, but there are medium- or high-severity pavement distresses or nearby drainage structures need maintenance or repair. Perform pavement maintenance, repair broken structures, or clean inlets and outfalls as required **Monitor Area:** Testing did not indicate a structural weakness and the pavement has only low-severity distresses. Monitor the area for changes such as depressions, cracking, or ponding.
High	Void detected with GPR and verified with the HWD and/or DCP. Take immediate action for full-depth repair of pavement and drainage structure, if applicable.

4-6 ROUGHNESS SURVEYS.

The highway industry defines pavement roughness in terms of the ride quality experienced by a passenger. Automotive manufacturers design suspension systems to reduce the impact of common surface irregularities and improve overall ride quality. In contrast, the primary purpose of an aircraft suspension system is to absorb energy expended during landing. Aircraft suspension systems have less capacity to dampen the impact of surface irregularities compared to the magnitude of the energy that must be addressed during landing. Airfield pavement roughness is defined in terms of fatigue on aircraft components (increased stress and wear) and/or other factors that impair the safe operation of the aircraft (e.g., cockpit vibrations, excessive g-forces).

4-6.1 Airfield Roughness Survey.

A runway roughness evaluation examines the elevation profile of the runway surface and evaluates aircraft response to this profile. Newly constructed runway pavements are evaluated to help ensure longitudinal slopes meet established design criteria. Longitudinal and transverse slope criteria for airfields are defined in UFC 3-260-01, *Airfield and Heliport Planning and Design*. As a pavement ages, the longitudinal surface profile may vary from the original design standards due to factors such as frost heave or subgrade settlement and cause excessive roughness. When roughness evaluations are performed on multiple sections, the results for each section can be extrapolated.

The Services do not routinely conduct this type of evaluation, but, when performed, use the guidance in FAA AC 150/5380-9, *Guidelines and Procedures for Measuring Airfield Pavement Roughness*. Installations requiring a runway roughness evaluation can contact their Service POCs for assistance (see paragraph 2-9.3).

4-6.1.1 Single Event Bump.

Single event bumps are isolated events where changes in pavement elevation occur over a relatively short distance of 100 meters (328 feet) or less. Such elevation changes may occur as an abrupt vertical lip or as a more gradual deviation from a planned pavement profile. A basic “virtual straightedge” analysis as outlined in FAA AC 150/5380-9 can identify single event bumps. Riding the pavement in a passenger vehicle might reveal shorter length bumps but finding longer length bumps may require a thorough analysis of the pavement profile.

4-6.1.2 Profile Roughness.

Profile roughness is the surface profile deviations present over a portion of the runway that cause airplanes to respond in ways that can increase fatigue on airplane components, reduce braking action, or impair cockpit operations. Response depends on airplane size, weight, and operation speed. Roughness may affect the fatigue life of airplane components or decrease operational safety of the airplane. Depending upon airplane characteristics and operating speed, an airplane may be excited into harmonic resonance due to profile roughness, which can increase inertial forces or vibrations within the airplane structure.

4-6.1.3 Boeing Bump Index (BBI).

While not routinely conducted by DoD, FAA AC 150/5380-9 calls for using the “Boeing Bump” procedure and uses the results of this procedure to develop the BBI. The BBI procedure defines three evaluation zones—acceptable, excessive, and unacceptable—that are defined based on a relationship between the BBI and the bump length. BBI values below 1.0 are in the acceptable zone. Values of BBI greater than 1.0 fall in either the excessive or unacceptable zones. The BBI may be used in Service-specific pavement management guidance. When used, the guidance in Table 4-9 defines required maintenance action.

Table 4-9 Boeing Bump Index (BBI) Roughness Levels

Roughness Levels	Description
Acceptable	Newly constructed or rehabilitated pavement to result in bump height and length combinations that fall within the lower region of the acceptable range. No repair is required on existing pavement.
Excessive	Immediate pavement repairs are necessary at this level, but closure of the affected pavement is not required.
Unacceptable	Roughness levels in the unacceptable zone warrant immediate closure of the affected pavement. Repairs are necessary to restore the pavement to an acceptable level.

4-6.2 Roughness Criteria for Aircraft Arresting Systems.

The 200 feet (60 m) of pavement on both the approach and departure sides of an arresting system pendant is a critical area. Protruding objects and undulating surfaces are detrimental to successful tail hook engagements and are prohibited. The roughness criteria for aircraft arresting systems are defined in UFC 3-260-01. Determine conformance with these requirements using differential leveling that may be performed by installation personnel or contractors.

4-6.3 Road Roughness Surveys.

UFC 3-201-01, *Civil Engineering*, calls for roads to be designed in accordance with SDDCTEA Pamphlet 55-17, AASHTO *A Policy on Geometric Design of Highways and Streets* (also known as The Green Book), AASHTO *Roadside Design Guide*, and AASHTO *Guidelines for Geometric Design of Low-Volume Roads*, as applicable. Just as with airfields, as a pavement ages, the longitudinal surface profile may vary from the original design standards due to factors such as frost heave or subgrade settlement and cause excessive roughness. Roughness evaluations are typically carried out on multiple sections, but the results for each section can be extrapolated. DoD does not currently make extensive use of roughness surveys because the “automated” surveys used to determine the International Roughness Index (IRI) (see paragraph 4-6.4) may not be cost-effective for military installations and the vehicle operating speeds on military installations as well as issues with items like utility appurtenances (manholes) raise questions about the viability of the IRI results. Information on roughness and the IRI is presented in this UFC for use when the IRI data is available.

4-6.4 International Roughness Index (IRI).

The IRI is the standard for expressing pavement smoothness on roads. It can be computed using profile measurements obtained from devices such as the inertial profiler, Dipstick®, and rod and level. There are documents that provide standardized methods to compute the IRI, including AASHTO R 43M/R 43-07, *Standard Practice for Quantifying Roughness of Pavements*, and ASTM E1926, *Standard Practice for*

Computing International Roughness Index of Roads from Longitudinal Profile Measurements.

The IRI is computed from a longitudinal profile measurement using a quarter-car simulation at a speed of 50 mph (80 km/h). The IRI is reported in either inches per mile (in./mile) or meters per kilometer (m/km; **note:** 1 m/km = 63.36 in./mile). The IRI scale starts at zero for a road with no roughness and covers positive numbers that increase in proportion to roughness. Table 4-10 provides typical IRI values with verbal descriptors of required maintenance actions when the IRI is used in Service-specific pavement management guidance.

Table 4-10 IRI Ranges and Maintenance Actions

IRI Range (in./mile)	Description
0 < IRI ≤ 380	No repairs are required based solely on IRI.
380 < IRI ≤ 500	Pavement repairs are necessary at this level, but reduction of traffic speed or closure of the affected pavement is not required.
IRI > 500	Immediate pavement repairs are necessary to restore the pavement to an acceptable level. Consider reduction of traffic speed or closure of the affected pavement if pavement repairs cannot be performed.

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CHAPTER 5 DETERIORATION MODELS AND PERFORMANCE ANALYSIS

5-1 INTRODUCTION.

Pavement deterioration models are known as PCI family models. PCI family models are generated using the **PCI Deterioration Families** tool in PAVER as part of regularly scheduled airfield or road and parking PCI surveys. These deterioration models are based on past pavement performance and are used to predict future pavement condition to determine repair requirements based on that condition. Installation personnel may review or update PCI family models to determine where a pavement section is in its life cycle, determine effectiveness of maintenance actions, or determine deterioration rates for a specific subset of the pavement network.

5-2 PCI FAMILY MODEL PARAMETERS.

The DoD typically uses the pavement type and section rank as the primary parameters to define PCI Family Models for both airfield and road and parking pavement. When the Coefficient of Correlation is low and the standard deviation of error is high for a model, refine the model by creating separate models for different pavement types, e.g., AC and AAC, creating models for each Branch Use, or using other parameters such as whether the pavement has had localized preventive or global M&R performed, to create families with reasonable accuracy.

5-2.1 Pavement Surface Type.

The most important parameter for a deterioration model is the surface type, given that the deterioration rate of asphalt will typically be higher (average 2 to 3 points per year) than concrete (average 0.5 to 1.5 points per year).

5-2.2 Pavement Rank.

The pavement rank is the recommended standard for the second parameter. Group primary asphalt pavements, primary concrete pavements, etc. Secondary and tertiary pavement may be grouped together if model statistics are acceptable. Otherwise, create separate models for secondary and tertiary asphalt and concrete pavements as required.

5-2.3 Branch Use.

If model statistics do not meet the requirements outlined below, refine the models further to include the branch use. For example, when modeling statistics indicate the deterioration rate of the runway varies significantly from other primary pavements.

5-3 PCI FAMILY MODEL NAMING STANDARD.

Naming standards ensue the user can distinguish between models for a specific installation and are critical when distinguishing between family models in a rollup database. The standard is to use the convention **Site NameYr_Pavement Type_Rank** as the PCI family model name. For example, the deterioration model for Tyndall AFB primary PCC pavements last inspected in 2018 is **Tyndall18_PCC_P**.

If the branch use is used to create a family model for a specific reason as described above, name the model **Site NameYr_Pavement Type_Rank_Branch Use**; for Example, **Tyndall18_PCC_P_Road**. If the model must be created for specific branches rather than rank to achieve the required model statistics, replace the rank with the branch use; for example, **Tyndall18_PCC_Apron**.

5-4 PCI FAMILY MODEL PROCESS STANDARDS.

The PCI family model defines the deterioration rate of a pavement by plotting the condition of sections with similar characteristics against the age of the pavement in those sections. A minimum of five data points is required to define a deterioration model. This can be five inspections over time for one section, one inspection for five sections with similar surface types, or some other variation to get five points.

The PAVER user manual provides a description of the process of creating and assigning PCI family models. Following are supplemental instructions and standards for creating PCI family models for pavements on DoD installations.

5-4.1 Family Modeling - Review Model Data.

a. The **Review Model Data** tab (Figure 5-1) in the PAVER **PCI Deterioration Families** tool allows the user to create, copy, rename, or delete family models as well as review model data and add or delete specific data points.

Figure 5-1 Review Model Data Tab

b. When creating family models, PAVER gives the option of excluding inspection data based on backcalculated construction dates. Standard practice is to select **No** for this option unless there is evidence that using these points negatively affects the model, for example, when most of the points plot on a single line. In this case, rerun the model without the points with backcalculated construction dates.

c. As shown in Figure 5-1, data outliers are indicated by red triangles in the family model graph and identified in the status column of the table at the bottom of the form. Investigate outliers to determine if the age or PCI are accurate and correct any issues. If the age and PCI are correct, investigate the outliers from the current PCI inspection that are below the outlier boundary to determine the cause of the high rate of deterioration. Evaluation teams and consultants will document these issues in the report. These data may also be useful to determine when to refine the family model and when developing the PMP.

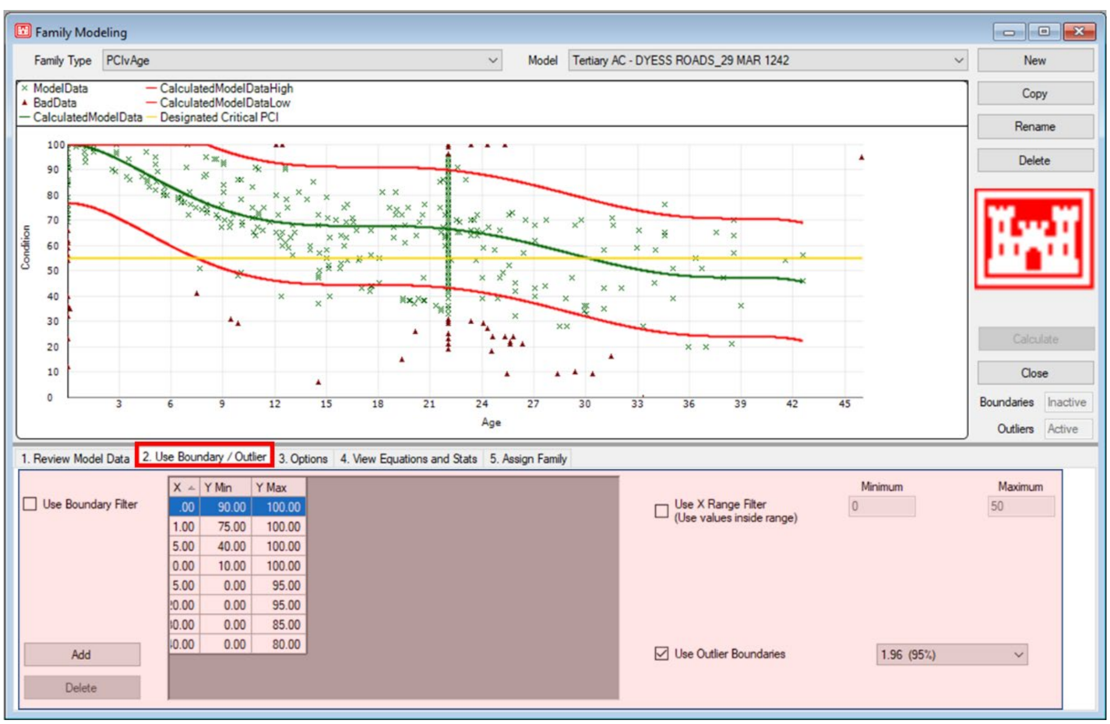
d. Review the data for the model when data points are “stacked,” as shown in Figure 5-1. A column of data points is a good indication that the age of the pavement (last construction date) is incorrect. Correct the issue by updating work using installation records or by backcalculating the last construction dates.

5-4.2 Family Modeling - Use Boundary / Outlier.

PAVER offers several options for filtering data used in deterioration models. As shown in Figure 5-2, the standard practice is to use the outlier boundary filter set at 1.96 (95 percent) confidence level. Only use the other filter options if there is a specific issue with the model that cannot be resolved by modifying the family parameters; for example, using a different model for AAC and AC surface types or separating secondary and tertiary pavement models.

The **Use Boundary Filter** option sets minimum and maximum PCI values for specified pavement ages. Any data points outside these values are filtered. Only use this option if there is a clear issue with the data model that filtering can resolve. The **Use X Range Filter** option defines the age range used for the model and filters any data points outside these values. Only use this option for DoD PCI Family Models when there is a clear issue with the data model that filtering can resolve, for example, when a deterioration model does not indicate any deterioration as it gets beyond 50 years. This can occur when the pavement in the model was designed in the 1950s or early 1960s for a much heavier load than it was subsequently used for and is therefore not seeing any deterioration, especially in a moderate climate.

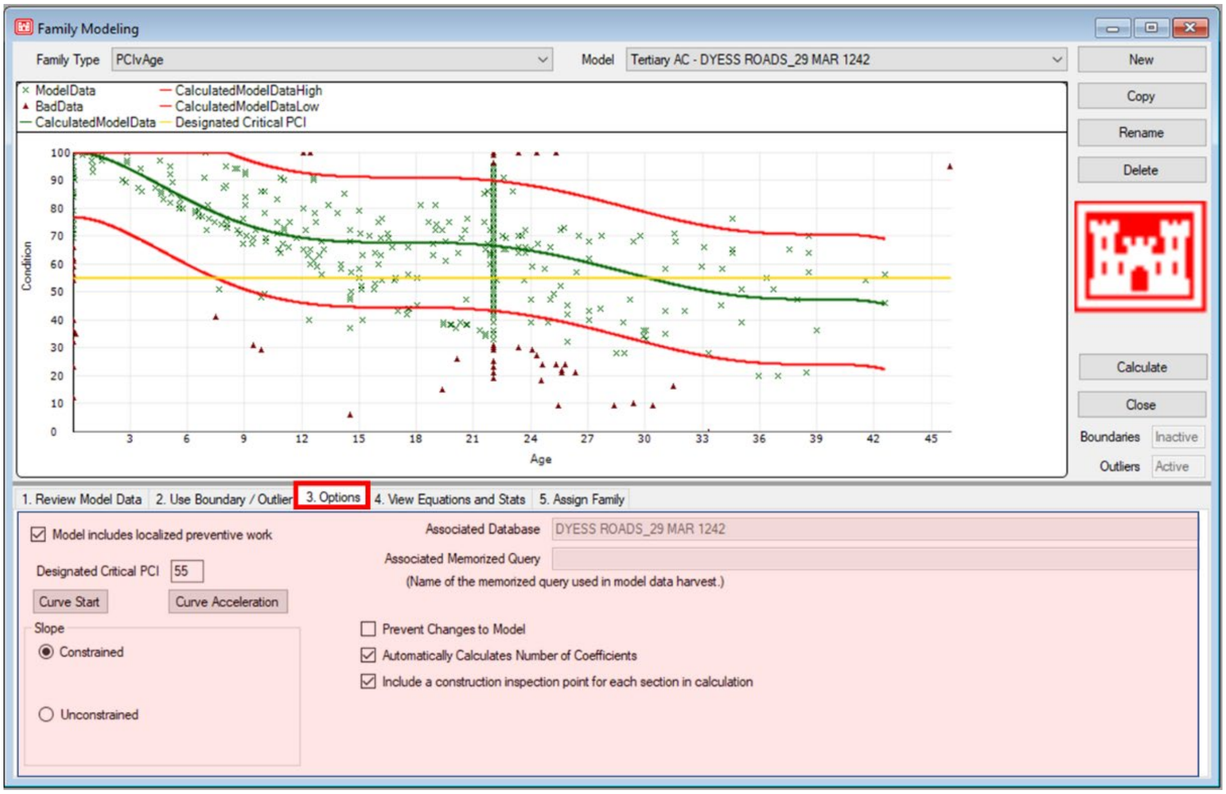
Figure 5-2 Use Boundary / Outlier Tab



5-4.3 Family Modeling - Options.

The **Options** tab is also called the Option card in the PAVER user manual. It plays a significant role in defining the deterioration model and has implications for work planning. Figure 5-3 shows the **Options** tab. Following are the key fields for this tab.

Figure 5-3 Options Tab



5-4.3.2 Model Includes Localized Preventive Work.

Unless there is specific information to the contrary, always check this box to indicate that PM is performed to indicate the deterioration model is based on this assumption. If PM is stopped, the rate of deterioration increases. Conversely, if PM was not previously performed and was subsequently started, the rate of deterioration decreases.

5-4.3.3 Critical Condition.

Theoretically, the critical condition is the point at which PM is no longer cost-effective and major M&R is triggered. The critical condition for all Services is currently set by policy at 70 for primary pavements. Service policies for critical condition on secondary and tertiary pavements range from 55 to 65, based on mission requirements.

5-4.3.4 Critical Condition Computation Tools.

The Services currently use the policy conditions outlined in paragraph 5-4.3.3 but PAVER has features to identify inflection points for consideration as a critical PCI. The

Curve Start and **Curve Acceleration** tools shown in Figure 5-3 can be used to validate the policy PCI or aid in prioritizing requirements for the PMP. They are only valid for fourth degree polynomials (4 coefficients) or higher. **Note:** A high degree model may have two inflection points.

5-4.3.5 Slope.

The constrained slope option will not allow the model to curve upward. The unconstrained option allows the model to curve upward as the pavement ages. Standard policy is to constrain the slope.

5-4.3.6 Automatically Calculates Number of Coefficients.

Once the points are plotted, the user can allow PAVER to determine a best-fit curve for the data that defines the changing rate of deterioration over time or the user can define the degree of the polynomial used to describe the deterioration. The user-defined option is typically used when the user wants to define a linear model (set the number of coefficients to two).

The linear model is useful when trying to define a simple rate of deterioration, but it does not take advantage of PAVER’s ability to define the changing rate of deterioration over time. An example of both the linear and best fit models are shown in Figures 5-4 and 5-5 for the **View Equations and Stats** tab. The recommended practice is to run the linear model to calculate a rate of deterioration that can be incorporated into the report but assign the best fit model determined by PAVER to sections for M&R work planning.

5-4.3.7 Prevent Changes to Model.

Standard policy is to leave **Prevent Changes to Model** unchecked (allows changes to the model).

5-4.3.8 Include a Construction Inspection Point for Each Section in Calculation.

This option allows the user to include a data point for PCI = 100 at age 0 for each pavement section in the model that reflects the condition at construction. When not selected, you can experience issues with the standard deviation, especially when pavement construction dates are grouped within a specific range rather than having a good age spread. Including a construction inspection point resolves these issues. The standard policy is to leave this checked.

5-4.4 Family Modeling - View Equations and Stats.

The **View Equations and Stats** tab shown in Figure 5-4 is also called the View Equations and Stats card in the PAVER user manual. It displays the intercept and coefficient values for the equation that best fits the data. It also lists various “goodness-of-fit” statistics for the model.

The minimum acceptable value for the coefficient of correlation is 0.70 and the maximum acceptable value for the standard deviation of error is 15.00. If statistics for a model are outside of these thresholds, review the model, determine potential causes, and revise the model. For example, the deterioration rate of milled and overlaid (AAC) pavements is typically higher than asphalt (AC) pavement. Creating separate models can resolve goodness-of-fit issues. **Note:** Five data points are required to create a model.

Figure 5-4 View Equations and Stats – Best Fit Model

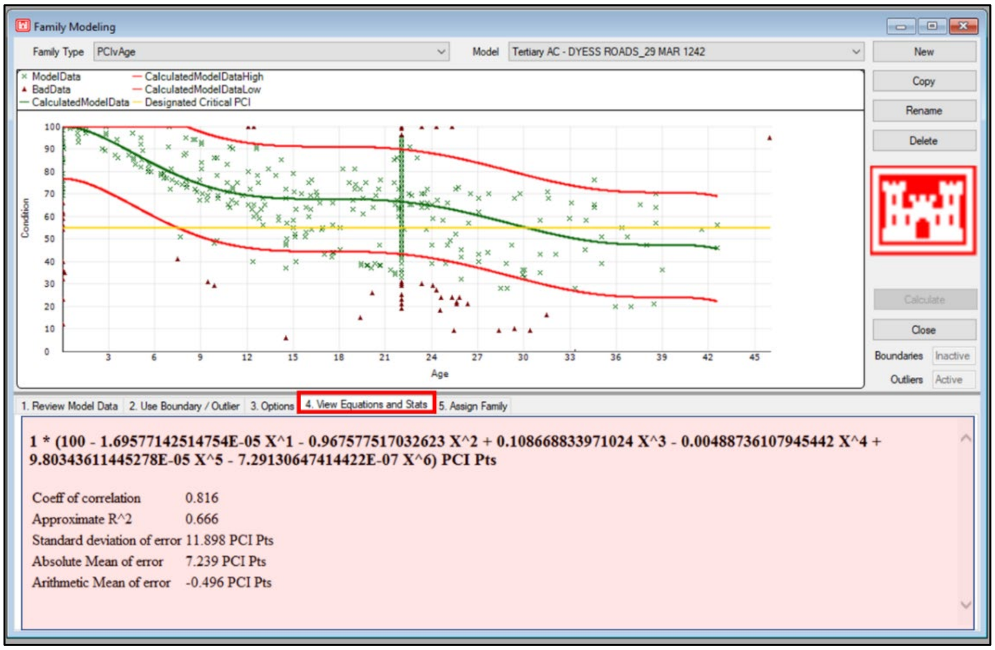
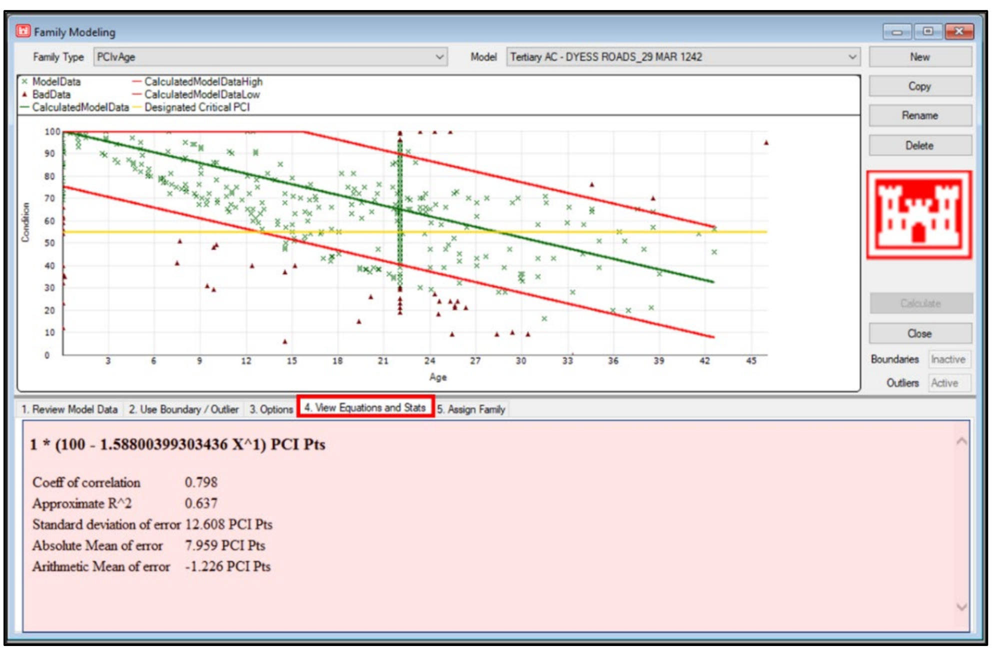


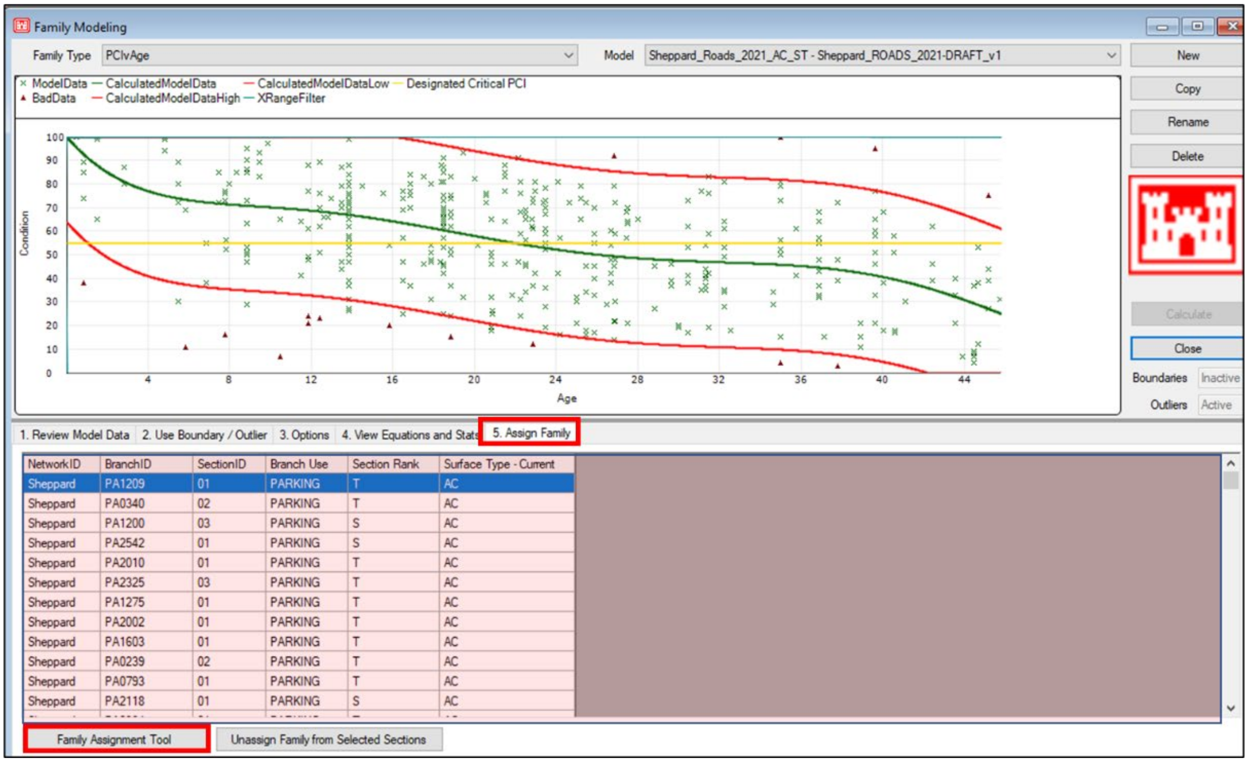
Figure 5-5 View Equations and Stats – Linear Model



5-4.5 Family Modeling - Assign Family.

After defining the PCI deterioration family model curves, go to Tab 5 and select the **Family Assignment Tool**. Select the **Show Subset** button to open the query tool and filter the data to the appropriate sections for the model, then assign the model to the sections.

Figure 5-6 Assign Family Model



5-4.5.1 Active Paved Section Model Assignment.

It is important to ensure that all active (section rank P, S, or T) paved sections are inspected and assigned to the appropriate family model. When doing work planning, PAVER uses the assigned family to determine future condition and bases M&R requirements on that condition.

5-4.5.2 Active Unpaved Section Model Assignment.

All unpaved (gravel) pavement sections are included in the inventory for use in reporting but are not typically inspected. Since there is no inspection, there is no data to determine a deterioration model, so, whether active or unused, these sections are assigned to a family model and are excluded from M&R work planning.

5-4.5.3 Unused Paved Section Model Assignment.

All unused pavement sections are included in the inventory for use in reporting but are not typically inspected, so unused (section rank of U) pavements are not assigned to a family model and not included in M&R work plans. Note that if there is a need to develop an M&R plan for currently unused pavement, a PCI family model based on data from other, similar sections can be assigned.

5-4.5.4 Unprivatized Housing Section Model Assignment.

Pavements in housing areas are included in the inventory for reporting purposes. Approaches between the Services vary on whether these pavements are inspected or not when the housing area is not privatized. If they are inspected, assign a family model. If they are not inspected, do not assign a model.

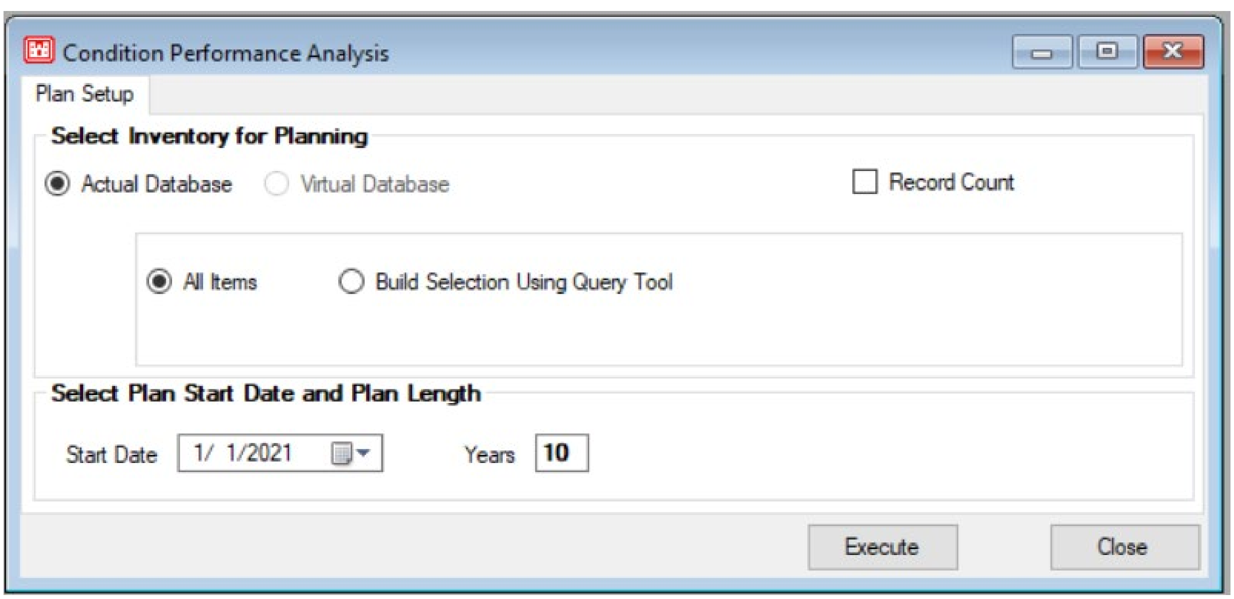
5-4.5.5 Privatized Housing Section Model Assignment.

Pavements in housing areas are included in the inventory for reporting purposes. Pavements may or may not be included in privatization agreements. If included in the privatization agreement, the pavement is typically not inspected and not included in M&R work plans, so do not assign a model for these sections. If not included in the privatization agreement and they are inspected, assign a family model and include them in the M&R work plans.

5-5 CONDITION PERFORMANCE ANALYSIS.

The **Condition Performance Analysis** feature in PAVER (Figure 5-7) uses the deterioration models assigned to each section to predict the future condition of the pavement networks in a database or any subset of the networks. The deterioration models are based on prior inspection data, so PAVER uses past performance to predict future condition. The user defines the pavements included in the analysis, the start date, and the duration of time for the analysis. PAVER produces summary, detail, and map views of the analysis results. The PAVER user guide describes each of these views.

Figure 5-7 Condition Performance Analysis



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CHAPTER 6 MAINTENANCE AND REPAIR (M&R) FAMILY MODELS

6-1 INTRODUCTION.

M&R family models are created for each M&R category. These M&R family models define work plan parameters. Just as with PCI family models, PAVER uses a two-step process: Create the M&R family model and assign the model to the appropriate sections.

6-2 MAINTENANCE AND REPAIR (M&R) CATEGORIES.

Each M&R category has a different focus for the type, scope, and timing of work. M&R categories include localized operational (aka safety or stopgap), localized preventive, global, and major M&R.

6-2.1 Localized Operational M&R.

Localized Operational (aka Safety or Stopgap) M&R is performed when a pavement is below the critical PCI to maintain the safety of operations by repairing individual distresses such as spalls, linear cracking, or alligator cracking at specific locations. Since the focus is on safety of operations, the maintenance and repair policy for operational M&R focuses on medium- and high-severity distresses that pose a risk to operations. Examples include repairing a large pothole at the main entrance to an installation or repairing high-severity spalling at the end of a runway to mitigate FOD risk.

6-2.2 Localized Preventive M&R.

Localized Preventive M&R is performed when a pavement is above the critical PCI. It includes maintenance actions performed on individual distresses intended to slow the rate of pavement deterioration and extend the life of the pavement. Localized preventive M&R may include repairs on low-, medium-, or high-severity distresses. An example is repairing medium- or high-severity longitudinal and transverse cracking on a parking area or apron. This action extends the life of the pavement by preventing water from migrating through cracks and damaging the base or causing other issues such as pumping.

6-2.3 Global Preventive M&R.

Global preventive M&R retards or slows pavement deterioration but is generally applied across entire sections or branches rather than localized areas. There are two primary approaches to global M&R: condition-based and age-based. In the condition-based approach, global M&R is planned within a specified condition range. The age-based approach sets a minimum age before starting global M&R. In either case, the basic principle is that global M&R is most effective early in pavement life when climate-related distresses have not progressed. There are instances where global M&R is used later in the pavement life to address low- or medium-severity distresses. Global M&R is commonly performed on a recurring schedule without regard to the distresses present. Surface treatments on asphalt pavements are the primary example of global M&R.

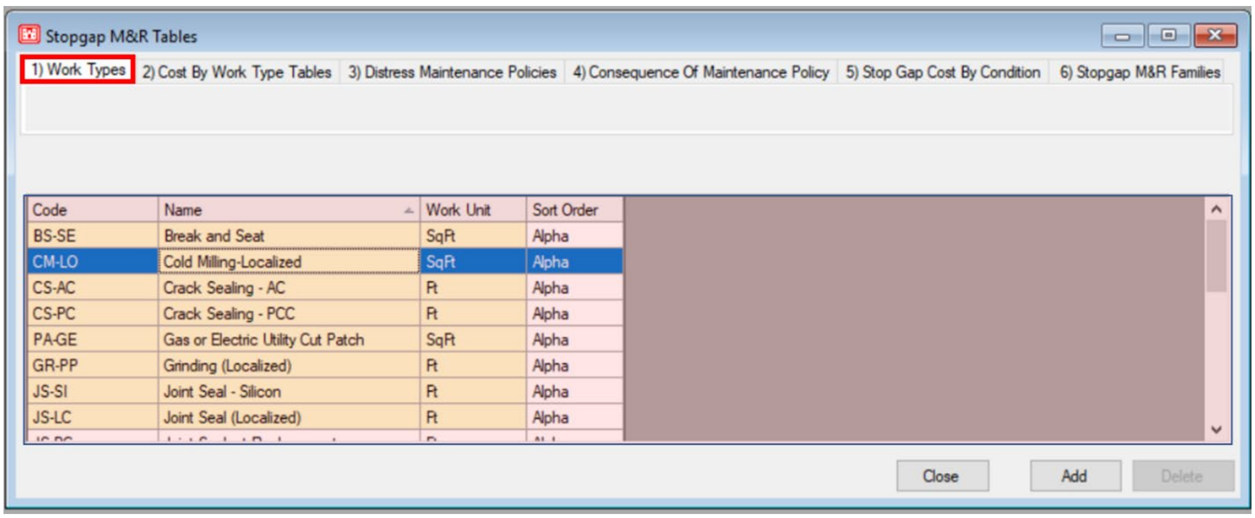
6-2.4 Major M&R.

Major M&R is defined as activities applied to an entire pavement section to correct or improve existing structural or functional issues. Functional issues include deteriorated pavement surfaces that pose a risk to aircraft or ground vehicles. Major M&R includes mill and overlay, structural overlay, or reconstruction of asphalt pavements and slab replacement or reconstruction for PCC pavement. The distinguishing feature is that any of these treatments bring the PCI value back to 100.

6-3 LOCALIZED M&R TABLES.

Localized preventive and operational (aka safety or stopgap) M&R tables define the preventive and operational work planning parameters. As shown in Figure 6-1, M&R tables include work types, cost by work type tables, distress maintenance policies, consequence of maintenance policy, and cost by condition. Standards for these tables are outlined below and in the appendices. M&R families are defined on **6) Stopgap M&R Families** using input from tabs 1 through 5. The example below is for stopgap, but preventive M&R tables are similar.

Figure 6-1 Localized M&R Tables



6-3.1 Localized M&R Work Types.

The **Work Types** table (tab 1) in Figure 6-1 lists the standard PAVER work types shown in Table 6-1. These work types are applicable to both localized preventive and operational M&R. While users can create user-defined work types in PAVER, they are not permitted in DoD PAVER databases. When doing work planning for a new inspection, user-defined work types in an existing database are changed to standard work types and the user-defined work types are deleted from the database. If a Service requires a work type that is not in the localized M&R table, submit the requirement to the Tri-Service Pavement Working Group for inclusion in PAVER.

The work types in Table 6-1 are used in the **Cost by Work Type Tables** (tab 2) and **Distress Maintenance Policies** (tab 3) tables in Figure 6-1. The same PAVER work types are used for both airfield and road and parking M&R, but the maintenance policies differ. Details for the work elements for most work types are outlined in UFC 3-270-01, *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair*, and in UFC 3-250-08FA, *Standard Practice for Sealing Joints and Cracks in Rigid and Flexible Pavements*.

Table 6-1 Localized M&R Work Types

Code	Name	Work Unit	Description
BS-SE	Break and Seat	SqFt	Crack or break and seat are fractured slab technologies used to minimize the occurrence and severity of reflection cracks. They involve breaking the concrete pavement and seating the broken slabs using a pneumatic roller to reestablish support between the base and the slabs prior to overlaying. Crack and seat is performed on plain, jointed concrete. Break and seat is used on reinforced PCC and breaks the slabs into smaller pieces. Both fractured slab technologies are typically performed on entire sections and rarely used for localized repair.
CM-LO	Cold Milling-Localized	SqFt	Pavement milling (cold planing, asphalt milling, or profiling) is the process of removing at least part of the surface of a paved area using milling machines or cold planers. When used for localized repair, milling removes just enough thickness to level and smooth the surface but may also be used to remove the full depth of the pavement. See UFC 3-270-01, Chapter 13.
CS-AC	Crack Sealing - AC	Ft	Remove old sealant (if any), saw/route cracks, clean crack reservoir, install backer rod to control depth of sealant, and seal using an approved hot-applied sealant. Note that the procedure will vary depending on the width of the crack. See UFC 3-270-01, Chapter 9.
CS-PC	Crack Sealing - PCC	Ft	Remove old sealant (if any), saw/route cracks, clean crack reservoir, install backer rod to control depth of sealant, and seal using an approved hot- or cold-applied sealant. Note that the procedure will vary depending on the width of the crack. See UFC 3-270-01, Chapter 12.
ED-RF	Retrofitted Edge Drain	Ft	Retrofitting edge drains is typically done for an entire section but may be done for localized areas. It involves removing existing edge drains, trenching, and placing the new edge drain system. A good candidate for retrofitted edge drainage is a pavement showing early signs of moisture-related damage. Additionally, pavements with acceptable surface geometrics (longitudinal grades and transverse cross-slopes) and adequate depth and condition of roadside ditches are good candidates for retrofitted edge drainage. See UFC 3-270-01, Chapter 19.
GR-AC	Grinding - AC (Localized)	Ft	Diamond grinding, using closely spaced diamond saw blades mounted on a rotating shaft, removes a thin layer of the asphalt surface to correct for heaving at PCC interface locations and correct surface defects, such as wheel path rutting. The diamond-grinding process results in less impact than milling. See UFC 3-270-01, Chapter 11.

Code	Name	Work Unit	Description
GR-PC	Grinding – PCC (Localized)	Ft	Diamond grinding, using closely spaced diamond saw blades mounted on a rotating shaft, removes a thin layer of the concrete surface to correct for faulting at joints and crack locations. The diamond-grinding process results in less impact than milling. See UFC 3-270-01, Chapter 17.
HR-PD	Partial Depth Heat Resistant PCC Repair	SqFt	A partial-depth heat-resistant PCC repair applies to pavement in vertical landing zones subject to deterioration from heat by aircraft with vectored thrust such as the V-22, F-35B, and AV-8 aircraft. There are restrictions on where a partial-depth repair is allowed. It involves sawing and removing concrete to a minimum depth of 3 inches or to sound concrete, but not more than 1/3 the thickness of the pavement, then cleaning the repair area, placing new heat-resistant concrete, and re-sealing the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint. See UFC 3-270-01, Chapter 20.
HR-FD	Full Depth Heat Resistant PCC Repair	SqFt	A full-depth heat-resistant PCC repair applies to pavement in vertical landing zones subject to deterioration from heat by aircraft with vectored thrust such as the V-22, F-35B, and AV-8 aircraft. There are instances when a full-depth repair is required. It involves sawing and removing the full depth of the concrete, repairing and recompacting the base or subgrade below the slab, placing dowels and tie-bars, then placing new heat-resistant concrete and re-sealing the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint. See UFC 3-270-01, Chapter 20.
HR-CR	Partial Depth Continuously Reinforced Heat Resistant PCC Repair	SqFt	A partial-depth continuously reinforced heat-resistant PCC repair applies to pavement in vertical landing zones subject to deterioration from heat by aircraft with vectored thrust such as the V-22, F-35B, and AV-8 aircraft. There are restrictions on where a partial-depth repair is allowed. It involves sawing and removing concrete and reinforcement then replacing the reinforcement and tie bars, placing new heat-resistant concrete, and re-sealing the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint. See UFC 3-270-01, Chapter 20.
JS-LC	Joint Seal (Localized)	Ft	Joint seal replacement is typically done on entire sections but may be done for localized areas. The procedure varies depending on type of seal: hot pour, silicone, or preformed compression seals, but in general involves removing the old sealant, cleaning the reservoir, and placing new joint seal. See UFC 3-270-01, Chapter 12.
LT-PC	Load Transfer Restoration – PCC (Localized)	Ft	Load transfer restoration is typically done for an entire section but may be done for localized areas. It involves saw-cutting and chipping concrete to create slots at the joints, placing load transfer devices, typically dowel bars, into the slots and properly aligning the bars, placing repair material into the slots, restoring the joint at the slot locations, sealing the joints, and grinding at joint locations or over the full pavement width and length to improve smoothness. It is used to retard further deterioration of the concrete pavement by reducing the potential for joint-related distresses. Restoration of load transfer can improve pavement performance by reducing pumping, faulting, and corner breaks, and by retarding the deterioration of transverse cracks. See UFC 3-270-01, Chapter 18.

Code	Name	Work Unit	Description
NONE	No Localized M & R	SqFt	When the severity of the distress does not negatively impact the operational safety of the pavement or trying to repair a distress (especially a low-severity distress) will potentially create more of a risk than the existing distress, the best choice is to take no action and monitor the distress for further deterioration.
PA-AD	Patching - AC Deep	SqFt	Full-depth asphalt repairs involve removing the pavement down to the subgrade or to an intermediate base or subbase layer that is intact then replacing the base or subbase with materials that meet the specifications for these respective layers and replacing the wearing surface with HMA concrete (cold mix asphalt is not preferred but may be used if hot mix is not available). See UFC 3-270-01, Chapter 3.
PA-AL	Patching - AC Leveling	SqFt	Patching AC leveling is used to address depressions or rutting by placing microsurfacing to level the pavement when the rutting or depression is stabilized.
PA-AS	Patching - AC Shallow	SqFt	Partial-depth repairs involve removing the asphalt surface to the base, recompacting the base, and replacing the wearing surface with HMA concrete (cold mix asphalt is not preferred but may be used if hot mix is not available). See UFC 3-270-01, Chapter 4.
PA-IR	Patching-Infrared	SqFt	Infrared patching involves heating the asphalt to a working temperature of 300 °F, penetrating the asphalt to a depth of 3 to 4 inches. After removing deteriorated asphalt and raking in new asphalt, the area is compacted with a vibratory roller.
PA-PF	Patching - PCC Full Depth	SqFt	Full-depth PCC repair involves sawing and removing the full depth of the concrete, repairing and recompacting the base or subgrade below the slab, placing dowels and tie-bars, then placing new concrete. Note that maintaining the joint is critical on any repair adjacent to a joint. See UFC 3-270-01, Chapter 14.
PA-PP	Patching - PCC Partial Depth	SqFt	Partial-depth PCC repair involves sawing and removing concrete to a minimum depth of 2 inches or to sound concrete, but not more than 1/3 the thickness of the pavement, then cleaning the repair area and placing new concrete. Note that maintaining the joint is critical on any repair adjacent to a joint. See UFC 3-270-01, Chapter 13.
PA-PL	Patching – PCC Partial Depth POL Damage Repair	SqFt	PCC partial-depth POL damage repair applies to pavement areas subject to deterioration from a combination of POL and heat, which results in scaling or spalling of the top 1 to 2 inches (25 to 50 millimeters) of the pavement as can be generated by POL and heat from B-1, F-18, F-35, and V-22 operations. This work type involves sawing and removing concrete to a minimum depth of 2 inches or to sound concrete, but not more than 1/3 the thickness of the pavement, then cleaning the repair area and placing new magnesium phosphate cement. Once the repair is in place, the area may be sealed using a sodium silicate surface treatment. See UFC 3-270-01, Chapter 21.
SH-LE	Shoulder leveling	Ft	Shoulder leveling involves removing loose materials, placing, grading, and compacting aggregate to correct shoulder drop-off caused by shoulder erosion, settlement, or by building up the roadway without adjusting the shoulder level.

Code	Name	Work Unit	Description
SL-PC	Slab Replacement - PCC	SqFt	PCC slab replacement involves sawing and removing the full depth of the concrete, repairing and recompacting the base or subgrade below the slab, placing dowels, then placing new concrete and sealing the joints. Procedures generally follow those outlined in UFC 3-270-01, Chapter 14.
SS-SG	Spread Sand or Gravel	SqFt	Sand seal is used to address a bleeding asphalt pavement surface. Hot sand is placed with a spreader to blot up the excess binder on the surface. The sand is rolled with a pneumatic roller then the excess sand is removed with a vacuum sweeper. See UFC 3-270-01, Chapter 7.
ST-AL	Surface Treatment – AC (Localized)	SqFt	Surface treatments for asphalt pavement are typically applied to entire sections (global) but may be done for localized areas. Different types of surface treatment are used depending on the age, condition, and use (airfield vs. road) of the pavement. These treatments include fog seals, rejuvenators, single or double bituminous surface treatments, slurry seals, and microsurfacing. See UFC 3-270-01, Chapters 5, 6, 7, 8, and 21.
ST-PL	Surface Treatment – PCC (Localized)	SqFt	Surface treatments for concrete pavement may be applied to entire sections but may also be done for localized areas. Surface treatments for PCC pavement surfaces (e.g., sodium silicate) are used to prevent deterioration from the effects of a combination of heat and POL contamination. Optimally, the surface is cleaned and sealed as a preventative measure within 6 months of commencing operations but may be used in conjunction with other appropriate repairs such as crack sealing and patching using magnesium phosphate cement. See UFC 3-270-01, Chapters 5, 6, 7, 8, and 21.
SJ-PC	Slab Jacking - PCC	SqFt	Slab jacking involves injection of a grout or polyurethane foam under a settled slab or multiple slabs to raise the slabs slowly under pressure to the desired elevation. It is used to address settlement or improve support under the pavement. See UFC 3-270-01, Chapter 15.
UN-PC	Undersealing - PCC	SqFt	Undersealing is used to stabilize the pavement slab by restoring support under the slab, typically at joint and crack locations. Undersealing is also called slab sealing, subsealing, slab stabilization, and pavement grouting. See UFC 3-270-01, Chapter 16.

6-3.2 Localized M&R Cost by Work Type Tables.

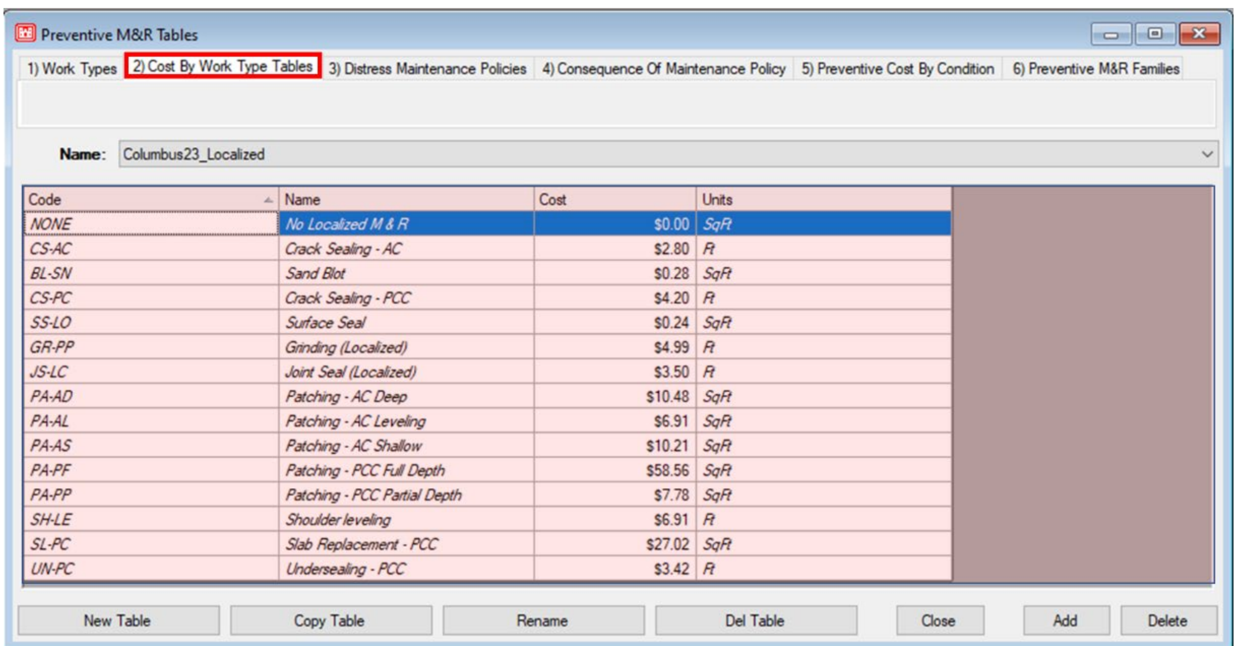
Historically the Services created standard cost by work type tables and updated them annually or used consultants to create or update them, but these tables did not follow a specific standard. This UFC defines a standard for creating and updating cost by work type tables for use by Service evaluation teams and consultants. Paragraph A-2 includes standard localized preventive and operational cost by work type tables for airfields and roads and parking pavements. This UFC defines the work elements for each of the standard work types. Based on the work element assumptions for each standard work type, generate fully burdened unit costs including O&M escalation factors using Tri-Service Automated Cost Engineering System (TRACES) applications such as the Parametric Cost Engineering System (PACES) or the Micro-Computer Aided Cost Estimating System Second Generation (MII).

Service evaluation teams and consultants performing PCI surveys use the standard cost by work type tables for each new PCI survey and apply area cost factors to adjust the standard unit costs for each work type for the specific installation. Adjust these standard cost tables when there is specific cost data available for work types at an installation. When adjusting costs, document any changes to specific work component assumptions for a given standard work type in the report. The intent is to clearly define changes to the unit cost basis. When doing work planning for a new inspection, use the updated cost table and delete any cost by work type tables used in previous inspections. Figure 6-2 is an example table.

Use the standard naming convention shown below for cost by work type tables. Costs for both AC and PCC pavement work types are included in the same table:

- **Site NameYr_Maintenance Category**
- For example, **Columbus23_AC_Localized**

Figure 6-2 Localized M&R Cost by Work Type Tables



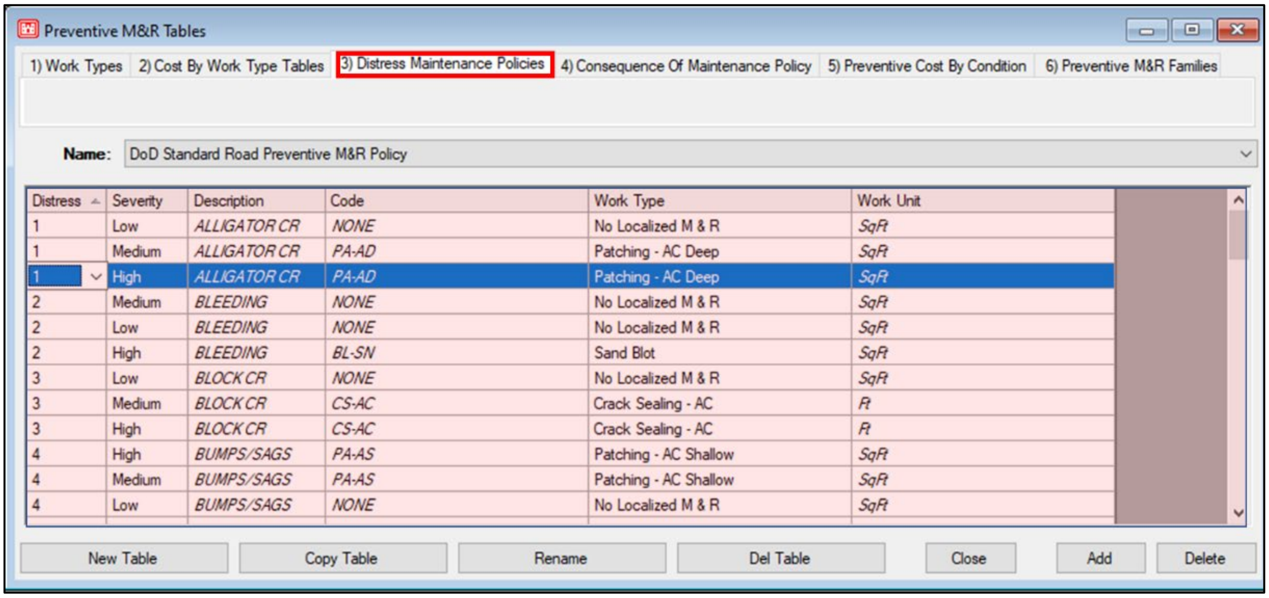
Code	Name	Cost	Units
NONE	No Localized M & R	$0.00	SqFt
CS-AC	Crack Sealing - AC	$2.80	Ft
BL-SN	Sand Blot	$0.28	SqFt
CS-PC	Crack Sealing - PCC	$4.20	Ft
SS-LO	Surface Seal	$0.24	SqFt
GR-PP	Grinding (Localized)	$4.99	Ft
JS-LC	Joint Seal (Localized)	$3.50	Ft
PA-AD	Patching - AC Deep	$10.48	SqFt
PA-AL	Patching - AC Leveling	$6.91	SqFt
PA-AS	Patching - AC Shallow	$10.21	SqFt
PA-PF	Patching - PCC Full Depth	$58.56	SqFt
PA-PP	Patching - PCC Partial Depth	$7.78	SqFt
SH-LE	Shoulder leveling	$6.91	Ft
SL-PC	Slab Replacement - PCC	$27.02	SqFt
UN-PC	Undersealing - PCC	$3.42	Ft

6-3.3 Localized M&R Distress Maintenance Policies.

Distress maintenance policies prescribe specific work types to repair specific distress types at each severity level. For example, in Figure 6-3 the first row shows high-severity alligator cracking as the distress. The **Code** and **Work Type** columns indicate to PAVER that when it encounters this distress at this severity level, it creates a requirement to perform a full-depth patch. Use separate policy tables for airfields and roads and parking pavements for both localized preventive and operational M&R. Paragraph A-3 includes standard distress maintenance policy tables.

Service evaluation teams and consultants performing PCI surveys will use the appropriate standard maintenance policy and the standard naming convention for each new PCI survey. Delete any distress maintenance policy tables from previous evaluations from the database. If a Service wants to change a standard maintenance policy, submit a change request using the UFC change request procedure on the Whole Building Design Guide (WBDG) website: https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc

Figure 6-3 Example Distress Maintenance Policies



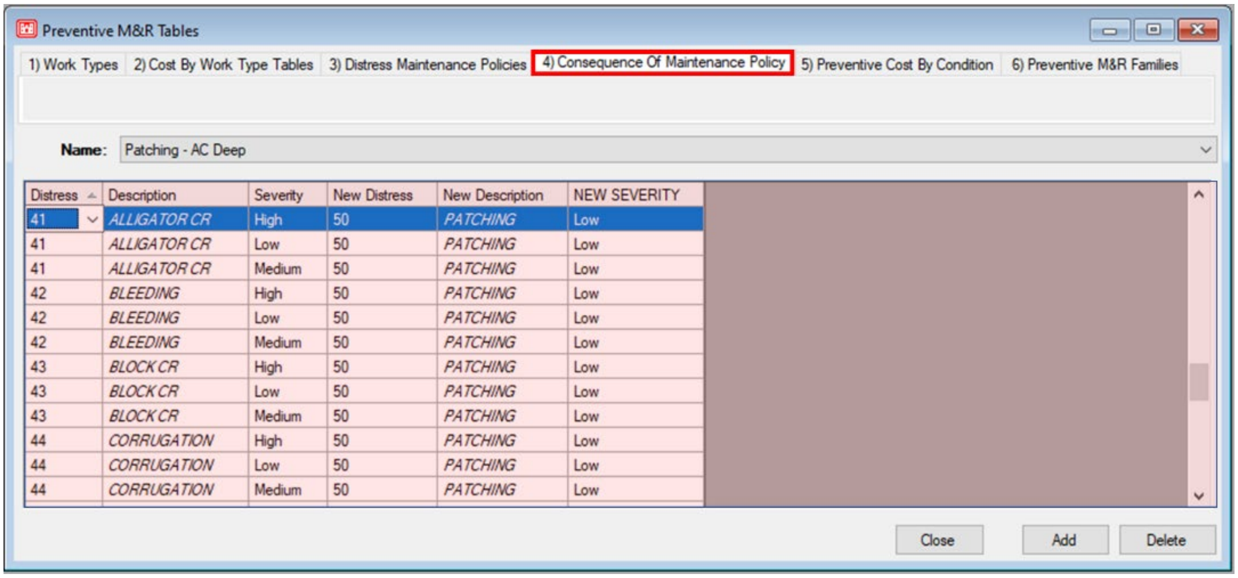
Distress	Severity	Description	Code	Work Type	Work Unit
1	Low	ALLIGATOR CR	NONE	No Localized M & R	SqFt
1	Medium	ALLIGATOR CR	PA-AD	Patching - AC Deep	SqFt
1	High	ALLIGATOR CR	PA-AD	Patching - AC Deep	SqFt
2	Medium	BLEEDING	NONE	No Localized M & R	SqFt
2	Low	BLEEDING	NONE	No Localized M & R	SqFt
2	High	BLEEDING	BL-SN	Sand Blot	SqFt
3	Low	BLOCK CR	NONE	No Localized M & R	SqFt
3	Medium	BLOCK CR	CS-AC	Crack Sealing - AC	Ft
3	High	BLOCK CR	CS-AC	Crack Sealing - AC	Ft
4	High	BUMPS/SAGS	PA-AS	Patching - AC Shallow	SqFt
4	Medium	BUMPS/SAGS	PA-AS	Patching - AC Shallow	SqFt
4	Low	BUMPS/SAGS	NONE	No Localized M & R	SqFt

6-3.4 Localized M&R Consequence of Maintenance Policy.

For every standard work type, there is an associated consequence of maintenance policy table. Each table consists of a list of all distresses related to a work type and the distress produced after performing the specified repair. This table informs PAVER about the distresses present after repair and is used to predict the condition after work is performed. For example, in Figure 6-4, when performing Patching - AC Deep to repair high-severity alligator cracking, the resulting distress is a low-severity patch. Standard consequence of maintenance policy tables are included in paragraph A-4.

Service evaluation teams and consultants performing PCI surveys will use the standard consequence of maintenance policy tables for each new PCI survey. Replace or update any consequence of maintenance policy tables from previous evaluations to match the standard consequence of maintenance policy and delete any tables for non-standard work types from the database. If a Service wants to change a standard consequence of maintenance policy, they can submit a change request using the UFC change request procedure on the WBDG website: https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc

Figure 6-4 Consequence of Maintenance Policy



Distress	Description	Severity	New Distress	New Description	NEW SEVERITY
41	ALLIGATOR CR	High	50	PATCHING	Low
41	ALLIGATOR CR	Low	50	PATCHING	Low
41	ALLIGATOR CR	Medium	50	PATCHING	Low
42	BLEEDING	High	50	PATCHING	Low
42	BLEEDING	Low	50	PATCHING	Low
42	BLEEDING	Medium	50	PATCHING	Low
43	BLOCK CR	High	50	PATCHING	Low
43	BLOCK CR	Low	50	PATCHING	Low
43	BLOCK CR	Medium	50	PATCHING	Low
44	CORRUGATION	High	50	PATCHING	Low
44	CORRUGATION	Low	50	PATCHING	Low
44	CORRUGATION	Medium	50	PATCHING	Low

6-3.5 Localized M&R Cost by Condition.

a. While PAVER can predict the future condition of a pavement section based on the PCI deterioration family model, it cannot predict specific distress types, severities, and quantities beyond the first year after a PCI survey. PAVER uses the cost by work type tables to determine the cost of required localized repairs when running a consequence of localized distress maintenance work plan. However, it uses cost by condition tables to determine M&R costs based on the future predicted condition of the pavement when running a critical PCI work plan.

b. Cost by condition tables are derived from the estimated cost of repairs developed from the cost by work type tables at the time of the most recent PCI. Cost by condition tables are created for operational, preventive, and major M&R. Each of these categories have separate tables for asphalt and PCC pavements. The results are cost by condition tables based on the current survey data and work type costs. Note that global M&R will always use cost by work type tables.

c. When running the work plan for future years, PAVER uses the cost per square foot from the table at the predicted PCI for the specified year multiplied by the true area of the section to predict the cost of M&R for each M&R category. Costs to repair a pavement increases as the pavement condition (PCI) decreases.

d. Service evaluation teams and consultants performing PCI surveys will develop standard cost by condition tables for each new PCI survey as outlined in paragraph 6-3.5.1. Create a new cost by condition table for the current inspection and delete any cost by condition tables used in previous inspections from the database when developing M&R Family Models for a new inspection.

e. Use the following standard naming convention for cost by condition type tables:

- Site **NameYr_Pavement Type_Maintenance Category**
- For example, **Columbus23_AC_PRV**

6-3.5.1 Developing Localized M&R Cost by Condition Tables.

Once the PCI survey is complete and the cost by work type and distress maintenance policy tables are updated, use the **Family Modeling** tool to create a **Cost by Condition Table**. After opening the **Family Modeling** tool, select **Local Cost v PCI Family Type**, then select **New** to open the **Options** form. Name the model using the naming convention and select the current **Distress Maintenance Policy** and **Cost by Work Type** as shown in Figure 6-5. When the **Query** tool opens, select the pavement type for the model. This generates a model like the one shown in Figure 6-6. Check the **View Equations and Stats** tab to ensure the coefficient of correlation is above 0.70. Selecting **Generate Cost Table** creates a Cost by Condition table in Excel.

Figure 6-5 Policy Unit Cost per Section

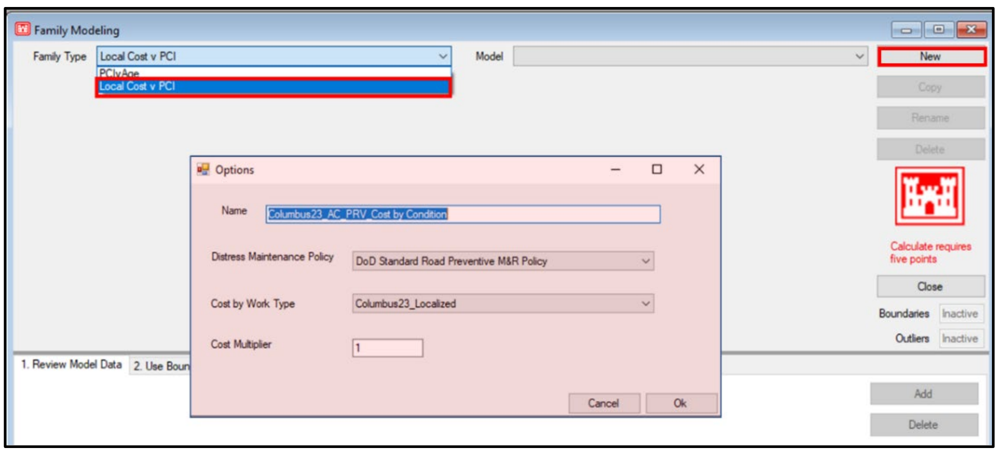
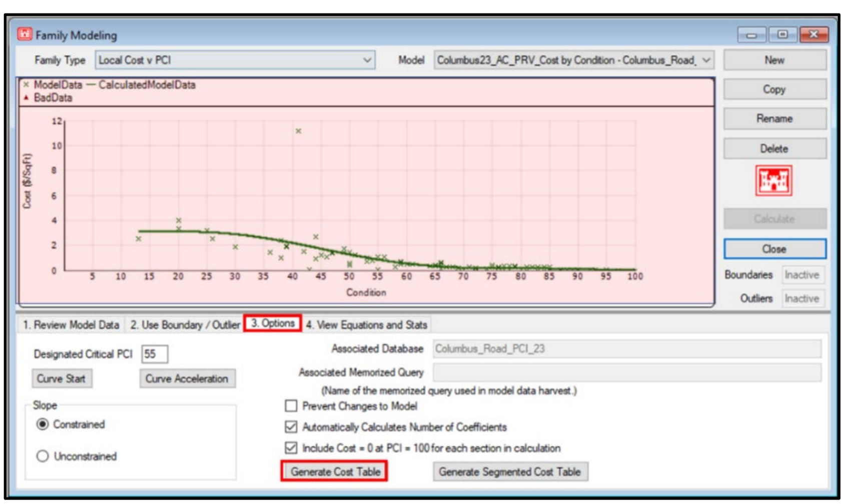


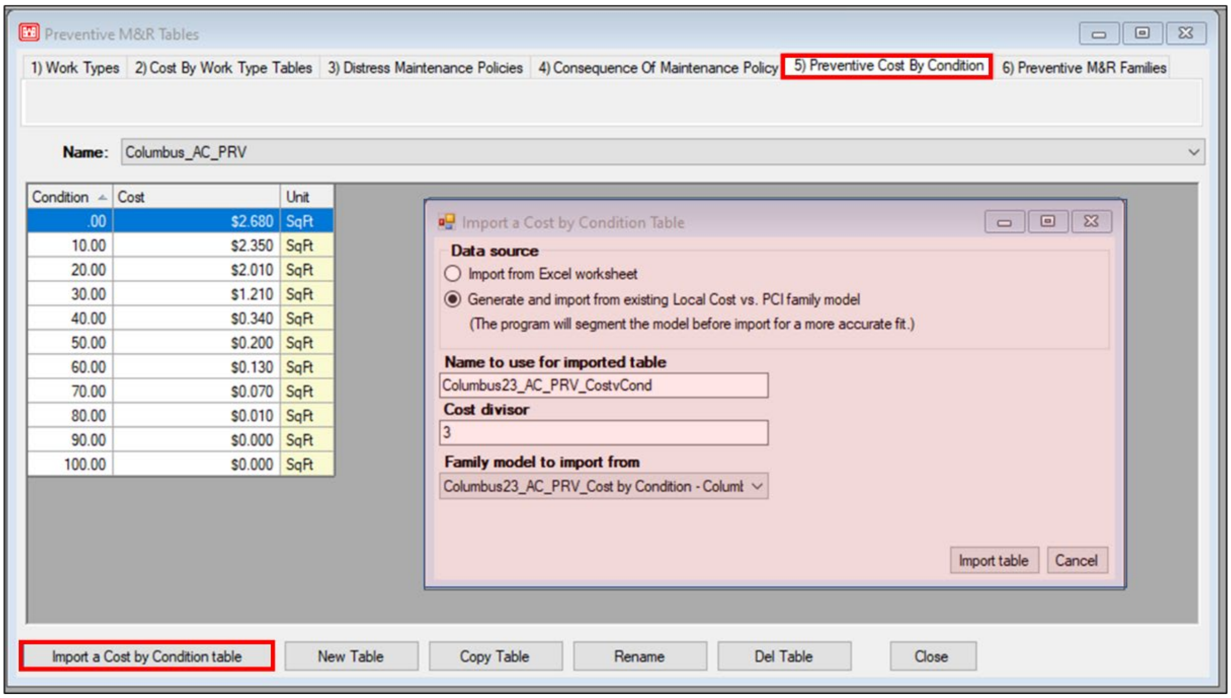
Figure 6-6 Policy Unit Cost per Section Trend Line



6-3.5.2 Cost by Condition Table.

After creating the Local Cost v PCI Family Model, reopen the **M&R Family Models** form, select the **Preventive Cost by Condition** tab (tab 5), then select **Import a Cost by Condition Table**. This opens the form shown in Figure 6-7 from which the user can import the Cost by Condition table from the Family Model or import it from an Excel worksheet. This results in a table that lists the cost by condition at 10-PCI intervals. When doing work planning, PAVER will interpolate the costs between these intervals. Repeat the process to create a separate table for operational AC, preventive AC, operational PCC, and preventive PCC.

Figure 6-7 Cost by Condition Table



6-3.6 Localized M&R Families.

The final step of the localized M&R family model process is creating the M&R families and assigning the distress maintenance policy, cost by work type, and cost by condition tables to the families, then assigning the model to the appropriate sections.

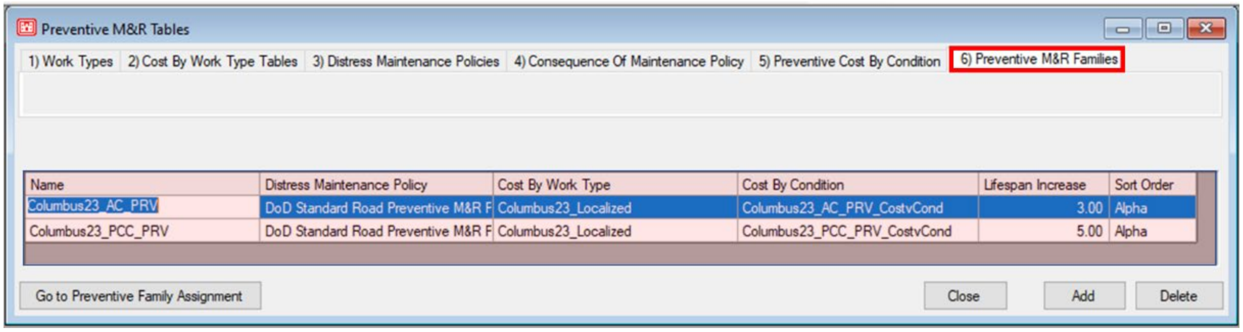
6-3.6.1 Create Localized M&R Families.

Create an asphalt and PCC family for both the preventive and operational M&R categories. Name the families using the standard convention below. Use the acronym STP for operational (aka safety or stopgap) and PRV for preventive.

- Site **NameYr_Pavement Type_M&R Category**
- For example, **Columbus23_AC_PRV**

Assign the tables to the family model using the drop-down in the **Distress Maintenance Policy**, **Cost By Work Type**, and **Cost By Condition** columns to select the appropriate table as shown in Figure 6-8. Delete all old/unused M&R family models and all unused tables.

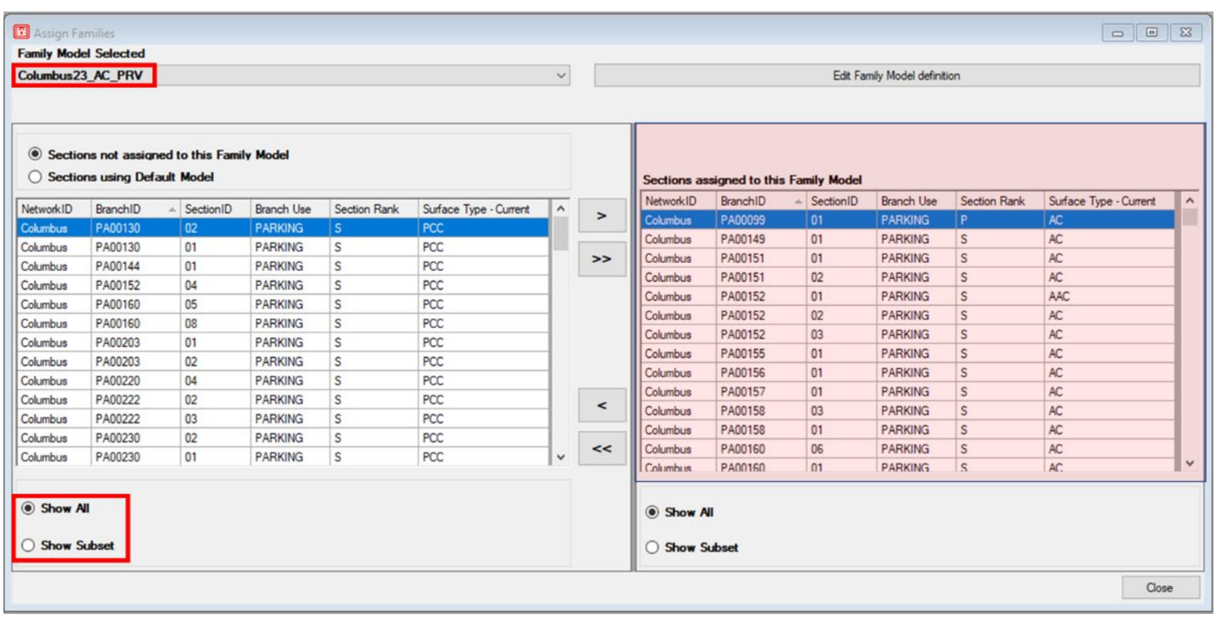
Figure 6-8 Creating a Localized M&R Family



6-3.6.2 Assign Localized M&R Families to Sections.

Use the **Go to Preventive Family Assignment** button in the lower left-hand corner of the form shown in Figure 6-8 to assign family models. Assign each of the M&R families to the appropriate sections. For example, the asphalt preventive family is assigned to all AC sections, as shown in Figure 6-9. Every paved section that was inspected must be assigned to a family. Filter sections using the **Query** tool, then use the arrows to move the selected sections from the unassigned list on the left side of the form in Figure 6-9 to the assigned list on the right. Unpaved or unused sections that did not have a PCI inspection are unassigned. In PAVER you will see these identified as **Sections using the Default Model**. These sections are excluded when running the M&R work plans.

Figure 6-9 Assigning a Localized M&R Family to Section



6-4 GLOBAL M&R TABLES.

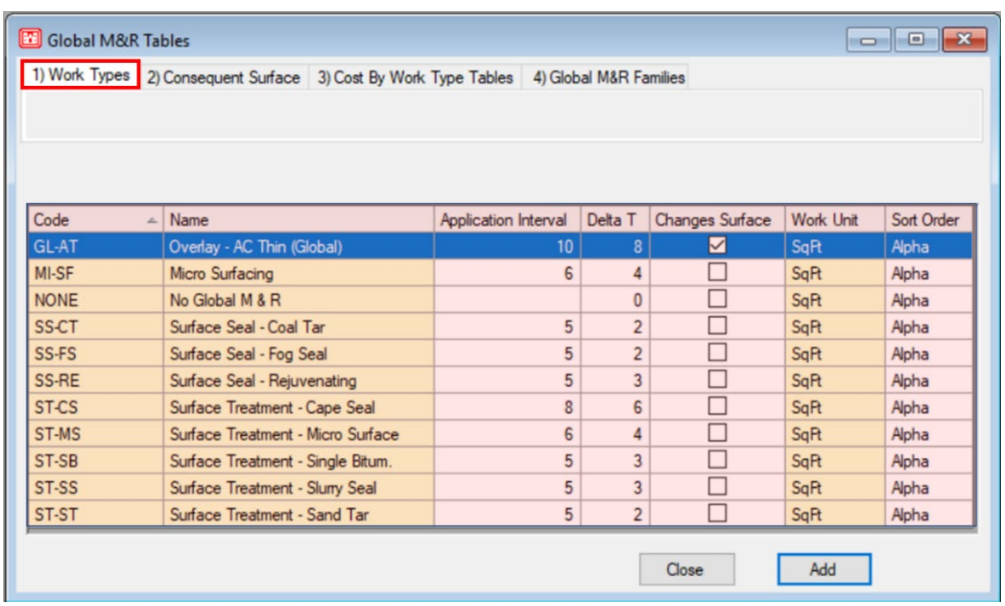
Historically, global M&R applied only to asphalt pavement. This UFC introduces global M&R for concrete pavement joint seals. The global M&R tables define global M&R work planning parameters. Tables include work types, cost by work type, and consequent surface. Standards for these tables are outlined below and in the appendices. In both the condition and time-based approach to global M&R described earlier, M&R is performed on an entire section without regard to the distresses present in that section. PAVER uses the cost by work type table to estimate costs for all future years rather than using a cost by condition table. Note that any localized maintenance identified by PAVER is done in conjunction with global to repair distresses that global maintenance will not address effectively.

6-4.1 Global M&R Work Types.

The Global M&R **Work Types** table (Tab 1) in Figure 6-10 lists standard PAVER work types. While users can create user-defined work types in PAVER, they are not permitted in DoD PAVER databases. Change any user-defined work types in a database to standard work types when doing a new inspection and delete the user-defined work types from the work type table. If a Service requires a new global work type, submit the requirement to the Tri-Service Pavement Working Group for inclusion in PAVER.

The work types shown in Figure 6-10 are used in **Cost By Work Type Tables** (tab 3) and the **Global M&R Families** table (tab 4). The same global work types are used for both airfield and road and parking M&R, although there are different policies for when and where to use these work types. Details for performing most work types are outlined in UFC 3-270-01 and UFC 3-250-03, *Standard Practice Manual for Flexible Pavements*. Table 6-2 provides a description of standard global work types.

Figure 6-10 Global M&R Work Types



Code	Name	Application Interval	Delta T	Changes Surface	Work Unit	Sort Order
GL-AT	Overlay - AC Thin (Global)	10	8	☑	SqFt	Alpha
MI-SF	Micro Surfacing	6	4	☐	SqFt	Alpha
NONE	No Global M & R		0	☐	SqFt	Alpha
SS-CT	Surface Seal - Coal Tar	5	2	☐	SqFt	Alpha
SS-FS	Surface Seal - Fog Seal	5	2	☐	SqFt	Alpha
SS-RE	Surface Seal - Rejuvenating	5	3	☐	SqFt	Alpha
ST-CS	Surface Treatment - Cape Seal	8	6	☐	SqFt	Alpha
ST-MS	Surface Treatment - Micro Surface	6	4	☐	SqFt	Alpha
ST-SB	Surface Treatment - Single Bitum.	5	3	☐	SqFt	Alpha
ST-SS	Surface Treatment - Slurry Seal	5	3	☐	SqFt	Alpha
ST-ST	Surface Treatment - Sand Tar	5	2	☐	SqFt	Alpha

Table 6-2 Global M&R Work Types

Code	Name	Application Interval (yrs.)	Delta T (yrs.)	Work Unit	Description
NONE	No Global M & R	0	0	SqFt	The no global work type allows the user to establish a policy in which there are cases or periods when global M&R is not used; for example, a policy in which Global M&R is not applied to runways.
GL-AT	Overlay - AC Thin (Global)	10	8	SqFt	Thin HMA overlays are commonly used to correct minor to moderate pavement surface defects to restore ride quality and improve friction while protecting the underlying pavement structure. Thin overlays may be applied to either concrete or asphalt pavements or over existing surface treatments and are typically not considered a structural layer. Industry convention generally defines thin overlays as no more than 1.5 to 2 inches thick, typically constructed as a single lift. See UFC 3-250-03 for more information.
GL-FR	Overlay - Fuel-Resistant AC (Global)	10	8	SqFt	Fuel-resistant HMA overlays composed of mineral aggregate, polymer-modified asphalt binder, and additives mixed in a central mixing plant are used as a surface course for locations that need a fuel-resistant surface while protecting the underlying pavement structure. Thin overlays may be applied to either concrete or asphalt pavements and are typically not considered a structural layer when less than 2 inches thick. Industry convention generally defines fuel-resistant overlays as no more than 1.5 to 3 inches thick, constructed as a single lift. See UFGS 32 12 17.19, *Fuel Resistant Asphalt Paving for Airfields - Surface Course*.
JS-CP	Joint Seal – Compression			Ft	This work type specifically addresses replacing compression seals for an entire section(s). The procedure involves removing the old sealant, routing the reservoir to achieve the correct shape factor, cleaning the reservoir, and placing new joint seal. See UFC 3-270-01, Chapter 12.
JS-HP	Joint Seal – Hot Pour			Ft	This work type specifically addresses replacing hot pour sealant for an entire section(s). The procedure involves removing the old sealant, routing the reservoir to achieve the correct shape factor, cleaning the reservoir, and placing new joint seal. See UFC 3-270-01, Chapter 12.

Code	Name	Application Interval (yrs.)	Delta T (yrs.)	Work Unit	Description
JS-SI	Joint Seal - Silicone			Ft	This work type specifically addresses replacing silicone sealant for an entire section(s). The procedure involves removing the old sealant, routing the reservoir to achieve the correct shape factor, cleaning the reservoir, and placing new joint seal. See UFC 3-270-01, Chapter 12.
SS-CT	Surface Seal - Coal Tar	5	2	SqFt	A coal-tar surface seal is a coal-tar emulsion used as a fuel-resistant sealer (FRS), which is a combination of coal-tar emulsion, fine aggregate, water, and occasionally other additives. Consider use only where the need is for a fuel-resistant surface, such as aprons where pavements are subject to fuel spills. These materials are mixed in batches and applied to HMA surfaces by hand, sprayer, or mechanical squeegee. The FRS is placed in thin layers, usually 1/16 inch (2 mm) or less. See UFC 3-250-03, paragraph 4-4. **Important:** Coal tar is a human carcinogen. Consult local and state environmental/safety regulations. Many locations prohibit the use of coal tar products. Verify the selected materials comply with federal, state, and local authority requirements.
SS-FS	Surface Seal - Fog Seal	3	2	SqFt	A fog seal is a light application of diluted asphalt emulsion (including natural asphalt such as Gilsonite), often containing polymer additives. It is used to renew old asphalt surfaces, seal small cracks and surface voids, and inhibit weathering. Consider fog seals for environmental surface distresses such as non-structural cracking or before raveling begins. Continue applying the fog seal on an approximately three-year cycle, depending on environment and pavement condition. Current guidance does not support the use of fog seals on runways without approval. See UFC 3-270-01, paragraph 5-4, and UFC 3-250-03, paragraph 3-4.
SS-RE	Surface Seal - Rejuvenating	5	3	SqFt	A “rejuvenator” is a solvent-based asphalt material (including natural asphalt such as Gilsonite), often containing polymer additives and light oils. They are used for PM to slightly soften and partially restore oxidized pavement surfaces. They do not solve raveling issues or reduce cracking problems. There are numerous commercially available products for use on roads, parking areas, airfield shoulders, and overruns. Current guidance does not support the use of rejuvenators on airfield pavement without approval. See UFC 3-270-01, paragraph 5-4, and UFC 3-250-03, paragraph 3-5.

Code	Name	Application Interval (yrs.)	Delta T (yrs.)	Work Unit	Description
ST-CS	Surface Treatment - Cape Seal	8	6	SqFt	A cape seal is surface treatment in which a bituminous surface treatment (often called a chip seal) is followed by the application of either slurry seal or micro-surfacing. The advantage of this treatment is that the chip seal seals and protects the underlying pavement, while the slurry seal helps to protect the chip seal, locking the chip seal aggregate in place to minimize chip/aggregate loss and providing a smoother final surface. Cape seals are used on roads and parking lots. Do not use cape seals on airfield pavements except for overruns and not within 200 feet (61 m) of the threshold. See guidance on bituminous surface treatment in UFC 3-270-01, Chapter 6, and UFC 3-250-03, Chapter 4.
ST-MS	Surface Treatment - Micro Surface	6	4	SqFt	Microsurfacing is a mixture of polymer-modified asphalt emulsion, crushed dense graded aggregate, mineral filler, additives, and water. It provides a thin resurfacing of 3/8 to 3/4 inch (10 to 20 mm). It is very similar to slurry seal but is typically a more durable treatment. Microsurfacing is primarily used to mitigate raveling and oxidation of asphalt pavement surfaces, but also improves friction and appearance of both asphalt and concrete surfaces. Microsurfacing can be designed with larger aggregate for use in filling shallow to moderate depth ruts in asphalt pavement and can also seal low-severity cracks. See UFC 3-250-03, Chapter 4, and UFC 3-270-01, Chapter 8.
ST-SB	Surface Treatment – Single Bituminous	5	3	SqFt	A single bituminous surface treatment (SBST) consists of a sprayed asphalt application followed immediately by a layer of aggregate. This treatment is used to retard deterioration of raveling, improve skid resistance, seal small cracks, and waterproof the surface on light-traffic roads and parking lots. Do not use SBST on airfield pavements except for overruns and not within 200 feet (61 meters) of the threshold. See UFC 3-270-01, Chapter 6, and UFC 3-250-03, Chapter 4.
ST-DB	Surface Treatment - Double Bituminous				A double bituminous surface treatment (DBST) is essentially the same as the SBST, except that more than one application of binder and aggregate is used. DBSTs are used to retard deterioration of raveling, improve skid resistance, seal small cracks, and waterproof the surface of roads and parking areas. Do not use DBST on airfield pavements except for overruns and not within 200 feet (61 meters) of the threshold. See UFC 3-270-01, Chapter 7, and UFC 3-250-03, Chapter 4.

Code	Name	Application Interval (yrs.)	Delta T (yrs.)	Work Unit	Description
ST-SS	Surface Treatment - Slurry Seal	5	3	SqFt	A slurry seal is a mixture of asphalt emulsion, aggregate, water, and mineral filler applied or screeded onto the pavement surface in a thin layer using squeegees or a spreader box. Slurry seals are used to protect the underlying surface from water infiltration, fill surface cracks and voids, and improve friction and appearance of an existing pavement. Slurry seals do not provide any structural benefit to the pavement but are a very cost-effective treatment for preserving the existing pavement surface, improving appearance, and restoring or enhancing friction. See UFC 3-250-03, Chapter 4, and UFC 3-270-01, Chapter 8.
ST-ST	Surface Treatment - Sand Tar	5	2	SqFt	Sand seal can be used to address a bleeding pavement surface or provide a thin sealer using sprayed application of asphalt emulsion followed by a covering of clean sand or fine aggregate. A pneumatic-tire roller is often used after applying the sand. Excess sand is removed from the pavement surface after rolling.

6-4.2 Global M&R Consequent Surface.

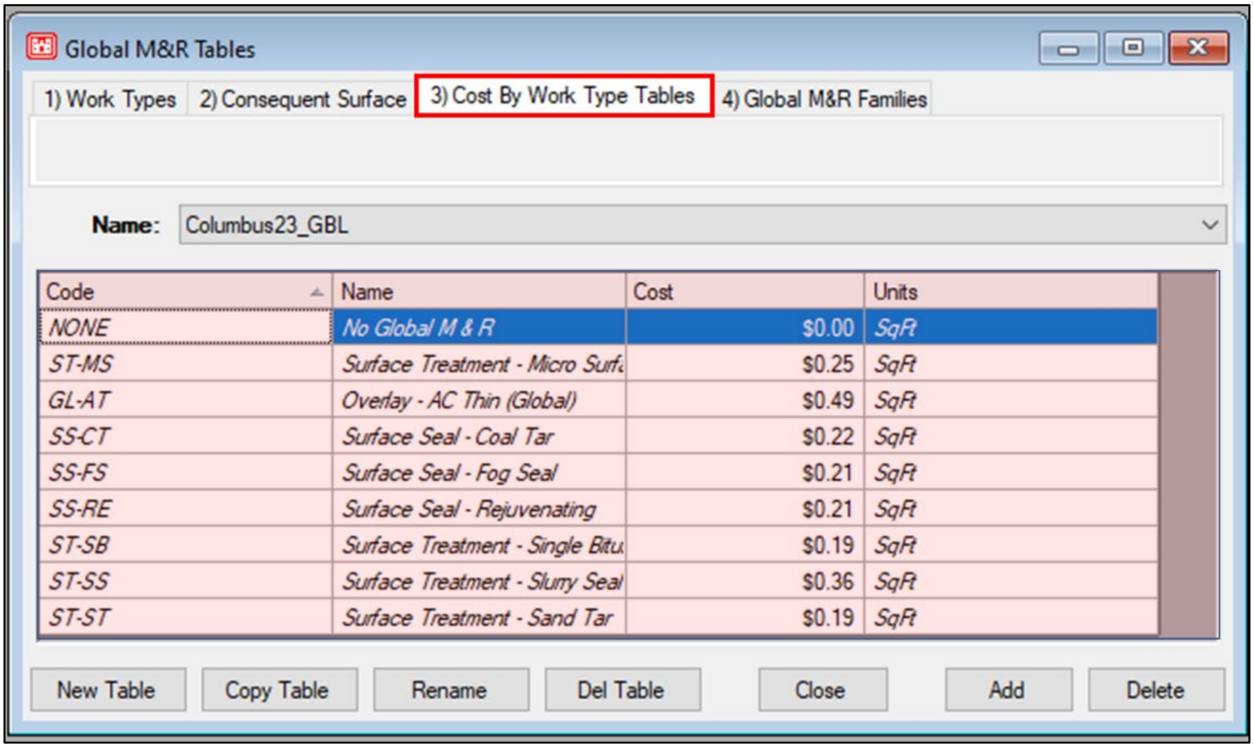
Tab 2 of the Global M&R Tables form defines the consequent (resultant) surface produced when a given work type is performed over different surface types. Only PAVER default surface types and global work types are permitted. Currently, the only work types that result in a change in surface type are Overlay – AC Thin (Global) and Overlay - Fuel-Resistant AC (Global).

6-4.3 Global M&R Cost by Work Type.

Paragraph A-2 includes global cost by work type tables for airfields and roads and parking pavements. Historically, the Services have either had consultants create cost by work type tables that did not follow a specific standard or they created their own standard cost by work type tables and updated them annually for use by their evaluation teams and consultants. This UFC defines the work elements for each of the standard work types. Fully burdened unit costs for each of these work types, including any O&M escalation factors, are generated using Tri-Service Automated Cost Engineering System (TRACES) applications such as the Parametric Cost Engineering System (PACES) or the Micro-Computer Aided Cost Estimating System Second Generation (MII), based on the work element assumptions for each standard work type.

Service evaluation teams and consultants performing PCI surveys use the standard global cost by work type tables for each new PCI survey and apply area cost factors to adjust the standard unit costs for each work type for the specific installation. Adjust these standard cost tables when there is specific cost data available for work types at an installation. When adjusting costs, clearly define and document any changes to specific work component assumptions in the report so users understand the unit cost basis for a given standard work type. Use the updated cost table when developing work plans for a new inspection and delete any cost by work type tables used in previous inspections. An example table is shown in Figure 6-11.

Figure 6-11 Global Cost by Work Type Tables



6-4.4 Global M&R Families.

The final step of the global M&R family model process involves creating the M&R families and assigning the work types and cost by work type tables to the families then assigning the model to the appropriate sections.

6-4.4.1 Create Global M&R Families.

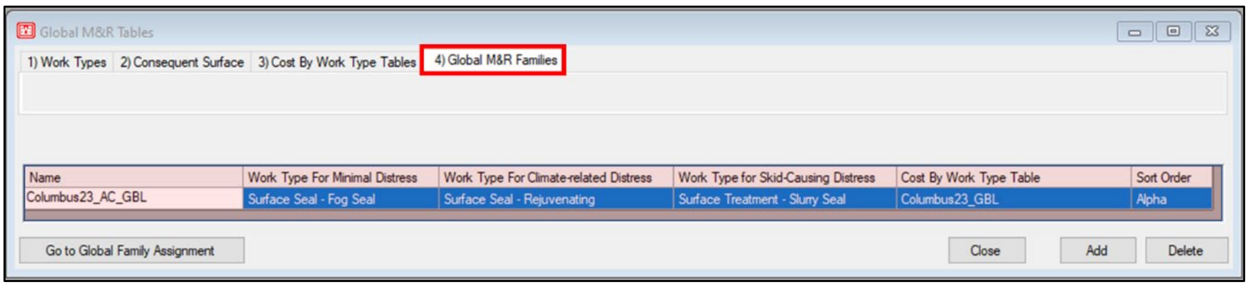
At a minimum, create a global M&R family for AC and one for PCC pavement. It is often desirable to create different global M&R families for pavements with different branch uses when required. For example, a different family can be created for roads than is used for parking pavements. The families are named using the standard convention below. Use the acronym GBL for the M&R category and include the branch use at the end of the name, if used.

- Site **NameYr_Pavement Type_M&R Category**
- For example, **Columbus23_AC_GBL**

6-4.4.2 Global Maintenance Policies.

The process for setting the maintenance policies for global M&R is integral to creating a family. After creating the family, assign the global work type using the drop-down menu for each category shown in Figure 6-12: **Work Type for Minimal Distress**, **Work Type for Climate-related Distress**, and **Work Type for Skid-Causing Distress**. Assigning the **Global Cost by Work Type Table** completes the process. Delete all old or unused global M&R family models and all unused cost by work type tables. Global maintenance policies for airfields and road and parking pavements differ; see the standard global M&R polices in paragraph A-3.3. See details on global policy in UFC 3-270-01 and UFC 3-250-03.

Figure 6-12 Global M&R Maintenance Policy Example



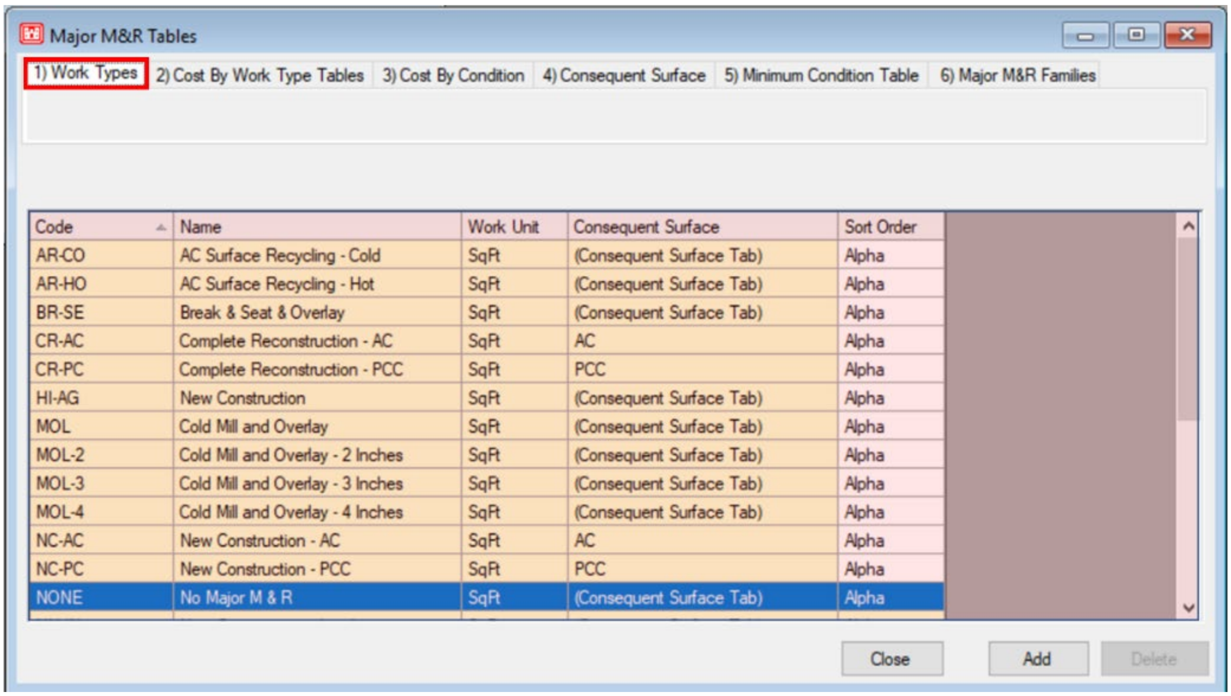
6-4.4.3 Assign Global M&R Families to Sections.

Each of the families created above are assigned to the appropriate sections. For example, assign all asphalt sections in a road and parking network to the global AC family model. Every paved section that was inspected must be assigned to a family. The default family model can be used for unpaved or unused sections as well as sections that did not have a PCI inspection, but these sections are excluded using the **Query** tool when running M&R work plans.

6-5 MAJOR M&R TABLES.

The major M&R tables define major M&R work planning parameters. Figure 6-13 shows the **Major M&R Tables** form. Tables include **Work Types** (tab 1), **Cost By Work Type Tables** (tab 2), **Cost By Condition** (tab 3), **Consequent Surface** (tab 4), and **Minimum Condition Table** (tab 5). **Major M&R Families** are defined on tab 6 using the tables on tabs 1 through 5. Standards for these tables are outlined below and in the appendices.

Figure 6-13 Major M&R Tables



Code	Name	Work Unit	Consequent Surface	Sort Order
AR-CO	AC Surface Recycling - Cold	SqFt	(Consequent Surface Tab)	Alpha
AR-HO	AC Surface Recycling - Hot	SqFt	(Consequent Surface Tab)	Alpha
BR-SE	Break & Seat & Overlay	SqFt	(Consequent Surface Tab)	Alpha
CR-AC	Complete Reconstruction - AC	SqFt	AC	Alpha
CR-PC	Complete Reconstruction - PCC	SqFt	PCC	Alpha
HI-AG	New Construction	SqFt	(Consequent Surface Tab)	Alpha
MOL	Cold Mill and Overlay	SqFt	(Consequent Surface Tab)	Alpha
MOL-2	Cold Mill and Overlay - 2 Inches	SqFt	(Consequent Surface Tab)	Alpha
MOL-3	Cold Mill and Overlay - 3 Inches	SqFt	(Consequent Surface Tab)	Alpha
MOL-4	Cold Mill and Overlay - 4 Inches	SqFt	(Consequent Surface Tab)	Alpha
NC-AC	New Construction - AC	SqFt	AC	Alpha
NC-PC	New Construction - PCC	SqFt	PCC	Alpha
NONE	No Major M & R	SqFt	(Consequent Surface Tab)	Alpha

6-5.1 Major M&R Work Types.

The **Work Types** Table (tab 1) in Figure 6-13 lists a set of standard Major M&R work types. While users can create user-defined major M&R work types in PAVER, they are not permitted in DoD PAVER databases. Change any user-defined work types in an existing database to standard work types and delete the user-defined work types from the Major M&R Work Type table when defining planning parameters for a new inspection. If a Service requires a work type that is not in the major M&R work type table, they will submit the requirement to the Tri-Service Pavement Working Group for inclusion in PAVER.

Work types in Table 6-3 are used in the **Cost By Work Type Tables** (tab 2) and **Consequent Surface** tables (tab 4). This work type table is used for airfield and road and parking M&R, but implementation varies according to this UFC, UFC 3-250-03, UFC 3-250-04, *Standard Practice for Concrete Pavements*, UFC 3-260-02, and UFC 3-250-01, *Pavement Design for Roads and Parking Areas*.

Table 6-3 Major M&R Work Types

Code	Name	Work Unit	Description
AR-CO	AC Surface Recycling - Cold	SqFt	Cold-mix recycling involves removing the existing asphalt, crushing to specified particle size, mixing with virgin material, and using it to pave secondary roads or parking areas (if a seal coat is applied) or as a base course. See UFC 3-250-07 and UFC 3-270-01.
AR-HO	AC Surface Recycling - Hot	SqFt	Hot-mix recycling involves removing the existing HMA, crushing it, and mixing it in a hot-mix plant with new aggregate, asphalt, and recycling agent, when required. This work type can be used for airfields (with restrictions noted in UFC 3-260-02), roads, or parking areas. This work type can also be accomplished with in-place recycling. See UFC 3-250-07 and UFC 3-270-01.
BR-SE	Break & Seat & Overlay	SqFt	Break and seat and crack and seat are both fractured slab technologies used on concrete pavement. Both minimize the size of the concrete slabs and then seat the broken concrete pieces. The pavement is then overlaid with HMA. See Asphalt Institute MS-4, *The Asphalt Handbook*, and MS-17, *Asphalt Overlays for Highway and Street Rehabilitation*.
BR-RB	Rubblization & Overlay	SqFt	Rubblization is a fractured slab technology used on concrete pavement. It eliminates the slab movement by converting the old concrete pavement to aggregate-size pieces. The resulting rubblized pavement layer functions as an aggregate base course. The pavement is then overlaid with HMA. This work type assumes the subgrade is strong enough for the process to work correctly, e.g., the subgrade will not quicken due to pore pressure and thus weaken it and that an underdrain design is installed prior to rubblization to relieve pore pressure and prevent settlement (unless the geotechnical analysis indicates an underdrain is not required). Ensure a geotechnical assessment is done before using rubblization. See Asphalt Institute manuals MS-4 and MS-17.
CR-AC-4	Complete Reconstruction, 4 inches AC	SqFt	Complete reconstruction AC-4 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new AC layer are greater than 2 inches and less than or equal to 4 inches, the existing and new base are equal to 6 inches, and there is no subbase. See 3-260-02 and UFC 3-250-03.

Code	Name	Work Unit	Description
CR-AC-6	Complete Reconstruction, 6 inches AC	SqFt	Complete reconstruction AC-6 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new AC layer are greater than 4 inches and less than or equal to 6 inches, the existing and new base are equal to 6 inches, and there is a 4-inch subbase. See 3-260-02 and UFC 3-250-03.
CR-AC-8	Complete Reconstruction, 8 inches AC	SqFt	Complete reconstruction AC-8 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new AC layer are greater than 6 inches and less than or equal to 8 inches, the existing and new base are equal to 8 inches, and there is a 6-inch subbase. See 3-260-02 and UFC 3-250-03.
CR-PC-8	Complete Reconstruction, 8 inches PCC	SqFt	Complete reconstruction PC-8 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new PCC layer are greater than 6 inches and less than or equal to 8 inches, the existing and new base are greater than 4 inches and less than or equal to 6 inches. See 3-260-02 and UFC 3-250-04.
CR-PC-12	Complete Reconstruction, 12 inches PCC	SqFt	Complete reconstruction PC-12 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new PCC layer are greater than 8 inches and less than or equal to 12 inches, the existing and new base are equal to greater than 6 inches and less than or equal to 8 inches. See 3-260-02 and UFC 3-250-04.
CR-PC-18	Complete Reconstruction, 18 inches PCC	SqFt	Complete reconstruction PC-18 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new PCC layer are greater than 12 inches and less than or equal to 18 inches, the existing and new base are greater than 8 inches and less than or equal to 12 inches. See 3-260-02 and UFC 3-250-04.
CR-PC-24	Complete Reconstruction, 24 inches PCC	SqFt	Complete reconstruction PC-24 involves removing the existing pavement structure to the subgrade and replacing it. The assumption for this work type is that both the existing and new PCC layer are greater than 18 inches and less than or equal to 24 inches, the existing and new base are greater than 12 inches and less than or equal to 16 inches. See 3-260-02 and UFC 3-250-04.

Code	Name	Work Unit	Description
HI-AG	New Construction	SqFt	This PAVER work type does not have a specific pavement type and is not used by DoD. If included in a DoD database, replace it with the appropriate work type for the section based on the pavement type.
MOL	Cold Mill and Overlay	SqFt	This PAVER work type does not define a specific pavement thickness and is not used by DoD. If included in a DoD database, replace it with the appropriate work type for the section based on the asphalt pavement thickness.
MOL-2	Cold Mill and Overlay - 2 Inches	SqFt	This work type involves milling 2 inches of the existing asphalt surface and replacing it with 2 inches of HMA. See UFC 3-250-07 and UFC 3-260-02.
MOL-3	Cold Mill and Overlay - 3 Inches	SqFt	This work type involves milling 3 inches of the existing asphalt surface and replacing it with 3 inches of HMA. See UFC 3-250-07 and UFC 3-260-02.
MOL-4	Cold Mill and Overlay - 4 Inches	SqFt	This work type involves milling 4 inches of the existing asphalt surface and replacing it with 4 inches of HMA. See UFC 3-250-07 and UFC 3-260-02.
NC-AC-4	New Construction, 4 inches AC	SqFt	New construction AC-4 involves constructing a new AC pavement structure. The assumption for this work type is that the AC layer is greater than 2 inches and less than or equal to 4 inches, the base is equal to 6 inches, and there is no subbase. See UFC 3-250-03 and UFC 3-260-02.
NC-AC-6	New Construction, 6 inches AC	SqFt	New construction AC-6 involves constructing a new AC pavement structure. The assumption for this work type is that the AC layer is greater than 4 inches and less than or equal to 6 inches, the base is equal to 6 inches, and there is a 4-inch subbase. See UFC 3-250-03 and UFC 3-260-02.
NC-AC-8	New Construction, 8 inches AC	SqFt	New construction AC-8 involves constructing a new AC pavement structure. The assumption for this work type is that the AC layer is greater than 6 inches and less than or equal to 8 inches, the base is equal to 8 inches, and there is a 6-inch subbase. See UFC 3-250-03 and UFC 3-260-02.
NC-PC-8	New Construction, 8 inches PCC	SqFt	New construction PC-8 involves constructing a new PCC pavement structure. The assumption for this work type is that the PCC layer is greater than 6 and less than or equal to 8 inches, the base is greater than 4 inches and less than or equal to 6 inches. See UFC 3-250-04 and UFC 3-260-02.

Code	Name	Work Unit	Description
NC-PC-12	New Construction, 12 inches PCC	SqFt	New construction PC-12 involves constructing a new PCC pavement structure. The assumption for this work type is that the PCC layer is greater than 8 and less than or equal to 12 inches, the base is greater than 6 inches and less than or equal to 8 inches. See UFC 3-250-04 and UFC 3-260-02.
NC-PC-18	New Construction, 18 inches PCC	SqFt	New construction PC-18 involves constructing a new PCC pavement structure. The assumption for this work type is that the PCC layer is greater than 12 and less than or equal to 18 inches, the base is greater than 8 inches and less than or equal to 12 inches. See UFC 3-250-04 and UFC 3-260-02.
NC-PC-24	New Construction, 24 inches PCC	SqFt	New construction PC-24 involves constructing a new PCC pavement structure. The assumption for this work type is that the PCC layer is greater than 18 and less than or equal to 24 inches, the base is greater than 12 inches and less than or equal to 16 inches. See UFC 3-250-04 and UFC 3-260-02.
NONE	No Major M & R	SqFt	When a pavement is above the critical PCI there is typically no major M&R requirement unless the pavement is being overlaid to increase the structural capacity such as when there is a mission change or when the usage pattern of a road is changed.
NU-IN	New Construction - Initial	SqFt	This is the default work type used when a new section is created. If there is no other major M&R in the work history, this item cannot be updated to reflect the specific construction, e.g., New Construction AC, but the material type field can be edited and the surface type is defined in the inventory.
NU-US	New Construction - Unsurfaced	SqFt	New construction unsurfaced involves constructing a new unpaved (gravel) structure. The assumption for this work type is that the aggregate wearing surface layer is 4 inches and the base is 6 inches.
OL-AF	Overlay - AC Fabric	SqFt	This work type involves placing an overlay to address pavement surface distresses and/or to increase the structural capability of a pavement. This overlay includes the use of a geofabric to mitigate reflective cracking issues and assumes a 2-inch overlay thickness. When thicknesses are less than or greater than these values, adjust the cost for this work type proportionately. See UFC 3-250-03 and UFC 3-260-02.

Code	Name	Work Unit	Description
OL-AS	Overlay - AC Structural	SqFt	This work type involves placing an overlay to address the surface condition of the pavement and/or to increase the structural capability of a pavement. It assumes a 4-inch overlay thickness. When the thickness is less than or greater than this, adjust the cost for this work type proportionately. See UFC 3-250-03 and UFC 3-260-02.
OL-AT	Overlay - AC Thin	SqFt	This work type involves placing an overlay to address the surface condition of the pavement but does not typically significantly increase the structural capability of a pavement. It assumes a 2-inch overlay thickness. See UFC 3-250-03 and UFC 3-260-02.
OL-PF	Overlay - PCC Fully Bonded	SqFt	This work type involves placing a fully bonded PCC overlay to increase the structural capability of a pavement. This overlay type is typically used when the existing slab is in Good condition. Action must be taken to ensure the bond. It assumes an overlay thickness greater than 2 inches and less than 5 inches. See UFC 3-250-04, Appendix B, and UFC 3-260-02.
OL-PP	Overlay - PCC Partially Bonded	SqFt	This work type involves placing a partially bonded PCC overlay to increase the structural capability of a pavement but may be used to address other issues. This overlay type is typically used when the existing slab is in Fair to Good condition. It assumes an overlay thickness of 6 inches. See UFC 3-260-02.
OL-PU	Overlay - PCC Unbonded	SqFt	This work type involves placing a bond breaker and a PCC overlay to increase the structural capability of a pavement but may be used to address other issues. This overlay type is typically used when the existing slab is in Poor to Fair condition. It assumes an overlay thickness of 6 inches. See UFC 3-260-02.
SR-AC	Surface Reconstruction - AC	SqFt	This work type involves milling the full depth of the existing asphalt surface, scarifying and recompacting the base, and placing HMA. The assumption for this work type is that the asphalt is 4 inches. When thicknesses are less than or greater than these values, adjust the cost for this work type proportionately. See UFC 3-250-07 and UFC 3-260-02.

Code	Name	Work Unit	Description
SR-PC	Surface Reconstruction - PCC	SqFt	This work type involves removing existing PCC, repairing and recompacting the base, and placing plain, jointed concrete. It assumes the pavement thickness for the existing and new concrete is greater than 6 inches and less than 8 inches. When thicknesses are greater than these values, adjust the cost for this work type proportionately. See UFC 3-250-04 and UFC 3-260-02.
SU-AC	Surface Course - AC	SqFt	This PAVER work type is intended to be used when defining work requirements for the AC surface course and leveling course separately. It is not used by DoD. If included in a DoD database, replace it with the appropriate work type for the section based on one of the approved asphalt pavement work types.
SU-DB	Surface Course - Double Bituminous.	SqFt	A double bituminous surface course is essentially the same as the single bituminous surface course, except that more than one application of binder and aggregate is used. It is not used on airfield pavements except for overruns and not within 200 feet (61 meters) of the threshold. See UFC 3-270-01, Chapter 7, and UFC 3-250-03, Chapter 4.
SU-PC	Surface Course - PCC	SqFt	This PAVER work type is intended to be used when defining work requirements for the surface course and a base course separately. It is not used by DoD. If included in a DoD database, replace it with the appropriate work type for the section based on one of the approved asphalt pavement work types.
SU-PF	Surface Course - Porous Friction	SqFt	A porous friction course is an open-graded, free-draining asphalt mixture that can be placed on an existing pavement to minimize hydroplaning and improve skid resistance. See UFC 3-260-02, Chapter 21, and UFC 3-250-03, Chapter 2.

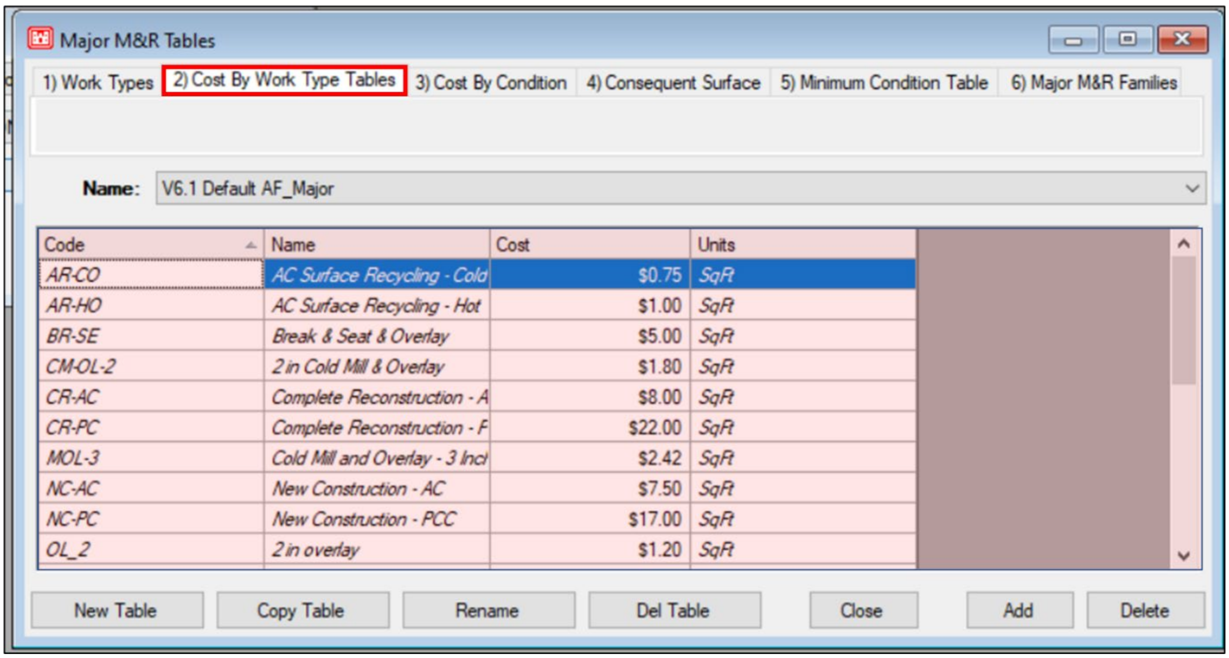
6-5.2 Major M&R Cost by Work Type.

This UFC defines the work elements for each of the standard work types. These work elements are used to define standard Major M&R cost by work type tables for airfields and roads and parking pavements. Paragraph A-2 includes cost by work type templates.

Service Evaluation Teams will update standard cost by work type tables annually using RS Means cost data or Tri-Service Automated Cost Engineering System (TRACES) applications such as the Parametric Cost Engineering System (PACES) or the Micro-Computer Aided Cost Estimating System Second Generation (MII). Use fully burdened unit costs for each of these work types, including O&M escalation factors.

Service Evaluation Teams and consultants performing a PCI survey apply the area cost factor published for that location (e.g., in RS Means) for each work type in the standard tables to adjust the standard unit costs for the specific installation. When there is specific cost data available at an installation for a specific work type, adjust the cost tables to reflect the known costs. Document changes to work component assumptions for a given standard work type in the report so clearly understand the unit cost basis. Use the most recent cost table when defining work planning parameters for a new inspection and delete any cost by work type tables used in previous inspections. An example table is shown in Figure 6-14.

Figure 6-14 Major M&R Cost by Work Type Table



6-5.3 Major M&R Cost by Condition.

After completing the PCI survey, updating the work types and cost by work type tables, and assigning the M&R families, run a “One-year Unconstrained Budget” work plan for Major M&R on asphalt and one for concrete without “major above critical,” as described in Chapter 7.

After running the work plan, select the **Funding Detail Table (all sections)** work plan view and export it to Excel. In Excel, unhide all columns, create a column to compute the major M&R unit cost (Major Under Critical Funded / True Area) for each section, then delete the remaining unneeded columns to create a report like the one in Figure 6-15. Create a scatter plot of the unit cost versus the condition, use the Excel trend line function to create a best-fit curve for the data as shown in Figure 6-16, and display the equation. Use the equation that describes the cost by condition relationship to create the cost by condition table at a minimum of 10-PCI intervals from 0 to 100. Adjust the costs to reflect $0 at PCI 100. Use the unit cost of reconstruction for all PCI values below the Service-defined trigger point PCI for reconstruction. PAVER will interpolate the costs between the intervals when you are above this point at which reconstruction is recommended. Repeat the process to create a separate table for both AC and PCC pavement and populate the cost by condition tables in PAVER.

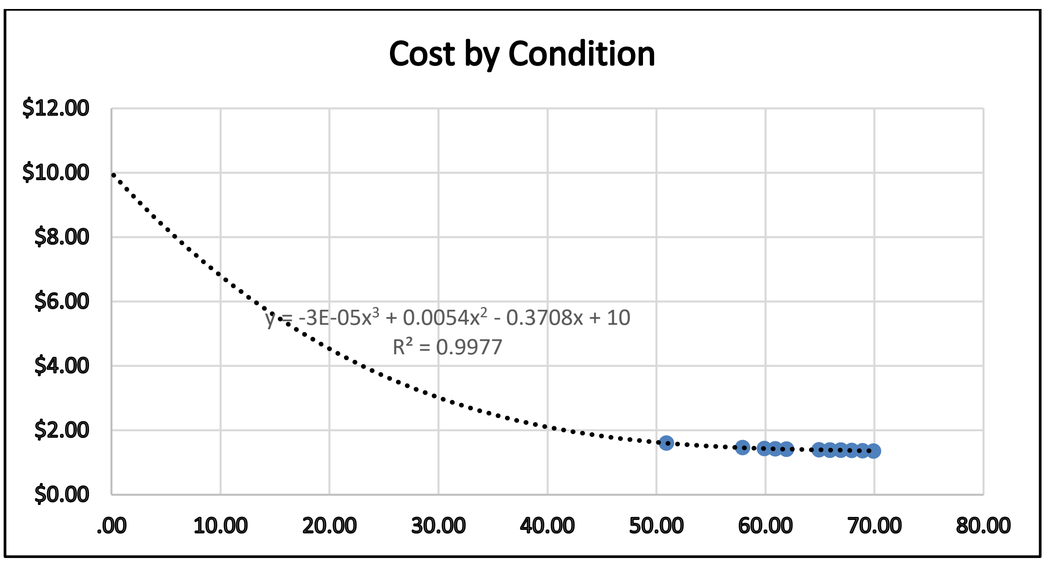
Figure 6-15 Major M&R Funding by Section

Funding Detail Table (all sections)

Network ID	Branch ID	Section ID	Date	Avg Of Condition Before	Avg Of Condition After	True Area	Major Under Critical Funded
Keesler	TWA	T07A	1/5/2020	83.90	83.90	50,600	$0.00
Keesler	AP1	A05B	1/5/2020	81.90	81.90	67,849.65	$0.00
Keesler	APOVERFLOW	A28B	1/5/2020	71.81	71.81	9,797	$0.00
Keesler	TWA	T05A	1/5/2020	69.90	100.00	111,720	$152,028.27
Keesler	RW0321	R07C2	1/5/2020	68.90	100.00	36,504.75	$49,929.92
Keesler	AP2	A34B	1/5/2020	67.90	100.00	51,675	$71,039.31
Keesler	RW0321	R09C1	1/5/2020	66.90	100.00	6,000	$8,290.20
Keesler	AP1	A17B	1/5/2020	66.90	100.00	44,040	$60,850.09
Keesler	AP2	A08B	1/5/2020	66.90	100.00	10,000	$13,817.00
Keesler	RW0321	R08C1	1/5/2020	65.90	100.00	56,250	$78,112.59
Keesler	RW0321	R08C2	1/5/2020	65.90	100.00	56,250	$78,112.59
Keesler	RW0321	R05C1	1/5/2020	65.90	100.00	123,997.5	$172,191.38
Keesler	RW0321	R07C1	1/5/2020	65.90	100.00	36,504.75	$50,692.99
Keesler	RW0321	R05C2	1/5/2020	65.90	100.00	126,247.5	$175,315.89
Keesler	RW0321	R06C2	1/5/2020	64.90	100.00	2,250	$3,140.18
Keesler	OAREFUELER	A31C	1/5/2020	63.16	63.16	104,859.8	$0.00
Keesler	RW0321	R04A1	1/5/2020	61.90	100.00	30,000	$42,496.17
Keesler	AP1	A19B	1/5/2020	61.90	100.00	12,900	$18,273.35
Keesler	RW0321	R06C1	1/5/2020	61.90	100.00	4,500	$6,374.43

Close

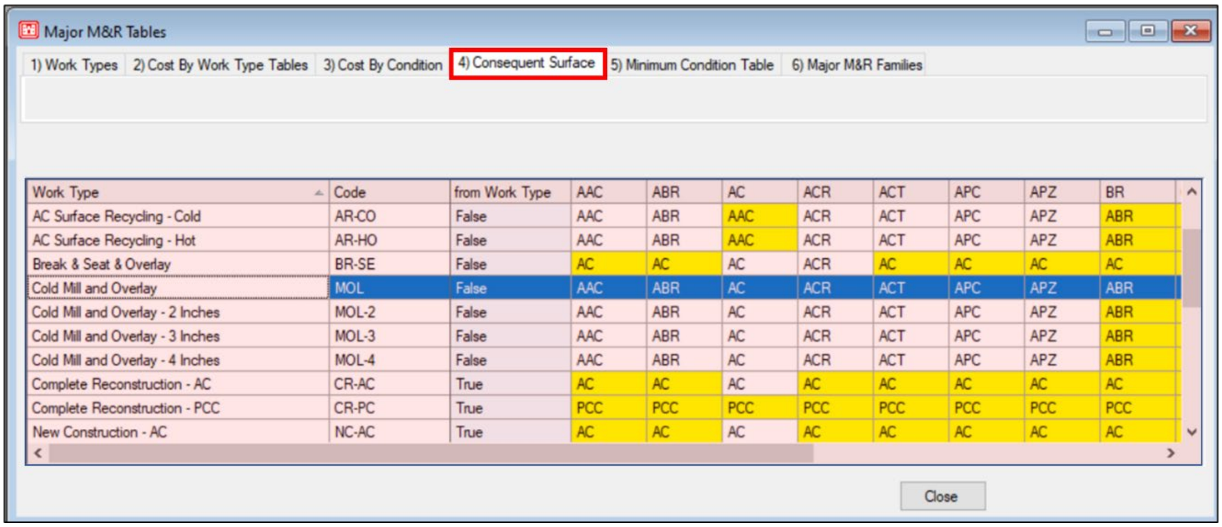
Figure 6-16 Major M&R Unit Cost by Condition Trend Line



6-5.4 Major M&R Consequent Surface.

The Major M&R Consequent Surface table defines the consequent (resultant) surface produced when a given work type is performed over different surface types. Only PAVER default surface types and Major M&R work types are permitted. Go to **System Tables and Tools**>>**Edit Inventory Picklists**>>**Engineering Fields** and delete any user-defined surface types from the database when doing a new PCI evaluation. Figure 6-17 shows an example consequent surface table.

Figure 6-17 Major M&R Consequent Surface Table



Work Type	Code	from Work Type	AAC	ABR	AC	ACR	ACT	APC	APZ	BR
AC Surface Recycling - Cold	AR-CO	False	AAC	ABR	AAC	ACR	ACT	APC	APZ	ABR
AC Surface Recycling - Hot	AR-HO	False	AAC	ABR	AAC	ACR	ACT	APC	APZ	ABR
Break & Seat & Overlay	BR-SE	False	AC	AC	AC	ACR	AC	AC	AC	AC
Cold Mill and Overlay	MOL	False	AAC	ABR	AC	ACR	ACT	APC	APZ	ABR
Cold Mill and Overlay - 2 Inches	MOL-2	False	AAC	ABR	AC	ACR	ACT	APC	APZ	ABR
Cold Mill and Overlay - 3 Inches	MOL-3	False	AAC	ABR	AC	ACR	ACT	APC	APZ	ABR
Cold Mill and Overlay - 4 Inches	MOL-4	False	AAC	ABR	AC	ACR	ACT	APC	APZ	ABR
Complete Reconstruction - AC	CR-AC	True	AC	AC	AC	AC	AC	AC	AC	AC
Complete Reconstruction - PCC	CR-PC	True	PCC	PCC	PCC	PCC	PCC	PCC	PCC	PCC
New Construction - AC	NC-AC	True	AC	AC	AC	AC	AC	AC	AC	AC

6-5.5 Major M&R Minimum Condition.

The Major M&R Minimum Condition table allows the user to set the minimum acceptable condition for each year. Update this table when a Minimum Condition M&R Work Plan is required when doing M&R Work Planning. Note that the Services do not typically use Minimum Condition M&R Work Plans.

6-5.6 Major M&R Families.

The final steps of the major M&R family model process involve creating the M&R family, assigning the minimum condition and cost by condition tables to the family, and then assigning the model to the appropriate sections.

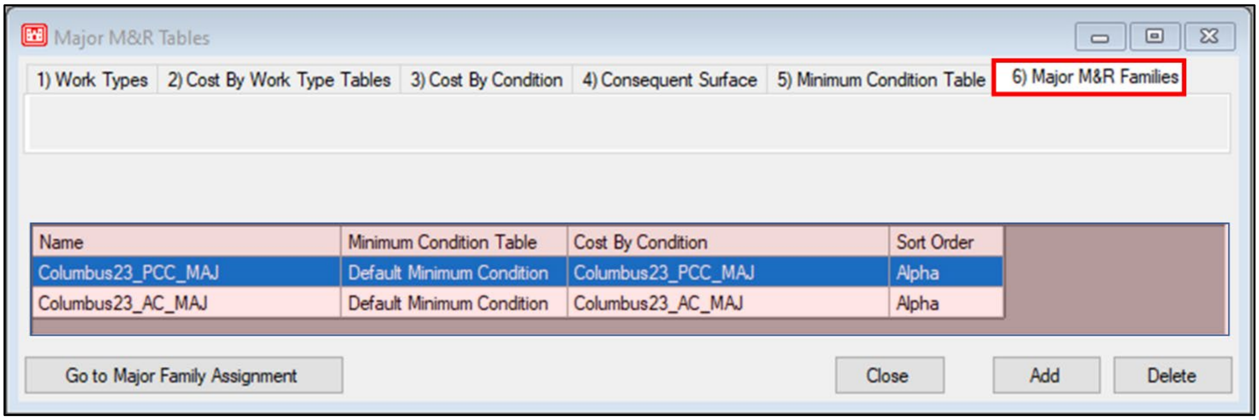
6-5.6.1 Create Major M&R Families.

Add an asphalt and PCC family using the standard convention below, with the acronym MAJ for major M&R.

- Site **NameYr_Pavement Type_M&R Category**
- For example, **Columbus23_AC_MAJ**

Assign the default minimum condition table to the major M&R family and assign the appropriate cost by condition table created in the previous section using the drop-down in the **Minimum Condition Table** and **Cost By Condition** columns as shown in Figure 6-18. Delete all old or unused major M&R family models and all unused tables.

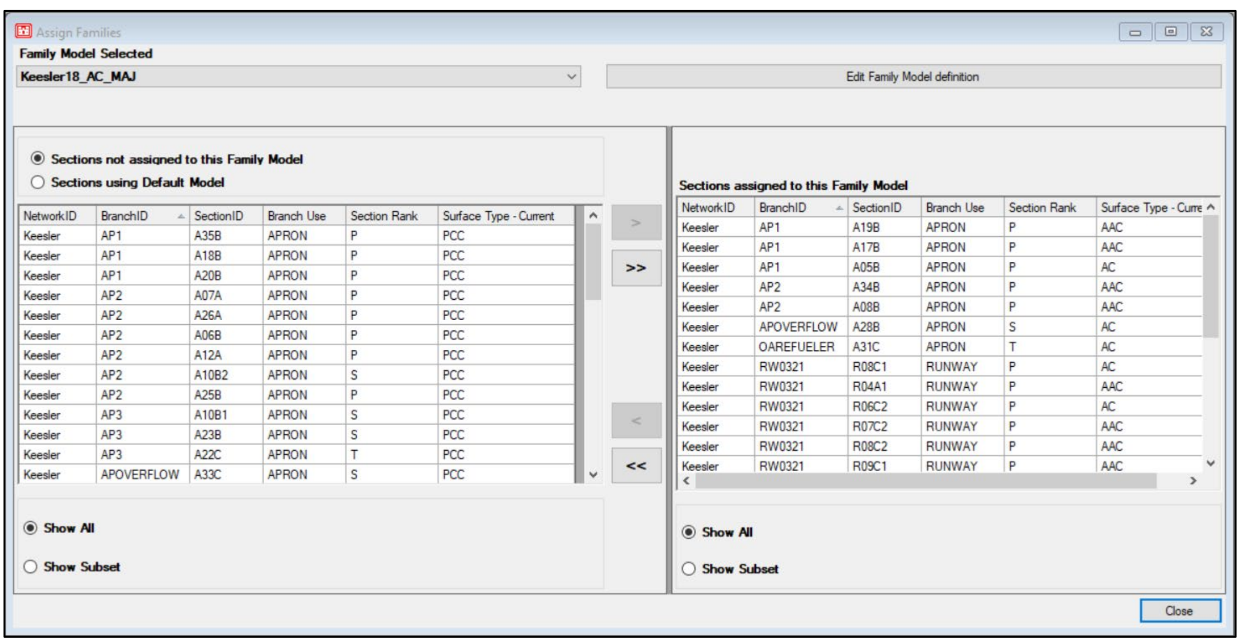
Figure 6-18 Major M&R Families



6-5.6.2 Assign Major M&R Families to Sections.

Each of the families created above are assigned to the appropriate sections by selecting the **Go to Major Family Assignment** button. For example, the asphalt major M&R family is assigned to all AC sections using the PAVER query tool. Open the query tool by selecting the **Show Subset** radio button in Figure 6-19. Assign a family to every paved section that was inspected. Unpaved or unused sections and sections that did not have a PCI inspection may be assigned to the default family model and excluded when running the M&R work plans.

Figure 6-19 Assign Sections to Major M&R Families

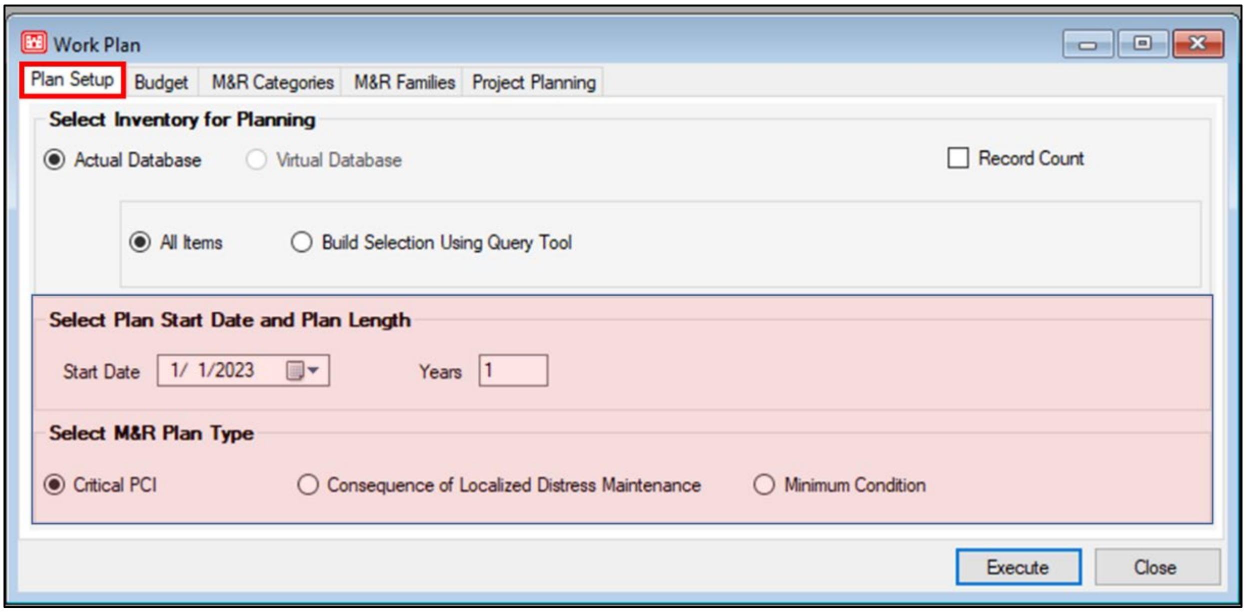


CHAPTER 7 MAINTENANCE AND REPAIR WORK PLANNING

7-1 INTRODUCTION.

M&R work plans outline the M&R requirements for each section based on the assigned PCI deterioration families, M&R family models, and parameters defined on the five work plan tabs as shown in Figure 7-1. The Services use several standard work plans described in this chapter, including consequence of localized distress maintenance, one-year unconstrained, eliminate backlog, maintain current condition, and operational (stopgap/safety) only.

Figure 7-1 M&R Work Plan Form



7-2 WORK PLAN SETUP.

Use the **Plan Setup** tab shown in Figure 7-1 to define the sections included in the work plan, set the plan start date and length, and select the M&R plan type. The other tabs and options shown on these tabs will change based on the selected M&R plan type.

7-2.1 Select Sections for Planning.

Standard practice is to use the **Actual Database** option to run work plans. When all sections in the inventory are inspected and assigned to families, use the **All Items** option, as shown in Figure 7-1. When there are sections that were not inspected or assigned to families, filter these sections using the **Build Selection Using Query Tool** option. The **Virtual Database** option runs work plans on aggregated sections in a virtual inventory. This option is not typically used for individual installations but is useful when analyzing rollup databases. This option is only active when the user creates a virtual inventory (database).

7-2.2 Select Plan Start Date and Plan Length.

As shown in Figure 7-1, standard practice is to use January first of the year following the current inspection year as the plan start date. Run both the Critical PCI Unconstrained work plan and the Consequence of Localized Distress Maintenance work plan for one year. Run Constrained Critical PCI work plans for a minimum of five years as described in paragraph 7.5.4 or for longer periods to meet Service-specific requirements.

7-2.3 Select M&R Plan Type.

There are three M&R work plan types as shown in Figure 7-1: **Critical PCI**, **Consequence of Localized Distress Maintenance**, and the **Minimum Condition** work plans. Each is described below.

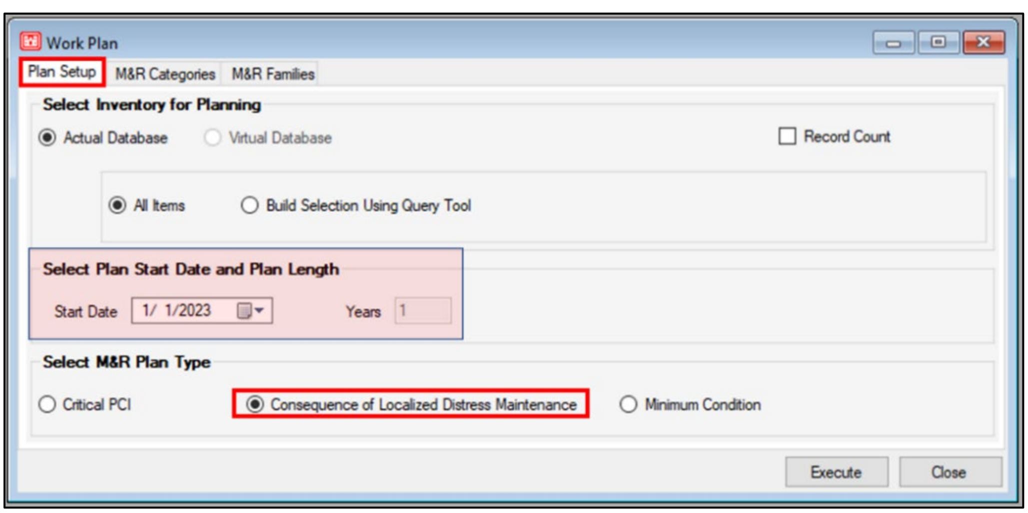
7-3 MINIMUM CONDITION WORK PLAN.

The minimum condition work plan lets the user set the lowest pavement condition (PCI) that is allowed per year using the minimum condition table (defined in the major M&R family model). The Services do not use the Minimum Condition work plan, so this UFC does not discuss the details of the Minimum Condition approach.

7-4 CONSEQUENCE OF LOCALIZED DISTRESS MAINTENANCE.

The consequence of localized distress maintenance work plan generates a list of all the localized work requirements based on the assigned distress maintenance policy, calculates the cost of each requirement based on the cost by work type tables, and computes the resulting conditions when the distresses are repaired based on the consequence of maintenance policy. The plan is set to one year by default, as shown in Figure 7-2, and is based on the PCI data from the most recent inspection. Note, the **Budget** and **Project Planning** tabs are not used when running a Consequence of Localized Distress Maintenance work plan.

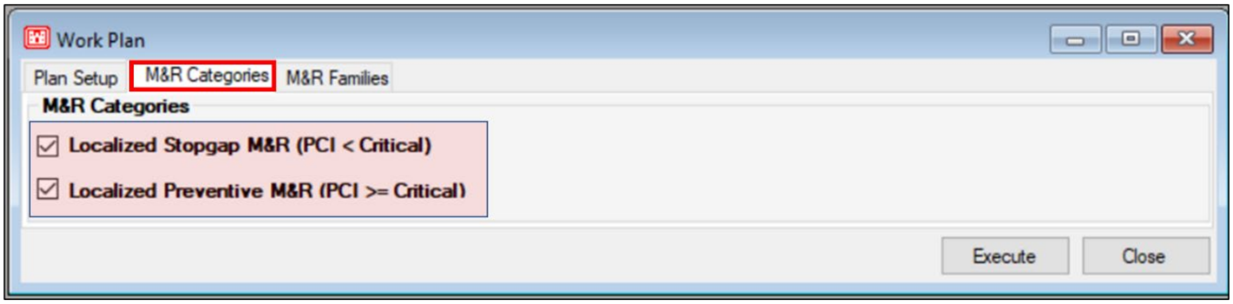
Figure 7-2 Consequence of Localized Distress Maintenance Work Plan



7-4.1 M&R Categories Tab.

Select both **Localized Stopgap M&R** and **Localized Preventive M&R** when running the consequence of localized distress maintenance work plan. Note that global and major M&R are not options on this tab since the focus is on localized M&R.

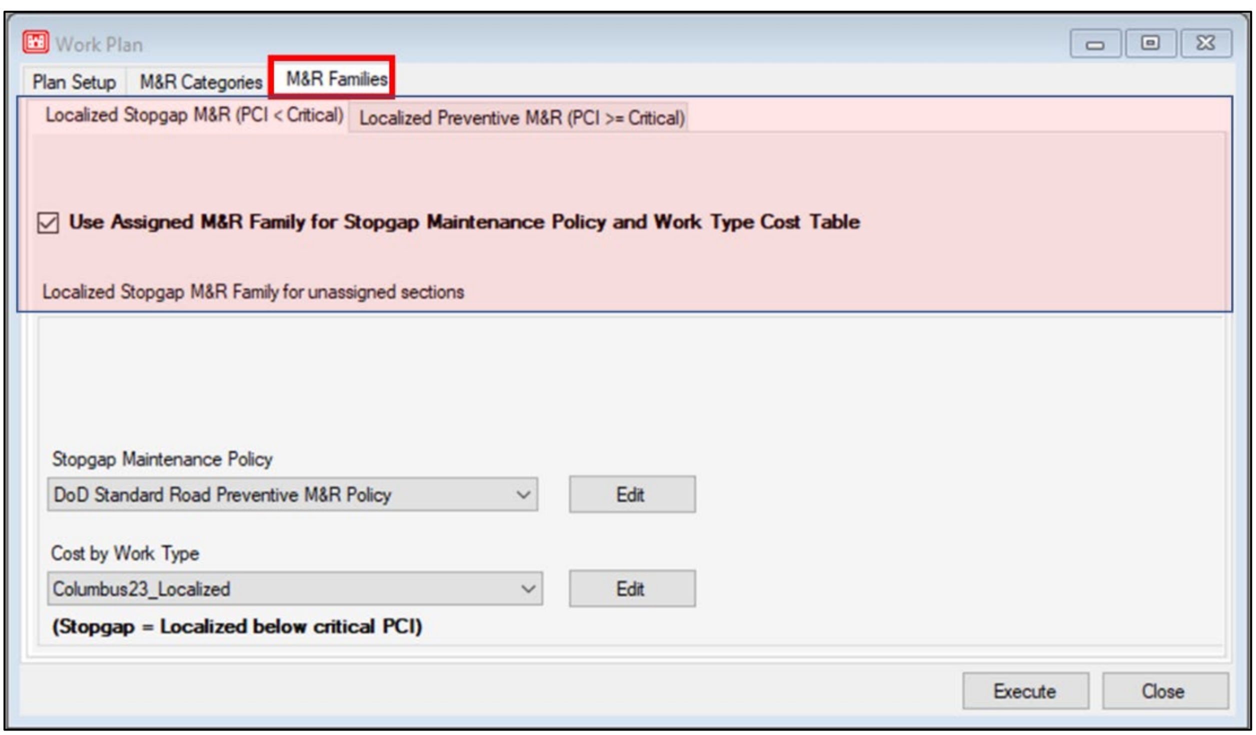
Figure 7-3 M&R Categories Tab



7-4.2 M&R Families Tab.

As shown in Figure 7-4, the **Use Assigned M&R Family for Stopgap Maintenance Policy and Work Type Cost Table** checkbox is checked by default for both **Localized Stopgap M&R** and **Localized Preventive M&R**. The option to define a default policy and cost by work type table for any unassigned sections is not typically used by the DoD since only sections with a current PCI inspection, an assigned PCI family, and an assigned M&R family are included in the work plan.

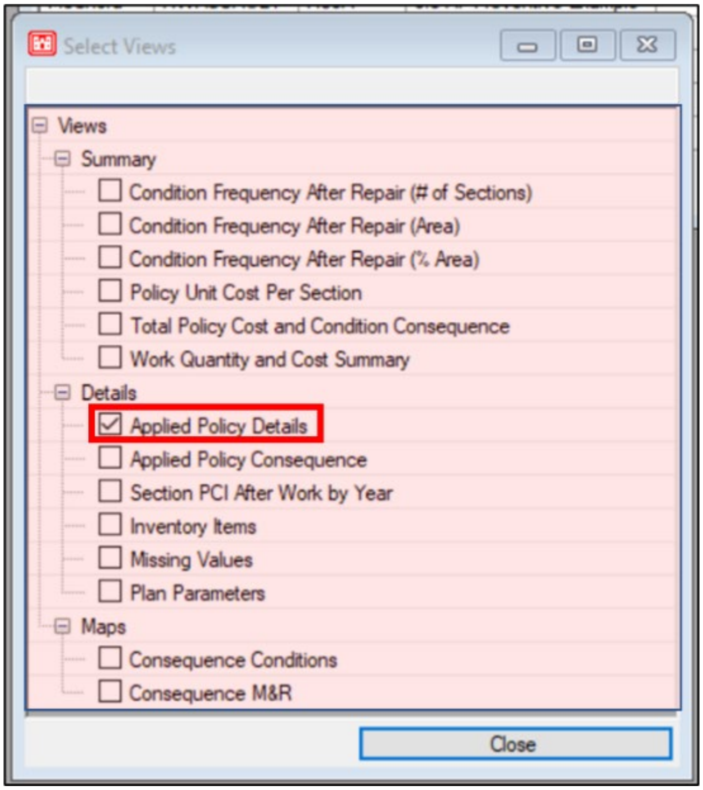
Figure 7-4 M&R Families Tab



7-4.3 Consequence of Localized Distress Maintenance Reports.

PAVER generates several reports (views) for the consequence of localized distress maintenance work plan as shown in Figure 7-5. The **Applied Policy Details** view is used to define specific work types and estimated quantities when developing a PMP, as described in paragraph 8-7. See paragraphs A-6 and A-7 for examples.

Figure 7-5 M&R Work Plan Views



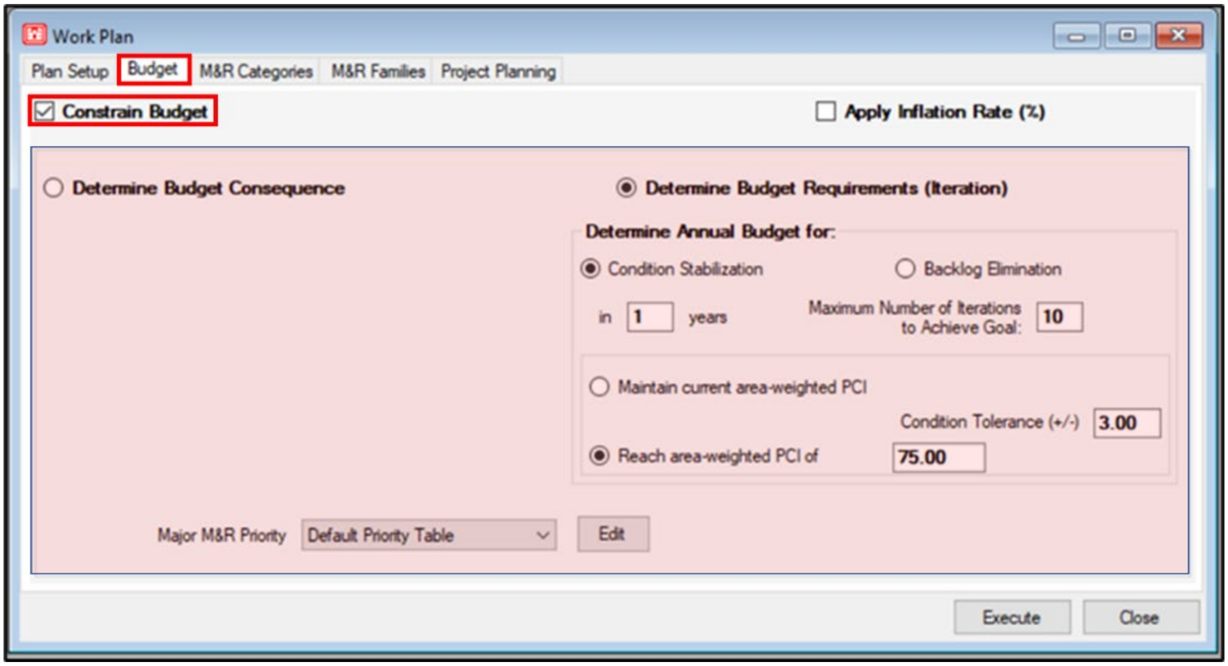
7-5 CRITICAL PCI WORK PLANS.

Select the Critical PCI M&R Plan Type on the **Plan Setup** tab to run Critical PCI work plans. These plans use the critical PCI of the section determined by the section rank, as described in paragraphs 3-4 and 5-4 as the mechanism for triggering Major M&R requirements. Select one of the critical PCI work plans as the optimal critical PCI work plan as described in Paragraph 8-5 to develop the PMP. See paragraphs A-5 and A-7 for examples.

7-5.1 Budget.

The **Budget** tab provides options to select a constrained (checked) or unconstrained (unchecked) budget. When checked, other options to define constrained budget parameters are available, as shown in Figure 7-6.

Figure 7-6 M&R Work Plan Budget Tab



7-5.2 Apply Inflation Rate.

Leave the **Apply Inflation Rate (%)** box unchecked. When selected, PAVER applies a user-defined inflation rate percentage to all work plans. Inflation rates are applied to budget requirements as part of the DoD budgeting process, so checking this box results in a double application of an inflation rate.

7-5.3 Unconstrained Budgets.

Leave the **Constrain Budget** box unchecked to create an unconstrained work plan. Set the plan length to one year on the **Plan Setup** tab to generate a work plan that addresses all current M&R requirements based on the parameters defined in the M&R family models. Grouping all M&R requirements for each section in a pavement facility provides an estimate of the total real property M&R requirements for each facility. This total facility M&R cost can be used as the numerator in the facility condition index computation for each facility when Service real property guidance permits.

The one-year unconstrained work plan is also used to develop Major M&R cost by condition tables as described in paragraph 6-5.3. Unlike running a consequence of localized distress maintenance work plan, where PAVER uses the cost by work type table to generate cost data, when running a critical PCI type plan, PAVER uses the cost by condition table to generate cost data. Therefore, you can see a cost difference for localized M&R between a one-year unconstrained work plan and the consequence of localized distress maintenance work plan. The latter is typically more accurate when running work plans at the time of a PCI inspection. An example of an unconstrained work plan is included in paragraph A-5.

7-5.4 Constrained Budget.

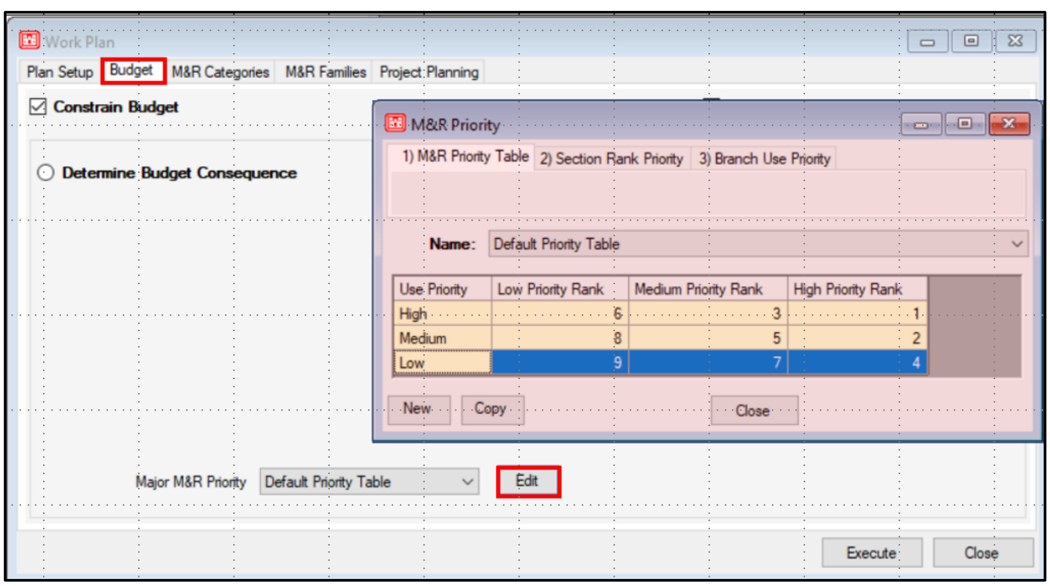
When the **Constrain Budget** box is checked on the **Budget** tab, PAVER develops a work plan to address all M&R requirements based on the parameters defined on the work plan **Budget** and **M&R Categories** tabs, as well as the M&R family models. DoD uses the eliminate backlog work plan and maintain current condition M&R work plan. The standard timeline for constrained budgets used by the DoD is five years, although circumstances or specific mission requirements may require increasing this timeline Constrained work plans are explained in more detail below and examples of constrained work plans are included in paragraph A-6.

7-5.5 Major M&R Priority Table.

When the **Constrain Budget** box is checked, the **Major M&R Priority** option is activated at the bottom of the form as shown in Figure 7-7. Select the **Edit** button to view priority tables. Only use the standard DoD priority tables defined in the UFC when doing major M&R work planning for airfield or road and parking pavements.

The **Major M&R Priority** option shown on the **Budget** tab is activated when the **Constrain Budget** box is checked, as shown in Figure 7-7. This table sets the priority PAVER uses to determine the order of requirements when running a constrained workplan. Selecting the **Edit** button brings up the form. Define the **Section Rank Priority** and **Branch Use Priority** (High, Medium, or Low) on tabs 2 and 3, then set the priority hierarchy on tab 1. Only use the standard DoD priority tables defined in this UFC.

Figure 7-7 Major M&R Priority Table



7-5.5.1 Branch Use Priority Table.

Table 3-2 defines branch use categories for both airfields and roads and parking. The priorities associated with these branch uses are defined in Table 7-1.

Table 7-1 Branch Use Priority Table

Airfield Branch Use Priority			Road and Parking Branch Use Priority		
Use Code	**Description**	**Priority**	**Use Category**	**Description**	**Priority**
RUNWAY	RUNWAY	High	ROADWAY	ROADWAY	High
TAXIWAY	TAXIWAY	Medium	MTRPOOL	MTRPOOL	Medium
HELIPAD	HELIPAD	Medium	OTHER	OTHER	Medium
APRON	APRON	Low	ROUND	ROUNDABOUT	Medium
BLAST PAD	BLAST PAD	Low	CLOSED-RD	CLOSED ROADWAY	Low
CARGO	CARGO	Low	DRIVEWAY	DRIVEWAY	Low
CLOSED-AF	CLOSED AIRFIELD	Low	PARKING	PARKING	Low
DEICING	DEICING	Low	SHOULDER-RD	ROAD SHOULDER	Low
OVERRUN	OVERRUN	Low	STORAGE	STORAGE	Low
SHOULDER-AF	AIRFIELD SHOULDER	Low			
LINE VEHICLE	GROUND EQUIPMENT	Low			

7-5.5.2 Section Rank Priority Table.

Table 3-4 defines the section ranks for both airfields and roads and parking. The priorities associated with these section ranks are defined in Table 7-2.

Table 7-2 Section Use Priority Table

Section Rank Priority Airfields, Road, and Parking		
Section Rank	**Description**	**Priority**
P	Primary	High
S	Secondary	Medium
T	Tertiary	Low
U	Unused	Low

7-5.5.3 Major M&R Priority Table.

The M&R priority hierarchy is the same for both airfields and roads and parking as shown in Table 7-3. An example implementation for an airfield is shown in Table 7-4 and a road and parking example is shown in Table 7-5.

Table 7-3 Major M&R Priority Table

M&R Priority Table			
Use Priority	High Priority Rank	Medium Priority Rank	Low Priority Rank
High	1	3	6
Medium	2	5	8
Low	4	7	9

Table 7-4 Airfield M&R Priority Table Example

Airfield M&R Priority Table Example			
Use Priority	High Priority Rank	Medium Priority Rank	Low Priority Rank
High	1 Main Runway	3 Crosswind Runway	6 Auxiliary Runway
Medium	2 Parallel Taxiway	5 Ladder Taxiway	8 Occasional Use Helipad
Low	4 Primary Apron	7 Transient Apron	9 Wash Rack

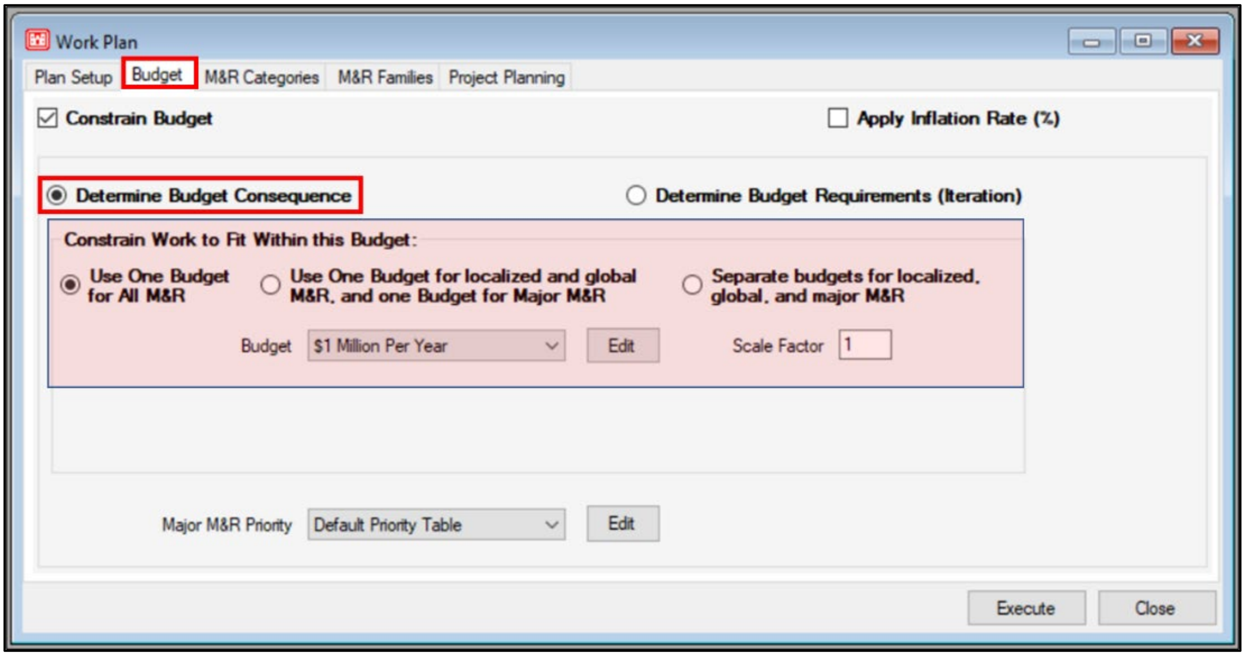
Table 7-5 Section Use Priority Table

Road and Parking M&R Priority Table Example			
Use Priority	High Priority Rank	Medium Priority Rank	Low Priority Rank
High	1 Primary Road (Arterial)	3 Collector Streets	6 Local Streets
Medium	2 Roundabout	5 Motor Pool	8 Other Pavement
Low	4 Hospital Parking Area	7 Facility Parking	9 Driveway

7-5.6 Determine Budget Consequence.

The **Determine Budget Consequence** option is activated when the **Constrain Budget** box is checked. This option allows the user to apply a known budget and have PAVER generate a work plan to fit that budget. DoD installations cannot typically predict future budgets with any level of accuracy so this option is not used by the Services.

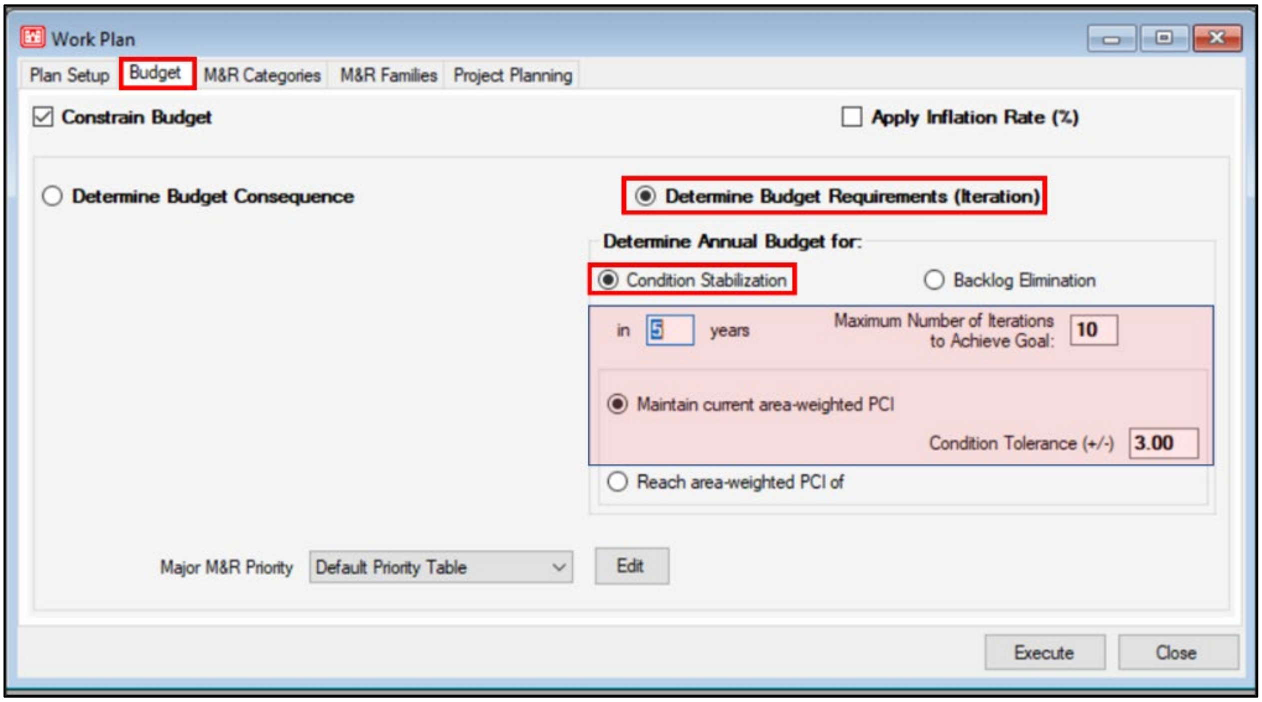
Figure 7-8 Determine Budget Consequence



7-5.7 Determine Budget Requirements.

The **Determine Budget Requirements (Iteration)** option is activated when the **Constrain Budget** box is checked. This option allows the user to determine an annual budget required to maintain the current condition (condition stabilization) or eliminate the M&R backlog, as shown in Figure 7-9. In either case, the goal is to balance the M&R work plan budget over the period of the work plan using the parameters defined on the work plan **Budget** and **M&R Categories** tabs as well as the M&R family models. PAVER generates an initial plan, but if the plan does not meet the goal, PAVER adjusts the plan and goes through another iteration until the goal is achieved.

Figure 7-9 Determine Budget Requirements – Condition Stabilization



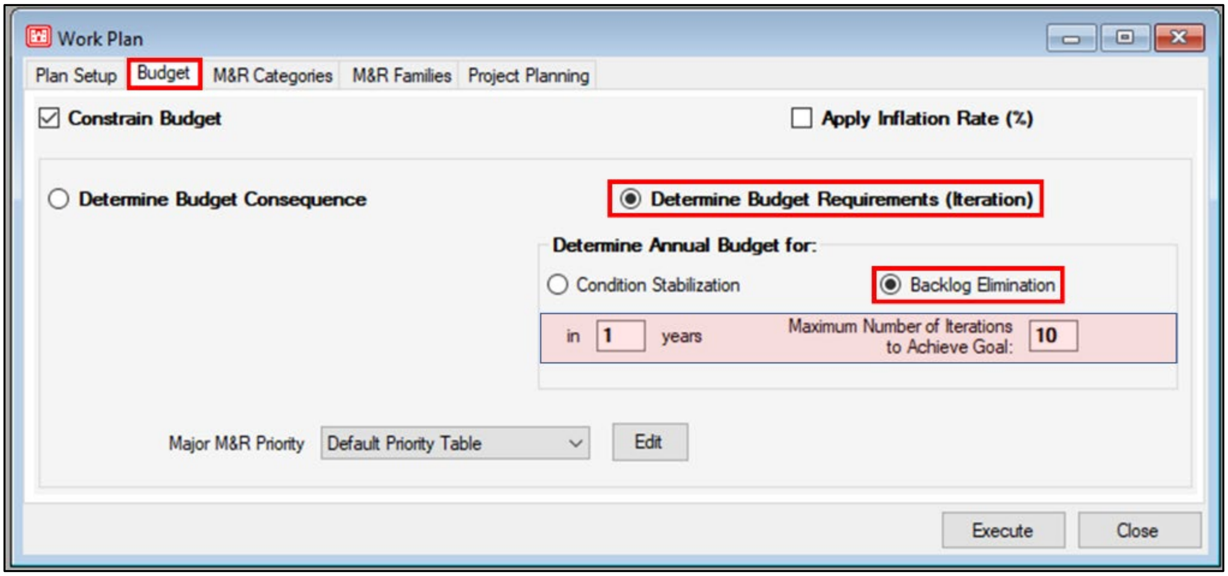
7-5.7.1 Determine Annual Budget for Condition Stabilization.

The Annual Condition Stabilization Budget is a standard work plan for DOD. This option generates a work plan that either reaches a defined area-weighted PCI within a specified period and condition tolerance or maintains the current area-weighted PCI within a specified condition and tolerance. The **Maintain current area weighted PCI** is typically used. As shown in Figure 7-9, set the plan length to five years and set the condition tolerance to ±3.00. This plan is typically the optimal critical PCI work plan when the current area-weighted PCI of the network is above 85.

7-5.7.2 Determine Annual Budget for Backlog Elimination.

The Determine Annual Backlog Elimination budget is also a standard work plan for DOD This option generates a work plan that includes Major M&R requirements for all sections below the critical PCI within the specified time frame. The plan length is set at a minimum of five years on the **Plan Setup** tab and the period is set at five years on the **Budget** tab. This plan is typically the optimal critical PCI work plan when the current area weighted PCI of the network is below 85.

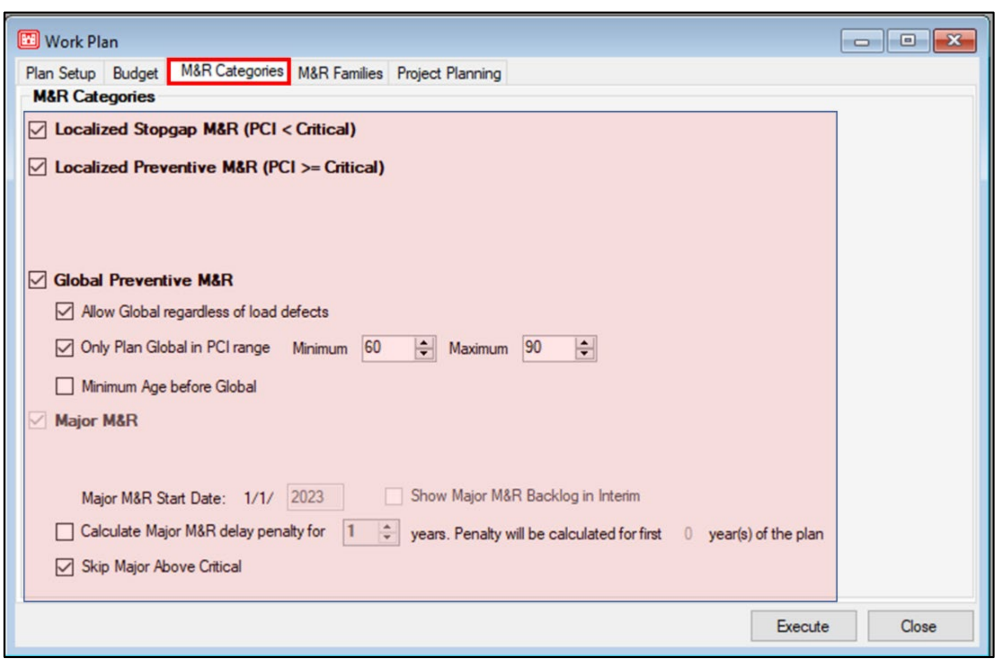
Figure 7-10 Determine Budget Requirements – Backlog Elimination



7-6 M&R CATEGORIES.

The **M&R Categories** tab allows the user to define the type of M&R included in the work plan. The standard approach is to select all M&R types when running any of the critical PCI M&R type plans, as shown in Figure 7-11.

Figure 7-11 M&R Categories Tab



7-6.1 Localized Operational (aka Safety or Stopgap) M&R.

When the **Localized Stopgap M&R (PCI < Critical)** box is checked, PAVER generates an operational M&R requirement for any section with a PCI below critical that does not have a major M&R requirement included in the work plan. This occurs when PAVER is going through the iteration process and cannot plan a major M&R requirement within the defined constraints. While the operational M&R work types are the same as those used for preventive M&R, the maintenance policy is different. The objective is to maintain safety of operations rather than pavement preservation. All cost projections are based on the cost by condition tables.

7-6.2 Localized Preventive M&R.

When the **Localized Preventive M&R (PCI > Critical)** box is checked, PAVER generates preventive M&R requirements for any section with a PCI above critical and distresses that require repair according to the preventive M&R maintenance policy. Just as with Operational M&R, PAVER uses the cost by condition table to generate cost data for localized preventive as opposed to running a Consequence of Localized Distress Maintenance work plan that uses the cost by work type table to generate cost data. When there is a difference, the Consequence of Localized Distress Maintenance work plan is typically more accurate when running work plans at the time of a PCI inspection, but may be less accurate in out-years.

7-6.3 Global Preventive M&R.

When the **Global Preventive M&R** box is checked, PAVER generates global M&R requirements for all sections included on the **Plan Setup** tab using the parameters defined in the global M&R family model and the standard global PCI range. Note that all global preventive M&R costs are generated using cost by work type tables.

7-6.3.1 Only Plan Global in PCI Range.

Set the global PCI range maximum value to 95. The minimum varies according to Service policies based on the mission aircraft. For example, a primary pavement could have a range of 70 to 95, so once the PCI of a section drops below 95, PAVER generates a global M&R requirement using the work type for the respective distress category (minimal, climate-related, and skid causing) and the application interval defined in the family model. Once the PCI drops below 70 for this example, PAVER will not generate a Global M&R requirement.

7-6.3.2 Minimum Age Before Global.

Leave the **Minimum Age before Global** box unchecked. It defines the minimum age before Global Preventive M&R is applied but is not used in DoD work plans.

7-6.4 Major M&R.

As shown in Figure 7-12, the **Major M&R** box is checked by default and is inactive because Major M&R is required to achieve the critical PCI work plan objective. PAVER generates Major M&R requirements for any section below the critical PCI.

7-6.4.1 Calculate Major M&R Delay Penalty.

PAVER reports any delay costs associated with delaying the start date of Major M&R over the length of the work plan when the **Calculate Major M&R Delay Penalty** box is checked, as shown in Figure 7-12. When the user defines the delay length, PAVER generates a report like the one in Figure 7-13. This example shows the cost for section R04A1 goes up by 7 percent if we delay Major M&R for one year, so the cost for the project after a one-year delay would be $43,104.6 * 1.07 = $46,121.92. Delay penalties are a deciding factor when scheduling PMP projects.

Figure 7-12 Critical PCI Work Plan – Major M&R Settings

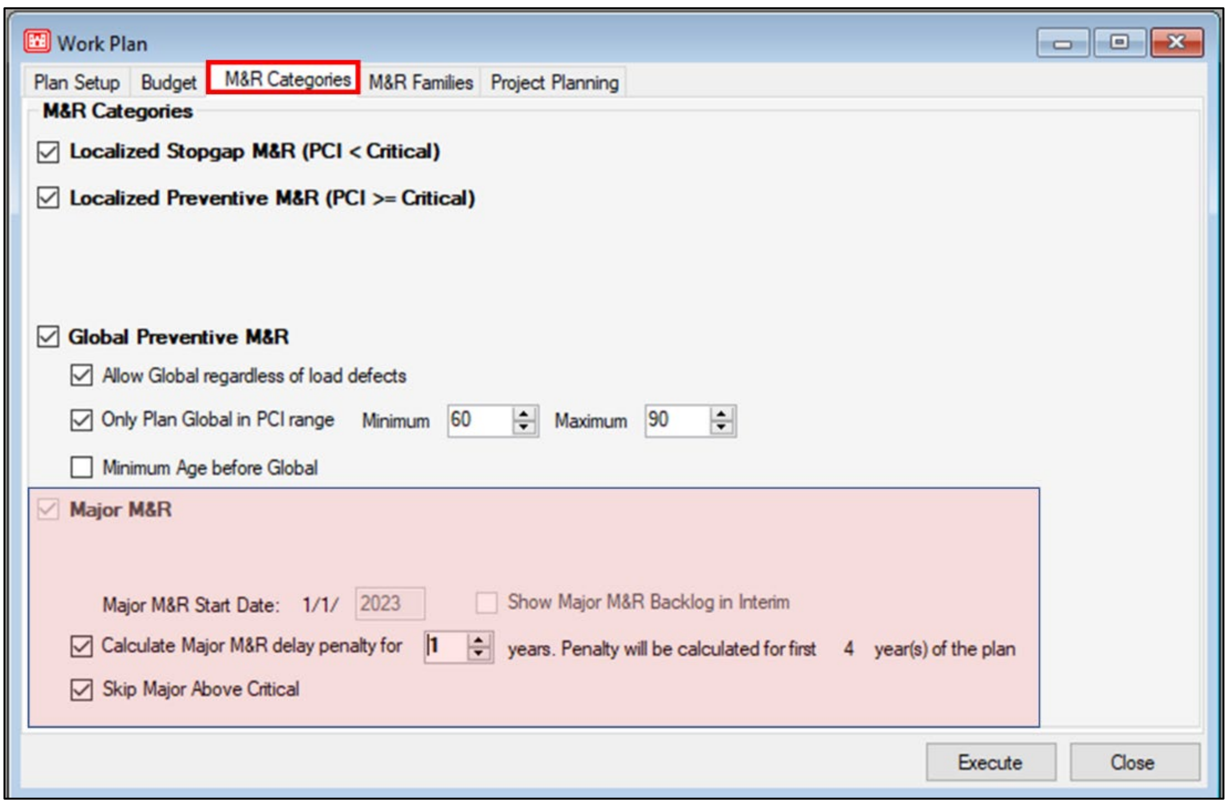
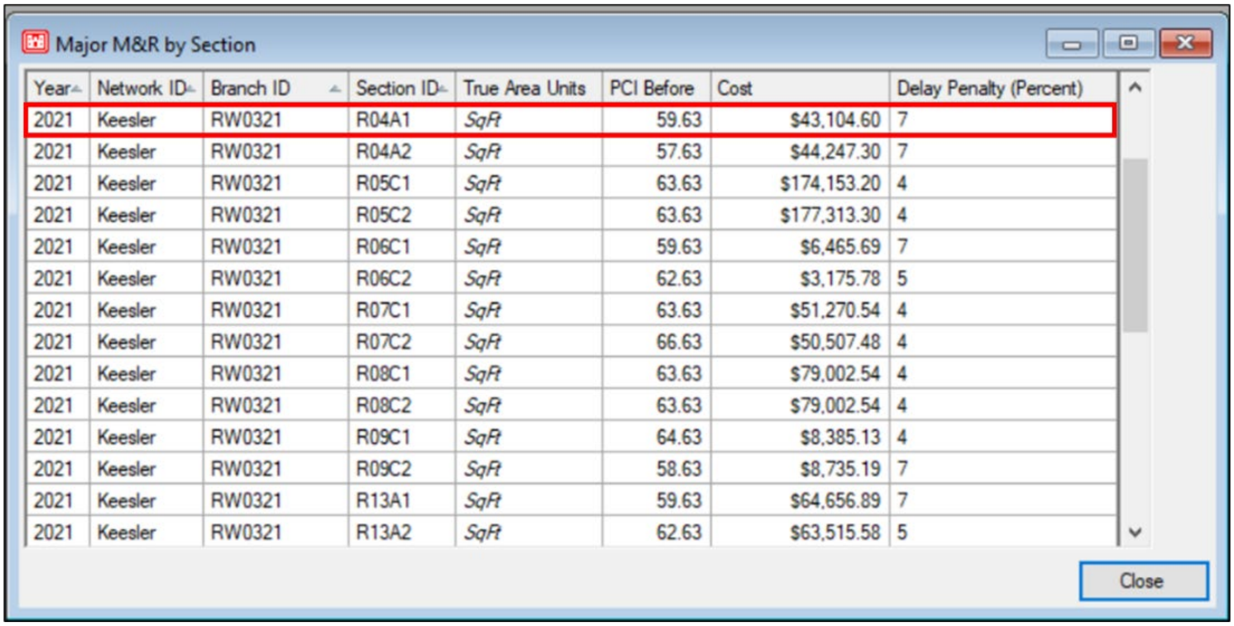


Figure 7-13 Delay Penalty



Major M&R by Section

Year	Network ID	Branch ID	Section ID	True Area Units	PCI Before	Cost	Delay Penalty (Percent)
2021	Keesler	RW0321	R04A1	SqFt	59.63	$43,104.60	7
2021	Keesler	RW0321	R04A2	SqFt	57.63	$44,247.30	7
2021	Keesler	RW0321	R05C1	SqFt	63.63	$174,153.20	4
2021	Keesler	RW0321	R05C2	SqFt	63.63	$177,313.30	4
2021	Keesler	RW0321	R06C1	SqFt	59.63	$6,465.69	7
2021	Keesler	RW0321	R06C2	SqFt	62.63	$3,175.78	5
2021	Keesler	RW0321	R07C1	SqFt	63.63	$51,270.54	4
2021	Keesler	RW0321	R07C2	SqFt	66.63	$50,507.48	4
2021	Keesler	RW0321	R08C1	SqFt	63.63	$79,002.54	4
2021	Keesler	RW0321	R08C2	SqFt	63.63	$79,002.54	4
2021	Keesler	RW0321	R09C1	SqFt	64.63	$8,385.13	4
2021	Keesler	RW0321	R09C2	SqFt	58.63	$8,735.19	7
2021	Keesler	RW0321	R13A1	SqFt	59.63	$64,656.89	7
2021	Keesler	RW0321	R13A2	SqFt	62.63	$63,515.58	5

Close

7-6.4.2 Skip Major Above Critical.

Standard policy is to check the **Skip Major Above Critical** box, let the PCI deteriorate to the critical PCI before generating a Major M&R requirement, and then address any structural issues. The exception to this is when there is a mission change at an installation that requires an increase in the structural capability of the pavement. When this box is unchecked, PAVER will generate Major M&R requirements when the PCI of a section is above critical, but the section has a structural distress density above 10 percent.

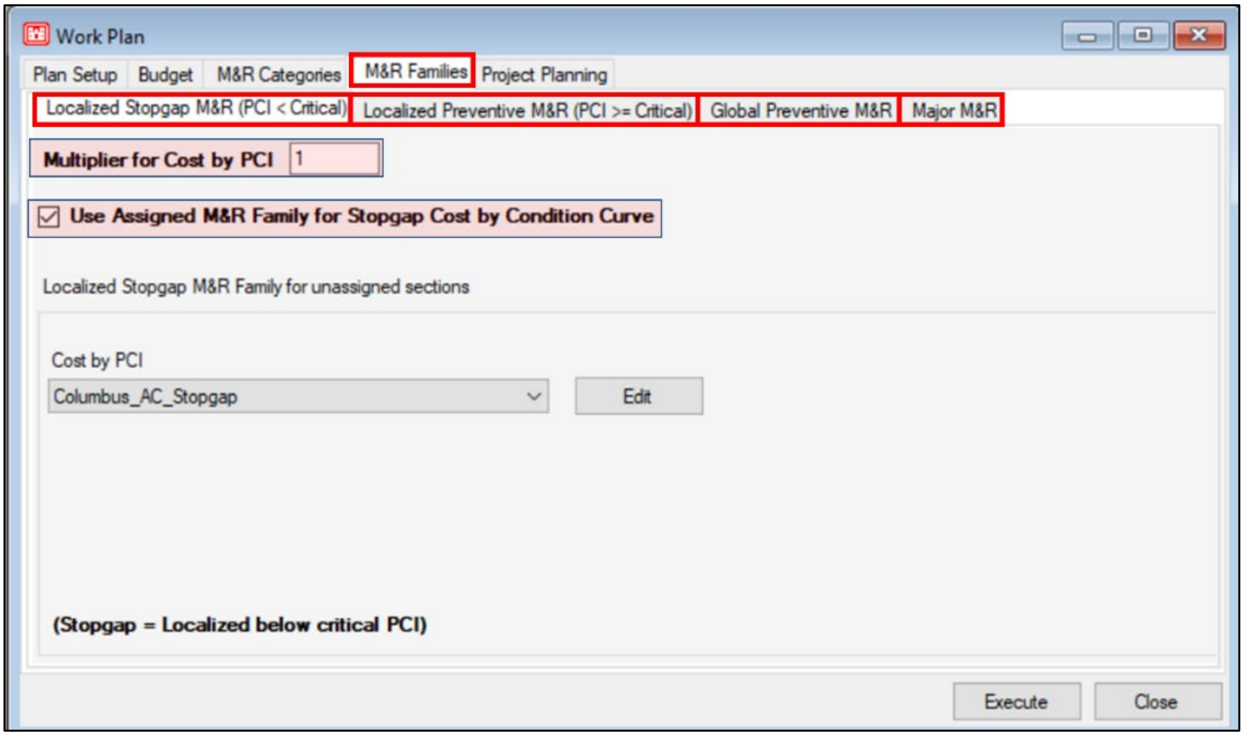
7-7 M&R FAMILIES.

The **M&R Families** tab allows the user to define the M&R family models to be used in the M&R plan. As shown in Figure 7-12, there is a tab for each M&R category. On each tab is a **Use Assigned M&R Family for Stopgap Cost Curve** checkbox. Each box is checked by default. Ensure every section that has been inspected is assigned to the appropriate family models for each M&R category. There is also an option to define a default M&R category or rule set (in the case of global). Since the standard approach is to assign all sections, the default settings are not needed. Filter out any sections that have not been inspected in the last two PCI cycles when running the work plan.

Define the M&R Family Models used in the M&R work plan on the **M&R Families** tab as shown in Figure 7-14. There is a tab for each M&R category, with the checkbox to **Use Assigned M&R Family for Stopgap Cost by Condition Curve** checked by default. So, when every inspected section is assigned to the appropriate family model for each M&R category, PAVER automatically applies the defined parameters. There is also an option to define a default M&R category or rule set (in the case of Global). Since the standard approach is to assign all sections, the default settings are not typically needed.

When running the work plan, use the **Query** tool to filter out any sections not inspected in the last two PCI cycles.

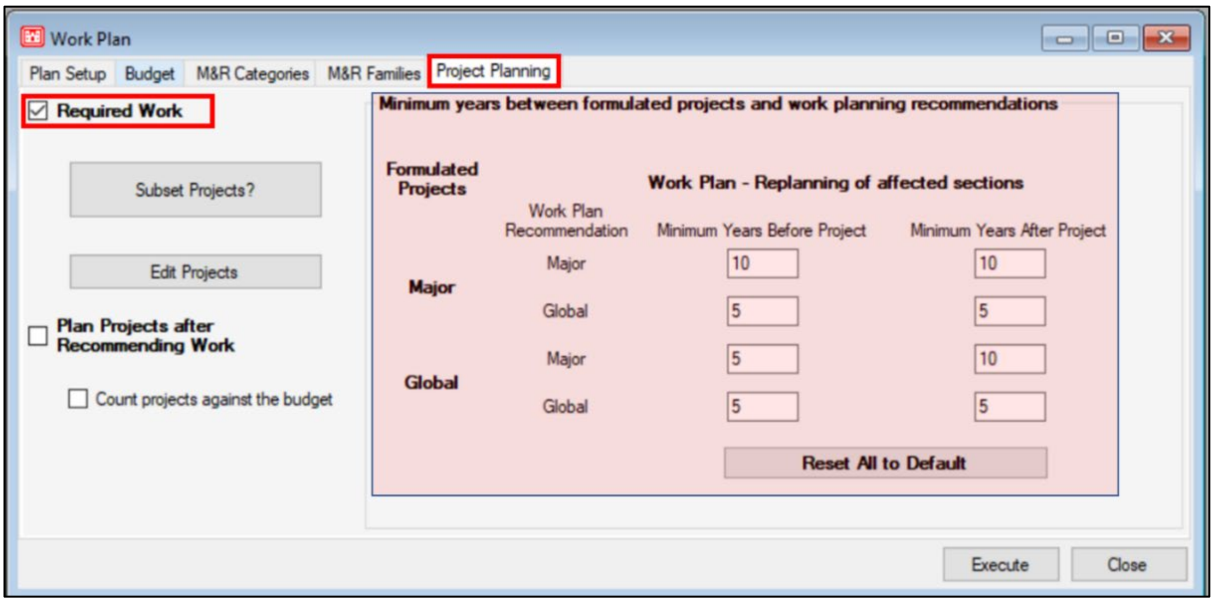
Figure 7-14 M&R Families Tab



7-8 PROJECT PLANNING

When the **Required Work** box is checked on the **Project Planning** tab, PAVER includes all or a subset of projects defined with the Required Work tool or the Project Formulation Wizard in the work plans. The **Project Planning** tab also allows the user to define other work planning parameters, such as the minimum time between projects and other work planning recommendations. Chapter 8 and paragraph A-9 discuss the process of using the M&R requirements from work plans to develop a pavement management plan (PMP). A PMP can be developed using spreadsheets or other tools but developing projects in PAVER and incorporating them into work plans to develop a PMP is considered a best practice.

Figure 7-15 Project Planning Tab



CHAPTER 8 PRIORITIZING REQUIREMENTS

8-1 OBJECTIVE

The level of detail in a pavement management plan (PMP) can range from a spreadsheet with a prioritized list of work tasks and projects in each year of the plan to a detailed document that outlines the team composition and development process, including limiting factors, assumptions, and analysis of alternatives. The objective of this UFC is to define the minimum PMP requirement, a prioritized list of work items and projects required to maintain pavements for each year in the next five calendar years.

8-2 BACKGROUND.

The goal of a PMP is to define and document M&R actions required to maintain operational safety, preserve and extend the life of pavements, and optimize life-cycle costs and pavement condition. The best approach to achieve this goal is to prioritize localized and global preventive maintenance and implement policies to perform Major M&R at the appropriate time as opposed to a “worst first” approach. In a “worst first” approach, pavements are allowed to deteriorate, localized M&R is just used to address issues that pose a safety concern, and Major M&R is prioritized based on which pavement is in the worst condition, with some consideration given to the use (e.g., runway versus taxiway or road versus parking). This UFC is intended to move the DoD away from a “worst first” approach.

8-3 RESPONSIBILITY FOR PAVEMENT MANAGEMENT PLANS.

8-3.1 Service Responsibility.

Each Service centrally manages their pavement evaluation programs and performs pavement evaluations on a regular cycle. These evaluations provide the baseline data to establish a PMP. The Services define specific PMP requirements in Service guidance to supplement the minimum standard outlined in this UFC, e.g., PMP content, development and execution responsibility, timelines, prioritization rules, and format.

8-3.2 Installation Responsibility.

Service teams or consultants gather data during regularly scheduled pavement evaluations and can provide expertise and support for developing a PMP. Installations use this data to develop the PMP in-house or assisted by a consultant, but in either case, installation-level knowledge is the key to developing an effective PMP. So, whether a Service evaluation team, a consultant, or installation personnel develop the PMP, the installation personnel are the only ones that can provide local knowledge and therefore must be fully engaged in the process of developing and maintaining their PMPs for airfield and road and parking pavement. The installation is also responsible for executing PMP projects ranging from day-to-day preventive maintenance performed in-house to larger-scale projects performed by the in-house workforce, by contract, or a combination of both.

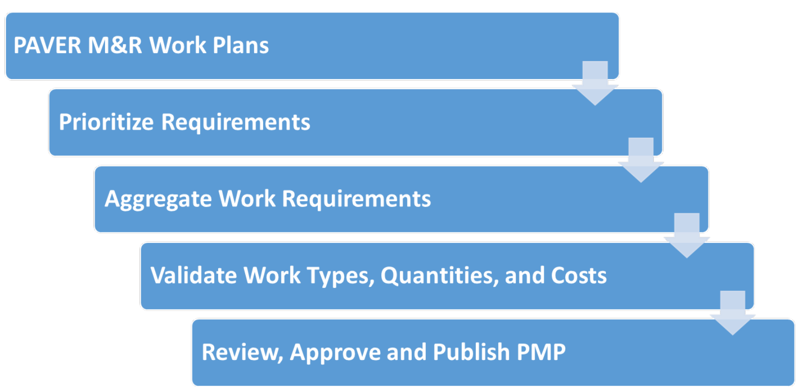
8-3.3 Team Approach.

There are many considerations that go into developing a PMP. Finding effective solutions to these considerations requires knowledge of the mission as well as knowledge of pavement management, design, and construction. The best approach to developing a PMP is to establish a team that brings the necessary skill sets and knowledge to the table. At a minimum, this team will include, if present, installation pavement engineers and technicians responsible for pavements M&R and planning, personnel responsible for managing real property and geospatial information system data, and personnel responsible for airfield management (when developing an airfield PMP).

8-4 PROCESS OVERVIEW.

Previous chapters described the tasks involved in organizing the inventory, determining pavement condition, defining deterioration rates, cost by work type and condition tables, and other work plan parameters culminating in the PAVER M&R work plans discussed in Chapter 7. These initial work plans provide the starting point for a PMP. A PMP can be developed using spreadsheets, PAVER, or other tools, but the overall process is similar for all. As shown in Figure 8-1, developing a PMP involves prioritizing the M&R requirements identified in the work plans, organizing the prioritized M&R requirements into executable work tasks and projects, and validating the work types, quantities, and costs for each year in the PMP. The final phase of the process is coordinating the PMP with the team, sending it forward for installation leadership approval (or higher approval if required by the Service), and publishing the PMP. At a minimum, review and update the PMP annually. Paragraph A-9.9 provides PMP examples.

Figure 8-1 PMP Development Process



8-5 PAVER M&R WORK PLANS.

The consequence of localized distress maintenance and optimal constrained critical PCI work plans generated by PAVER define all near-term and long-term localized, global, and Major M&R requirements. Prior to developing the PMP, decide whether the eliminate backlog, maintain condition, or other critical PCI work plan is optimal for the installation. As a general guideline, use the eliminate backlog work plan when the weighted area average PCI of all sections is below 85 and use the maintain condition workplan when this value is above 85.

8-6 PRIORITIZING REQUIREMENTS.

Using the optimal critical PCI work plan, prioritize all M&R requirements for each section by stratifying them based on risk and return on investment.

8-6.1 Defining Risk.

This UFC defines risk using the process described in paragraph 7-5.5 that assigns a use priority (based on the Branch use) and a rank priority. Combining these factors results in an indication of the level of risk, with 1 being the highest risk and 9 being the lowest risk in the priority matrix, as shown in Table 8-1. This approach is highly dependent on reasonable rank stratification. Without this stratification, there is no way to objectively prioritize requirements for different branch use categories, e.g., when most pavements are given a primary rank, the prioritization matrix does not provide sufficient differentiation. While this approach provides an objective, repeatable measure of risk, each Service can define other risk metrics to use based on the priority of the asset or impact on the mission.

Table 8-1 Maintenance and Repair Priority Table

M&R Priority Table			
Use Priority	**High Priority Rank**	**Medium Priority Rank**	**Low Priority Rank**
High	1	3	6
Medium	2	5	8
Low	4	7	9

8-6.2 Defining Return on Investment.

The fundamental concept to define the return on investment for pavements is that applying localized and global preventive maintenance when a pavement is in Good condition provides the greatest return on investment by extending the life of the pavement and the time before the pavement reaches the critical PCI. In addition, performing major M&R at the appropriate time is more cost-effective and provides a better return on investment than allowing a pavement to deteriorate to Poor condition that requires more extensive repairs. So, conceptually, the return on investment is defined by the condition of the pavement, as shown in Figure 8-2.

Figure 8-2 Return on Investment vs. Pavement Condition

≥ 0	≥ 10	≥ 20	≥ 30	≥ 40	≥ 50	≥ 60	≥ 70	≥ 80	≥ 90
Red/Unsatisfactory				Yellow/Degraded			Green/Adequate		
Low ------------------------------> Return on Investment ------------------------------------> High									

This basic approach provides an objective, repeatable measure of return on investment using the predicted condition in the planned year of execution. The Services can refine this procedure by using a composite index that incorporates other factors, such as the Structural Index (SI) and FOD Potential Rating for airfields or the International Roughness Index for roads to define this basic approach to return on investment. Alternatively, Services can define other return on investment metrics that provide greater fidelity, including the more complex “risk analysis procedure” outlined in paragraph A-10 to determine return on investment. While it is called the “risk analysis procedure,” it evaluates the M&R cost benefit. This procedure is currently implemented using spreadsheets but will be incorporated in a future version of PAVER. Regardless of the metric used, the overall objective is to define the return on investment.

8-6.3 Risk vs. Return on Investment.

Comparing the risk determined in the priority matrix in Table 8-1 to the return on investment based on the condition of the section in Figure 8-2 provides a means of determining a value in the matrix shown in Table 8-2. This value can be used to stratify the M&R requirements for each section in each year of the plan. Note that performing the sort procedure on the optimal critical PCI work plan as described in paragraphs A-6.6 and A-7.6 achieves the same result without assigning a value from the matrix to each section.

Table 8-2 Risk – Return Matrix

M&R Priority		Risk - Return Matrix									
Low ----------> Risk ----------> High	1	81	82	83	84	85	86	87	88	89	90
	2	71	72	73	74	75	76	77	78	79	80
	3	61	62	63	64	65	66	67	68	69	70
	4	51	52	53	54	55	56	57	58	59	60
	5	41	42	43	44	45	46	47	48	49	50
	6	31	32	33	34	35	36	37	38	39	40
	7	21	22	23	24	25	26	27	28	29	30
	8	11	12	13	14	15	16	17	18	19	20
	9	1	2	3	4	5	6	7	8	9	10
ROI as Indicated by PCI		≥ 0	≥ 10	≥ 20	≥ 30	≥ 40	≥ 50	≥ 60	≥ 70	≥ 80	≥ 90
		Red/Unsatisfactory				Yellow/Degraded			Green/Adequate		
		Low ----------> Return on Investment ----------> High									

8-6.4 Risk – Return Categories.

The risk - return categories shown in Figure 8-3 assume that return on investment declines once the PCI at the time of execution drops below the critical PCI of 70 and that there is minimal return on investment when the PCI drops below 40. Services can adjust the scale based on mission requirements or, for secondary or tertiary pavements, have lower critical PCI. The key concept is that in the absence of a more detailed return on investment computation, this basic approach serves as an objective measure to aggregate requirements and prioritize work tasks and projects for planning purposes. Using the risk analysis procedure described in paragraph A-10 to define return on investment provides more fidelity but the process remains the same. Once projects are defined, perform a life-cycle cost analysis to further refine return on investment.

The sequence of the risk - return categories in Figure 8-3 reflects the need to balance risk and return while furthering the goal of maintaining operational safety, preserving and extending the life of pavements, while optimizing life-cycle costs and pavement condition. Table 8-3 provides the recommended execution hierarchy to achieve these goals by placing a priority on localized and global preventive maintenance while implementing policies to perform Major M&R at the appropriate time. This execution hierarchy also recognizes there are instances when a requirement with a low return is given a higher execution priority. For example, while operational repairs on high-priority sections are not cost-effective, the risk associated with not doing them is high, especially on an airfield, so these repairs should be reviewed and placed at the top of the priority list when warranted.

Figure 8-3 Risk – Return Categories

M&R Priority		Risk - Return Categories		
Low -----------> Risk -----------> High	1 2 3	E High Risk Low Return	C High Risk Moderate Return	A High Risk High Return
	4 5 6	H Moderate Risk Low Return	F Moderate Risk Moderate Return	B Moderate Risk High Return
	7 8 9	I Low Risk Low Return	G Low Risk Moderate Return	D Low Risk High Return
ROI as Indicated by PCI		≥ 0 | ≥ 10 | ≥ 20 | ≥ 30	≥ 40 | ≥ 50 | ≥ 60	≥ 70 | ≥ 80 | ≥ 90
		Red/Unsatisfactory	Yellow/Degraded	Green/Adequate
		Low ------------------------------------> Return on Investment --> High		

Table 8-3 Risk – Return Category Description

Risk-Return Category	Requirements Description
C & E	Operational M&R - High Risk - Low Return
A & B	Localized and Global Preventive M&R - High to Moderate Risk - High Return
C	Major M&R - High - Risk - Moderate Return
D	Localized and Global Preventive M&R Low Risk - High Return
E	Major M&R High Risk - Low Return
F	Operational or Major M&R Moderate Risk - Moderate Return
G	Operational or Major M&R Low Risk - Moderate Return
H	Operational or Major M&R Moderate Risk - Low Return
I	Operational or Major M&R Low Risk - Low Return

8-7 AGGREGATE WORK REQUIREMENTS.

Once a prioritized requirements list is generated using the guidance above and in Chapters 6 and 7, the next step is to aggregate work requirements. This involves investigating opportunities to combine line items in the prioritized requirements list into executable tasks and projects (see Figure 8-4). Best practice is to combine requirements within each of the risk - return categories in Table 8-3, taking into consideration factors such as method of execution, specific work types, operational impacts, economies of scale, and phasing. Other considerations include opportunities to include pavement work in drainage, lighting, fuels, or other projects as well as addressing any outstanding waivers. PAVER provides tools to assist with setting up projects and incorporating them into critical PCI work plans. Paragraphs A-6, A-7, and A-9 provide examples of this process.

Figure 8-4 Prioritized Requirements List Example

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Work Type	Surface Type Current	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total Funded
Sheppard	RW15C33C	R04A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R04A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R05C1	2023	RUNWAY	P	Major Below Critical	AC	$0.00	$0.00	$0.00	$109,264.93	$109,264.93
Sheppard	RW15C33C	R05C2	2023	RUNWAY	P	Preventive + Global MR	AC	$0.00	$3,598.83	$14,238.68	$0.00	$17,837.51
Sheppard	RW15C33C	R06C1	2023	RUNWAY	P	Major Below Critical	AC	$0.00	$0.00	$0.00	$33,249.59	$33,249.59
Sheppard	RW15C33C	R06C2	2023	RUNWAY	P	Preventive + Global MR	AC	$0.00	$1,349.12	$4,271.68	$0.00	$5,620.80
Sheppard	RW15C33C	R07C1	2023	RUNWAY	P	Major Below Critical	AC	$0.00	$0.00	$0.00	$717,011.18	$717,011.18
Sheppard	RW15C33C	R07C2	2023	RUNWAY	P	Preventive + Global MR	AC	$0.00	$29,230.76	$92,552.75	$0.00	$121,783.51
Sheppard	RW15C33C	R08A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$4,932.77	$0.00	$0.00	$4,932.77
Sheppard	RW15C33C	R08A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$3,288.53	$0.00	$0.00	$3,288.53
Sheppard	RW15L33R	R01A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$11,058.28	$0.00	$0.00	$11,058.28
Sheppard	RW15L33R	R01A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$19,413.79	$0.00	$0.00	$19,413.79
Sheppard	RW15L33R	R02C1	2023	RUNWAY	P	Preventive	AC	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R02C2	2023	RUNWAY	P	Preventive	AC	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R03A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$14,052.28	$0.00	$0.00	$14,052.28
Sheppard	RW15L33R	R03A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$17,179.11	$0.00	$0.00	$17,179.11
Sheppard	RW15R33L	R09A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$11,659.60	$0.00	$0.00	$11,659.60
Sheppard	RW15R33L	R09A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$7,987.54	$0.00	$0.00	$7,987.54
Sheppard	RW15R33L	R10A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$7,712.88	$0.00	$0.00	$7,712.88
Sheppard	RW15R33L	R10A2	2023	RUNWAY	P	Preventive	PCC	$0.00	$20,295.54	$0.00	$0.00	$20,295.54
Sheppard	RW15R33L	R11C1	2023	RUNWAY	P	Preventive	PCC	$0.00	$170,972.59	$0.00	$0.00	$170,972.59
Sheppard	RW15R33L	R11C2	2023	RUNWAY	P	Preventive	PCC	$0.00	$394,637.32	$0.00	$0.00	$394,637.32
Sheppard	RW15R33L	R12A1	2023	RUNWAY	P	Preventive	PCC	$0.00	$6,726.84	$0.00	$0.00	$6,726.84

8-7.1 Method of Execution.

The method of execution is a primary consideration when combining requirements that drives how the requirements are aggregated into projects. The recommended approach adds a method of execution column to the prioritized requirements list for each work type in each section (see Figure 8-5). The detailed procedure is provided in paragraph A-9.5. Understanding the availability and capability of each of the alternatives listed below is key to developing an effective plan.

- Evaluate and maximize use of available in-house capabilities. In general, in-house capability is limited to localized Operational and Preventive Repairs but there can be instances where in-house work forces have more robust capabilities.
- Determine availability of installation and Service-level indefinite delivery / indefinite quantity (IDIQ) contracts. Generally, installation-level IDIQ contracts are used for localized repairs but can be considered for Global M&R if the contractor has the required equipment and expertise. Service-level contracts such as multiple award task order contracts (MATOC) are generally used for larger projects that include localized, global, or Major M&R.
- Competitive bid contracts are used for projects that include localized, global, or Major M&R.

Figure 8-5 Method of Execution Example

Network ID	Branch ID	Section ID	Date	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDFIFTHST	05	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	97.54	97.83	$0.00	$124.20	$0.00	$0.00	$124.20
Keesler	RDFIFTHST	06	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	79.54	83.62	$0.00	$197.48	$1,704.61	$0.00	$1,902.09
Keesler	RDFIRST	01	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	45.14	100.00	$0.00	$0.00	$0.00	$190,283.40	$190,283.40
Keesler	RDFIRST	02	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	51.24	100.00	$0.00	$0.00	$0.00	$39,667.24	$39,667.24
Keesler	RDFIRST	03	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	47.44	100.00	$0.00	$0.00	$0.00	$62,236.49	$62,236.49
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDFISHER	03	2023	ROADWAY	P	A	Major Below Critical	Contract	AC	1	49.44	100.00	$0.00	$0.00	$0.00	$71,448.66	$71,448.66
Keesler	RDGENCHAPP	01	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	78.84	82.92	$0.00	$722.39	$5,286.04	$0.00	$6,008.43
Keesler	RDGENCHAPP	02	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	58.74	100.00	$0.00	$0.00	$0.00	$74,172.69	$74,172.69
Keesler	RDGENCHAPP	03	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	52.94	100.00	$0.00	$0.00	$0.00	$96,747.59	$96,747.59
Keesler	RDHANGAR	01	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	40.24	100.00	$0.00	$0.00	$0.00	$606,313.00	$606,313.00
Keesler	RDHSTREET	01	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	59.74	100.00	$0.00	$0.00	$0.00	$24,277.94	$24,277.94
Keesler	RDHSTREET	02	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	64.24	100.00	$0.00	$0.00	$0.00	$27,682.46	$27,682.46
Keesler	RDHSTREET	03	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	38.14	100.00	$0.00	$0.00	$0.00	$105,875.24	$105,875.24
Keesler	RDHSTREET	04	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	39.54	100.00	$0.00	$0.00	$0.00	$110,359.76	$110,359.76
Keesler	RDHSTREET	05	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	45.04	100.00	$0.00	$0.00	$0.00	$60,890.96	$60,890.96
Keesler	RDHSTREET	06	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	80.34	84.42	$0.00	$769.96	$7,663.26	$0.00	$8,433.22
Keesler	RDJSTREET	01	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	34.84	100.00	$0.00	$0.00	$0.00	$29,773.20	$29,773.20
Keesler	RDJSTREET	02	2023	ROADWAY	P	A	Preventive	In-House	PCC	1	81.63	81.80	$0.00	$1,094.44	$0.00	$0.00	$1,094.44
Keesler	RDJSTREET	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	91.34	91.63	$0.00	$523.98	$0.00	$0.00	$523.98
Keesler	RDJSTREET	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	90.64	90.93	$0.00	$18.30	$0.00	$0.00	$18.30
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64

8-7.2 Grouping Work Requirements.

The best practice for grouping requirements into executable tasks and projects is to combine requirements within each risk - return category as shown in Figure 8-3 and defined in Table 8-3. Start by aggregating work requirements executed by in-house work forces, then proceed to aggregating localized, global, and Major M&R

requirements that will be performed by contract. Each of these steps are discussed in more detail below and in paragraph A-9.2 provides examples of this process.

8-7.2.1 Identify In-House Work Requirements.

Determine requirements that can reasonably be performed in-house from a manpower and capability perspective in each year of the PMP. These are typically localized operational or preventive repairs, so consider maximizing use of in-house work forces for repairs in risk - return categories A and B. Ensure the in-house work force has the capability to perform all of the repairs on a given section. Avoid situations where part of the work on a section is done in-house and the rest by IDIQ task order or another contract. For example, do not include any sections that call for a combination of localized and global if the in-house work force does not have the capability to do global. Best practice is to create a prioritized in-house requirements task list for each year in the PMP by extracting the requirements from the prioritized requirements list for execution by the in-house work force as shown in Figure 8-6 and described in paragraphs A-9.5 and A-9.6.

Figure 8-6 In-House Work List

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDASTREET	01	2023	ROADWAY	S	C	Stopgap	In-House	AC	3	41.49	41.49	$4,347.32	$0.00	$0.00	$0.00	$4,347.32
Keesler	RDGALAXY	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	12.49	12.49	$12,528.14	$0.00	$0.00	$0.00	$12,528.14
Keesler	RDUNKNOWN3	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	27.49	27.49	$4,275.51	$0.00	$0.00	$0.00	$4,275.51
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64
Keesler	RDLARCHER	07	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.24	92.53	$0.00	$71.99	$0.00	$0.00	$71.99
Keesler	RDLARCHER	08	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$277.92	$0.00	$0.00	$277.92
Keesler	RDLARCHER	09	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$284.11	$0.00	$0.00	$284.11
Keesler	RD5022	01	2023	ROADWAY	S	C	Preventive	In-House	PCC	3	68.52	68.64	$0.00	$961.09	$0.00	$0.00	$961.09
Keesler	RDBAUGHMAN	01	2023	ROADWAY	S	C	Preventive	In-House	AC	3	59.59	59.76	$0.00	$2,663.40	$0.00	$0.00	$2,663.40
Keesler	RDBAUGHMAN	02	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.89	93.06	$0.00	$44.83	$0.00	$0.00	$44.83
Keesler	RDPARADELN	01	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.89	93.06	$0.00	$354.95	$0.00	$0.00	$354.95
Keesler	RDTINGLE	01	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.79	92.96	$0.00	$139.34	$0.00	$0.00	$139.34
Keesler	RDTSTREET	01	2023	ROADWAY	S	C	Preventive	In-House	AC	3	55.89	56.05	$0.00	$12,432.39	$0.00	$0.00	$12,432.39
Keesler	PA00237	01	2023	PARKING	P	B	Preventive	In-House	AC	4	91.01	91.22	$0.00	$23.74	$0.00	$0.00	$23.74
Keesler	PA00237	02	2023	PARKING	P	B	Preventive	In-House	AC	4	90.11	90.32	$0.00	$62.09	$0.00	$0.00	$62.09

8-7.2.2 Combine Major M&R Requirements.

Major M&R requirements fall into all risk - return categories other than A, B, and D, with categories C, F, and G having the highest return on investment. Combine Major M&R requirements in these respective categories for each section in each year to determine opportunities to combine them for execution. Some examples are provided below.

- Mill and overlay requirements for various sections of a parking area are triggered when these sections drop below the critical PCI in different years, as shown in Figure 8-7. Aggregating these requirements into a single project provides economy of scale and avoids multiple road closures.
- Localized and global M&R are not performed on sections scheduled for Major M&R, but including sections in the same vicinity that require

localized or global M&R in a Major M&R project can provide both operational and cost benefits.

Figure 8-7 Combining Major M&R Requirements Example

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	PA00308	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	31.90	31.90	$2,961.33	$0.00	$0.00	$0.00	$2,961.33
Keesler	PA00308	01	2024	PARKING	S	I	Stopgap	In-House	AC	7	30.06	30.06	$3,172.41	$0.00	$0.00	$0.00	$3,172.41
Keesler	PA00308	01	2025	PARKING	S	I	Stopgap	In-House	AC	7	28.22	28.22	$3,571.62	$0.00	$0.00	$0.00	$3,571.62
Keesler	PA00308	01	2026	PARKING	S	I	Major Below Critical	Contract	AC	7	26.38	100.00	$0.00	$0.00	$0.00	$49,565.80	$49,565.80
Keesler	PA00308	01	2027	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$16.55	$0.00	$0.00	$16.55
Keesler	PA00308	03	2023	PARKING	S	G	Stopgap	In-House	AC	7	49.20	49.20	$1,903.17	$0.00	$0.00	$0.00	$1,903.17
Keesler	PA00308	03	2024	PARKING	S	G	Stopgap	In-House	AC	7	47.36	47.36	$2,024.12	$0.00	$0.00	$0.00	$2,024.12
Keesler	PA00308	03	2025	PARKING	S	G	Major Below Critical	Contract	AC	7	45.52	100.00	$0.00	$0.00	$0.00	$36,715.34	$36,715.34
Keesler	PA00308	03	2026	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$20.43	$0.00	$0.00	$20.43
Keesler	PA00308	03	2027	PARKING	S	D	Preventive	In-House	AC	7	96.53	96.73	$0.00	$38.63	$0.00	$0.00	$38.63
Keesler	PA00308	05	2023	PARKING	S	G	Stopgap	In-House	AC	7	53.80	53.80	$1,634.78	$0.00	$0.00	$0.00	$1,634.78
Keesler	PA00308	05	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	51.96	100.00	$0.00	$0.00	$0.00	$17,225.61	$17,225.61
Keesler	PA00308	05	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$20.86	$0.00	$0.00	$20.86
Keesler	PA00308	05	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$39.55	$0.00	$0.00	$39.55
Keesler	PA00308	05	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$58.14	$0.00	$0.00	$58.14
Keesler	PA00308	06	2023	PARKING	S	G	Preventive + Global MR	In-House	AC	7	69.40	73.28	$0.00	$1,339.40	$2,519.62	$0.00	$3,859.02
Keesler	PA00308	06	2024	PARKING	S	D	Preventive	In-House	AC	7	71.44	71.64	$0.00	$898.63	$0.00	$0.00	$898.63
Keesler	PA00308	06	2025	PARKING	S	G	Preventive	In-House	AC	7	69.80	70.00	$0.00	$1,117.49	$0.00	$0.00	$1,117.49
Keesler	PA00308	06	2026	PARKING	S	G	Preventive	In-House	AC	7	68.16	68.36	$0.00	$2,027.35	$0.00	$0.00	$2,027.35
Keesler	PA00308	06	2027	PARKING	S	G	Preventive	In-House	AC	7	66.52	66.72	$0.00	$2,937.10	$0.00	$0.00	$2,937.10
Keesler	PA00308	07	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.10	50.10	$1,310.88	$0.00	$0.00	$0.00	$1,310.88
Keesler	PA00308	07	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	48.26	100.00	$0.00	$0.00	$0.00	$17,470.96	$17,470.96
Keesler	PA00308	07	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$14.52	$0.00	$0.00	$14.52
Keesler	PA00308	07	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$27.53	$0.00	$0.00	$27.53
Keesler	PA00308	07	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$40.47	$0.00	$0.00	$40.47
Keesler	PA00308	08	2023	PARKING	S	G	Preventive	In-House	AC	7	55.10	55.30	$0.00	$6,482.38	$0.00	$0.00	$6,482.38
Keesler	PA00308	08	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	53.46	100.00	$0.00	$0.00	$0.00	$12,192.43	$12,192.43
Keesler	PA00308	08	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$14.77	$0.00	$0.00	$14.77
Keesler	PA00308	08	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$28.00	$0.00	$0.00	$28.00
Keesler	PA00308	08	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$41.15	$0.00	$0.00	$41.15
Keesler	PA00308	09	2023	PARKING	S	G	Stopgap	In-House	AC	7	51.90	51.90	$1,468.86	$0.00	$0.00	$0.00	$1,468.86
Keesler	PA00308	09	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	50.06	100.00	$0.00	$0.00	$0.00	$14,357.25	$14,357.25
Keesler	PA00308	09	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$17.39	$0.00	$0.00	$17.39
Keesler	PA00308	09	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$32.97	$0.00	$0.00	$32.97

8-7.2.3 Combine Localized and Global M&R Requirements.

Localized and global work requirements are often executed via IDIQ or included in a competitive bid contract with Major M&R. Combine requirements within each of these respective categories for each year in the PMP. Consider the following when combining localized and global M&R requirements.

- Consider using IDIQ contract vehicles for operational repairs when in-house work forces are unavailable or do not have the capability.
- Avoid combining work requirements in widely varying risk - return categories.
- Avoid situations where part of the work on a section is done by one execution method and the remainder by another.
- Identify sections with the same M&R requirements within a given risk - return category that can be combined into a project. For example, combine requirements for several aprons that all require joint seal replacement.

8-7.2.4 Input Required Projects in PAVER.

Leverage PAVER capabilities by creating required projects in PAVER using the **Required Work** tool or the **Project Formulation Wizard** for the projects identified in the previous paragraphs. Once entered into PAVER, re-run the Critical PCI Work Plan with the required projects. PAVER will attempt to develop a balanced budget around these required projects for each year in the work plan. Use an iterative approach for a large network. Combine the highest priority requirements into required projects, then rerun the work plan and combine the lower priority requirements. Paragraph A-9 provides examples of creating required projects in PAVER and re-running the work plans.

8-7.3 Defining Work Types and Estimated Quantities.

Recall that an optimal critical PCI work plan defines a general M&R category, e.g., Major Localized Preventive, but does define specific repair requirements. Use the Applied Policy Details view of the PAVER Consequence of Localized Distress Maintenance work plan to identify specific work types for each section in each year in the PMP. The Consequence of Localized Distress Maintenance work plan outlines all localized M&R requirements and includes the extrapolated distress quantities, the policy (operational or preventive), and estimated cost based on the cost by work type tables defined in the M&R Family models.

Note: This report is based on the distress data from the most recent PCI inspection, so it provides a reasonable estimate of distress types, severities, and quantities at the time of the last inspection. The severity and quantity estimates lose fidelity as time passes, but this report still provides a good indication of the distress types and required work types for each section. An example of a using the Consequence of Localized Distress Maintenance work plan to define work types and estimated quantities in the prioritized requirements list is provided in paragraphs A-9.6 and A-9.7.

8-8 VALIDATE REQUIREMENTS, QUANTITIES, AND COSTS.

A PCI inspection uses a statistical approach to determine the pavement condition, as described in UFC 3-260-16 and paragraph 4-2 of this UFC. The types, severities, and quantities of distresses are measured for a sufficient subset of the total samples in a section to attain the desired confidence level. PAVER extrapolates the quantities for each type and severity of distress for the entire section based on the samples inspected. These extrapolated distresses are good estimates but need to be validated for projects for several reasons.

8-8.1 Validating Rigid Pavement Repair Requirements.

Rigid pavement distresses are counted at the slab level per the PCI inspection rules outlined in UFC 3-260-16. This means that a slab may have multiple distresses of the same type but only one instance of a distress is recorded at the highest severity level. This can lead to underestimating quantities in certain circumstances.

8-8.2 Validating Extrapolated Distress Quantities.

While we can predict pavement condition in future years and the extrapolated distresses provide a reasonable estimate of quantities at the time of the inspection, there is no way to accurately predict quantities for specific distress types and severities in future years.

8-8.3 Validation Procedure.

At a minimum, perform a visual inspection to validate the distress types, severities and quantities identified in the last PCI inspection. Use this data to update the in-house work tasks and projects. Verify that the distress types present during the visual inspection are the same identified in the previous inspection. Look for distress types that were not recorded in the previous inspection and determine if there has been a significant increase in the severity or quantity of distresses. The PAVER Inspection Report generated with the Inspection Report/Forms/Setup wizard described in paragraph 4-2.1 is a useful tool for project validation. Run the report for the sections of interest as a reference when performing the validation. Other considerations include the following.

- Determine if the repair recommended in the distress maintenance policy is appropriate or if there are other underlying issues that call for a different work type to address the issue. Update the PMP to reflect the appropriate work type.
- Recall that critical PCI work plan cost estimates are based on cost by condition tables and the consequence of localized distress maintenance work plan costs are based on cost by work type tables. These approaches typically provide estimates that vary and that should be validated based on current costs and quantities. Update the PMP to reflect the current costs and quantities.
- Marking distresses to be repaired while doing the validation is a good approach when work is performed by in-house work forces or pavement IDIQ.
- A good practice when validating quantities for a localized M&R project is to generate a map that shows the distress locations (commonly known as a crack map).

8-8.4 Review, Approve, and Publish PMP.

Provide an opportunity for the PMP development team to perform a final review, resolve any comments or issues, then submit the plan to leadership for approval. The approval level is dictated by the Service. Update the approved PMP as the work tasks and projects are executed. Revise work plans and update the PMP on at least an annual basis. A best practice is to update the PAVER work history to document projects as they are completed and then updating work plans.

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APPENDIX A BEST PRACTICES

The Best Practices Appendix is considered to be guidance and not requirements. Its main purpose is to communicate proven facility solutions, systems, and lessons learned, but may not be the only solution to meet the requirement.

A-1 DESCRIPTIVE AND USER-DEFINED FIELDS.

This section discusses the use of descriptive and user-defined fields at the network, branch, and section levels.

A-1.1 Network-level Fields.

The Network-level user-defined fields listed below allow users to define the networks to include or exclude from M&R work plans or other analyses and reports. The Service POCs identified in paragraph 2-9.3 responsible for the pavement management program must create these fields. When the fields are created, PAVER gives them a unique ID. Export this database for use as a template. When this database is combined with an installation database, the fields are available with original unique ID.

This is a one-time process. Once the fields are included in each database, they are only updated if something changes, e.g., an installation’s assigned command changes. These fields are useful for individual databases and are essential for filtering data in a Service combined (rollup) database.

- Major Command (List of Commands as appropriate for Service)
- Privatized (Yes or No)
- Housing (Yes or No)

A-1.2 Branch-level Fields.

The Branch Use or Category Code (a descriptive field) fields cover the requirements, so no additional user-defined fields are recommended.

A-1.3 Section-level Fields.

A user-defined Status field at the section level, with values including those listed below, provides fidelity on the reason a section was or was not inspected and is used to filter out sections that should not be included in M&R work plans or other analyses. This user-defined field is imported into the database from a template created by the Service POC as described in paragraph 2-9.3. Alternatively, a Service could use the Section Category descriptive field for the same purpose. In either case, the Service defines a standard set of fields used in all databases.

- Inspected
- Maintained by Others
- Abandoned

- No Access
- Out of Scope
- Under Construction

A-2 COST BY WORK TYPE TABLES.

The following tables define the work elements used to develop standard costs for each PAVER standard work type used by DoD to develop airfield and road and parking M&R work plans and PMPs. These are fully burdened unit costs, including mobilization, overhead, materials, disposal, and labor costs, as well as any appropriate O&M escalation factors. They are based on RS Means or the Tri-Service Automated Cost Engineering System (TRACES) applications such as the Parametric Cost Engineering System (PACES) or the Micro-Computer Aided Cost Estimating System Second Generation (MII) using the current TRACES Cost Book/Unit Price Book (UPB). Each is based on the work element assumptions for each standard work type described below. Modify the values in these cost by work type tables using the area cost factor for the specific location.

If specific, well-documented local costs data exist or existing conditions differ from the assumptions used in Tables A-1, A-2, and A-3, adjust the unit costs but fully document all work element assumptions for the change in the pavement evaluation report and the PMP.

Table A-1 Localized M&R Cost by Work Type

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
BS-SE	Break and Seat	SqFt		Crack (plain PCC) or break (reinforced PCC) slabs, seat slabs with a pneumatic roller, Overlay pavement with HMA. Overlay thickness must meet minimum thickness requirements in UFC 3-260-02, but will not be less than 4 inches, which is the assumed thickness for this line item.
CM-LO	Cold Milling-Localized	SqFt		Mill (aka cold plane) asphalt pavement just enough thickness to level and smooth the surface. This line item assumes less than or equal to 2 inches of pavement are milled and that the material is stockpiled on installation for re-use so no disposal costs are incurred.
CS-AC	Crack Sealing - AC	Ft		Remove old sealant (if any), saw/route cracks, clean crack reservoir, install backer rod to control depth of sealant, and seal using an approved hot-applied sealant.
CS-PC	Crack Sealing - PCC	Ft		Remove old sealant (if any), saw/route cracks, clean crack reservoir, install backer rod to control depth of sealant, and seal using an approved silicone sealant.
GR-AC	Grinding - AC (Localized)	Ft		This line item assumes diamond grinding for localized repair using walk-behind diamond grinding equipment.
GR-PC	Grinding – PCC (Localized)	Ft		This line item assumes diamond grinding for localized repair using walk-behind diamond grinding equipment.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
JS-LC	Joint Seal (Localized)	Ft		Joint seal replacement is typically done on entire sections (global) but may be done for localized areas. This line item includes routing the reservoir to achieve the correct shape factor, cleaning the reservoir, placing backer rod, and placing new silicone joint seal.
NONE	No Localized M & R	SqFt	0.00	No work performed
PA-AD	Patching - AC Deep	SqFt		Remove existing pavement (5 inches assumed) and base (18 inches assumed). Compact the subgrade, replace, and compact the base in lifts, apply prime coat, replace, and compact HMA with tack coat between lifts.
PA-AL	Patching - AC Leveling	SqFt		Remove loose material from rut or depression to be repaired, seal cracks, apply micro-surfacing in 1/4-inch lifts (curing between lifts), roll, and cure the micro-surfacing.
PA-AS	Patching - AC Shallow	SqFt		Remove existing pavement (5 inches assumed), recompact the base, apply prime coat, replace and compact HMA with tack coat between lifts.
PA-IR	Patching-Infrared	SqFt		Using an infrared heater for the asphalt repair, heat the asphalt to a working temperature of 300 °F, penetrating the asphalt to a depth of 3 to 4 inches. Remove deteriorated asphalt and rake in new HMA then compact the area with a vibratory roller.
PA-PF	Patching - PCC Full Depth	SqFt		Sawcut pavement to full depth (12-inch plain PCC assumed), remove the concrete, scarify and recompact the base or subgrade below the slab, place dowels at joints to adjacent slabs to match existing dowel layout (20-foot slabs with 15" spacing of 20" 1.25" dowels assumed). Place tie-bars to remainder of existing slab then place new concrete. Maintain all joints to adjacent slabs.
PA-PP	Patching - PCC Partial Depth	SqFt		Sawcut and remove partial depth of concrete (4 inches assumed), clean the repair area, and place new concrete. This line item assumes use of a rapid-setting concrete such as those found on the Tri-Service website below. Note that maintaining the joint is critical on any repair adjacent to a joint. https://transportation.erdc.dren.mil/cacsites/TriService/pavement_repair.aspx
PA-PL	Patching – PCC Partial Depth POL Damage Repair	SqFt		Sawcut and remove partial depth of concrete (4 inches assumed), clean the repair area, and place new magnesium phosphate cement. Once the repair is in place, seal the pavement using a sodium silicate surface treatment.
SH-LE	Shoulder leveling	Ft		Remove loose materials along the length of the shoulder, place, grade, and compact aggregate to eliminate shoulder drop-off while maintaining the slope of the unpaved shoulder away from the road. This item assumes a 10-foot-wide shoulder with an average thickness of 4 inches of aggregate required for the repair.
SL-PC	Slab Replacement - PCC	SqFt		Make multiple sawcuts for the full depth of the existing slab (12 inches of plain PCC assumed) and remove the concrete. Scarify and recompact the base or subgrade below the slab, place dowels according to UFC 3-270-01 requirements, then place new concrete and seal the joints.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
ST-AL	Surface Treatment – AC (Localized)	SqFt		This line item assumes a slurry seal is applied to a localized area (e.g., a portion of a section like a parking area). Use the global work line item when the entire section(s) (e.g., a whole parking area of multiple parking areas) receives the surface treatment. Adjust the cost when a lower cost (e.g., fog seal or rejuvenator) or higher cost (e.g., cape seal or microsurface) surface treatment is used.
ST-PL	Surface Treatment – PCC (Localized)	SqFt		This line item assumes a localized area (e.g., one or more aircraft parking spots on an apron) are cleaned and sodium silicate is applied to prevent deterioration from heat and petroleum products. Use the global work line item when the entire section(s) (e.g., a whole apron) receives the surface treatment.
SS-SG	Spread Sand or Gravel	SqFt		Place hot sand with a spreader to blot up the excess binder on the surface, roll the sand with a pneumatic roller, then remove the excess sand with a vacuum sweeper.
UN-PC	Undersealing - PCC	SqFt		This line item assumes that a high-density polyurethane polymer material is used to underseal and restore support to the pavement slab. Drill holes in the area with voids, inject grout to fill the void, plug the drill holes, and grind surface to restore the profile of the affected joint(s) or crack(s).
SJ-PC	Slab Jacking - PCC	SqFt		This line item assumes that a high-density polyurethane polymer material is used to raise a slab or multiple slabs. Drill holes in the area(s) of the slab(s), inject grout to raise the slab(s) to the desired elevation, plug the drill holes, and grind surface to restore the profile of affected joint(s) or crack(s)
LT-PC	Load Transfer Restoration – PCC (Localized)	Ft		Sawcut and chip existing concrete at joints to mid-depth (12-inch plain PCC assumed) to create slots, place the dowel bars (20-foot slabs with 15" spacing of 20" 1.25" dowels assumed) into the slots, ensuring they are properly aligned. Place repair material into the slots (assumes use of a rapid-setting concrete such as those found on the Tri-Service Website below). Restore the joint at the slot locations, seal the joints, and grind any joint discontinuity. https://transportation.erdc.dren.mil/cacsites/TriService/pavement_repair.aspx
ED-RF	Retrofitted Edge Drain	Ft		Remove existing edge drains, trench (assume a 4-foot depth), place filter fabric, place new edge drain (6-inch flexible, corrugated polyethylene [CPE] pipe assumed), and backfill using procedures in UFC 3-270-01, Chapter 19.
HR-PD	Partial Depth Heat Resistant PCC Repair	SqFt		Sawcut and remove damaged concrete (4-inch depth assumed), clean the repair area, place new heat-resistant concrete, and re-seal the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint.
HR-FD	Full Depth Heat Resistant PCC Repair	SqFt		Sawcut pavement to full depth (12-inch plain PCC assumed), remove the concrete, scarify and recompact the base or subgrade below the slab, place dowels at joints to adjacent slabs to match existing dowel layout (20-foot slabs with 15" spacing of 20" 1.25" dowels assumed). Place tie-bars to remainder of existing slab, then place new heat-resistant concrete and re-seal the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
HR-CR	Partial Depth Continuously Reinforced Heat Resistant PCC Repair	SqFt		Sawcut and remove damaged concrete (6-inch depth assumed) and reinforcement, clean the repair area, replace the reinforcement and tie bars, then place new heat-resistant concrete and re-seal the surface with sodium silicate. Note that maintaining the joint is critical on any repair adjacent to a joint.

Table A-2 Global M&R Cost by Work Type

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
NONE	No Global M & R	SqFt	0.00	No work elements
GL-AT	Overlay - AC Thin (Global)	SqFt		Remove all loose material, place tack coat, and place HMA overlay. This line item assumes a 2-inch overlay with asphalt provided by a local central mixing plant. Compact pavement to specified density. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
GL-FR	Overlay - Fuel-Resistant AC (Global)	SqFt		Remove all loose material, place tack coat, place fuel-resistant HMA overlay. This line item assumes a 2-inch overlay with asphalt provided by a local central mixing plant. Compact pavement to specified density. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
JS-CP	Joint Seal – Compression	Ft		Remove old joint seal material, route the joint reservoir to achieve the correct shape factor, clean the reservoir, and place new compression joint seal.
JS-HP	Joint Seal – Hot Pour	Ft		Remove old joint seal material, route the joint reservoir to achieve the correct shape factor, clean the reservoir, and place new hot-pour joint seal.
JS-SI	Joint Seal - Silicon	Ft		Remove old joint seal material, route the joint reservoir to achieve the correct shape factor, clean the reservoir, and place new silicone joint seal.
SS-CT	Surface Seal - Coal Tar	SqFt		Remove all loose material on surface, mix the fuel-resistant sealer in batches, and place by pouring on pavement and using squeegees to spread the material. This line item assumes two layers are applied to the HMA. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
SS-FS	Surface Seal - Fog Seal	SqFt		Remove all loose material on surface and place fog seal using a distributor calibrated to deliver the fog seal at the specified rate. This line item assumes application dilution is 1 part emulsion to 1 part water with a 0.05 gallon per square yard application rate. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
SS-RE	Surface Seal - Rejuvenating	SqFt		Remove all loose material on surface and place rejuvenator using a distributor calibrated to deliver the material at the specified rate. This line item assumes a 0.1 gallon per square yard application rate. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
ST-CS	Surface Treatment - Cape Seal	SqFt		Remove all loose material on surface and place binder using a distributor calibrated to deliver the material at the specified rate. Apply the aggregate immediately after the binder and roll with a rubber-tired roller immediately after applying the aggregate to seat the aggregate in the binder. This line item assumes application of a slurry seal over the bituminous surface treatment using a truck-mounted continuous-mix slurry machine. Once the slurry seal is cured, roll with a pneumatic-tired roller. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
ST-MS	Surface Treatment - Micro Surface	SqFt		Remove all loose material on surface, apply tack coat, wet the pavement surface with water fogging, and place the micro-surface using a self-propelled mixing and placement vehicle. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
ST-SB	Surface Treatment - Single Bituminous	SqFt		Remove all loose material on surface and place binder using a distributor calibrated to deliver the material at the specified rate. Apply the aggregate immediately after the binder and roll with a rubber-tired roller immediately after applying the aggregate to seat the aggregate in the binder. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
ST-DB	Surface Treatment - Double Bituminous			Remove all loose material on surface and place binder using a distributor calibrated to deliver the material at the specified rate. Apply the aggregate immediately after the binder and roll with a rubber-tired roller immediately after applying the aggregate to seat the aggregate in the binder. Repeat the process, applying another layer of binder and aggregate, then roll with a rubber-tired roller immediately after applying the second layer of aggregate. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
ST-SS	Surface Treatment - Slurry Seal	SqFt		Remove all loose material on surface, apply tack coat, place the slurry seal using a truck-mounted continuous-mix slurry machine, and roll with a rubber-tired roller once the slurry seal has cured. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.
ST-ST	Surface Treatment - Sand Tar (Seal)	SqFt		Remove all loose material on surface and apply asphalt emulsion. (When used to address bleeding, do not apply asphalt binder before the sand seal is placed since the primary purpose is to blot up the excess binder on the surface.) Apply hot sand, roll the sand with a pneumatic-tire roller, and remove excess sand using a vacuum sweeper once the surface treatment is cooled. All structural distresses and crack repairs are covered by separate localized repair line items. This line item does not include pavement markings.

Table A-3 Major M&R Cost by Work Type

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
AR-CO	AC Surface Recycling - Cold	SqFt		Mill the existing asphalt, haul to crusher, and crush to specified particle size. Mix with virgin material and reuse material to pave secondary roads or parking areas (if a seal coat is applied) or as a base course. This work type assumes that both the existing and new pavement thickness is 3 inches and 4 inches when used as a base.
AR-HO	AC Surface Recycling - Hot	SqFt		Mill the existing HMA, haul millings to plant, crush millings, and mix millings in a hot-mix plant with new aggregate, asphalt, and recycling agent. Transport recycled asphalt to site, place and compact HMA, and place pavement markings. This line item assumes both the existing and new pavement thickness is 3 inches for roads or parking areas and 5 inches for an airfield. Adjust cost if in-place recycling is used but assume same thicknesses unless there is specific information regarding thickness.
BR-SE	Break & Seat & Overlay	SqFt		Minimize the size of the concrete slabs using a breaking or cracking procedure. Seat the broken concrete pieces with a heavily weighted rubber-tire roller. Overlay the pavement with HMA and place pavement markings. This work type assumes the existing plain concrete pavement is 6 inches for roads and parking and 12 inches for airfields and that the AC overlay is 3 inches for roads and parking and 5 inches for an airfield.
BR-RB	Rubblization & Overlay	SqFt		Install underdrain to relieve pressure during the rubblization process: trench (assume a 4-foot depth), place filter fabric, place new edge drain (6-inch flexible, CPE pipe assumed), and backfill using procedures in UFC 3-270-01, Chapter 19. Rubblize pavement using a multiple-head breaker or resonant pavement breaker, seat the broken pieces with a pneumatic roller, overlay the pavement with HMA, and place pavement markings. This work type assumes the geotechnical assessment cost is not included in this line item and that the existing concrete pavement is 6 inches for roads and parking and 12 inches for airfields. It also assumes the AC overlay is 3 inches for roads and parking and 5 inches for an airfield.
CR-AC-4	Complete Reconstruction, 4 inches AC	SqFt		Mill 4 inches of asphalt to base and remove existing 6-inch base to subgrade. Compact subgrade to meet UFC 3-260-02 requirements, place and compact 6 inches of base course, place and compact 4 inches of HMA in 2-inch lifts, and place pavement markings.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
CR-AC-6	Complete Reconstruction, 6 inches AC	SqFt		Mill 6 inches of asphalt to base, remove existing 6-inch base to subbase, and remove existing 4-inch subbase to subgrade. Compact subgrade to UFC 3-260-02 requirements, place and compact 4 inches of subbase and 6 inches of base course, place and compact 6 inches of HMA in 2-inch lifts, and place pavement markings.
CR-AC-8	Complete Reconstruction, 8 inches AC	SqFt		Mill 8 inches of asphalt to base, remove existing 8-inch base to subbase, and remove existing 6-inch subbase to subgrade. Compact subgrade to UFC 3-260-02 requirements, place and compact 6 inches of subbase and 8 inches of base course, place and compact 8 inches of HMA in 2-inch lifts, and place pavement markings.
CR-PC-8	Complete Reconstruction, 8 inches PCC	SqFt		Demolish existing 8-inch plain PCC slabs, remove existing 6-inch base to subgrade, and compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 6 inches of new base course and place new 8-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
CR-PC-12	Complete Reconstruction, 12 inches PCC	SqFt		Demolish existing 12-inch plain PCC slabs, remove existing 8-inch base to subgrade, and compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 8 inches of new base course and place new 12-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
CR-PC-18	Complete Reconstruction, 18 inches PCC	SqFt		Demolish existing 18-inch plain PCC slabs, remove existing 12-inch base to subgrade, compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 12 inches of new base course and place new 18-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
CR-PC-24	Complete Reconstruction, 24 inches PCC	SqFt		Demolish existing 24-inch plain PCC slabs, remove existing 16-inch base to subgrade, compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 16 inches of new base course and place new 24-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
HI-AG	New Construction	SqFt	0.00	No work type elements
MOL	Cold Mill and Overlay	SqFt	0.00	No work type elements

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
MOL-2	Cold Mill and Overlay - 2 Inches	SqFt		Mill 2 inches of the existing asphalt surface, remove all loose material, place tack coat, place and compact 2 inches of HMA, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
MOL-3	Cold Mill and Overlay - 3 Inches	SqFt		Mill 3 inches of the existing asphalt surface, remove all loose material, place tack coat, place and compact 3 inches of HMA, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
MOL-4	Cold Mill and Overlay - 4 Inches	SqFt		Mill 4 inches of the existing asphalt surface, remove all loose material, place tack coat, place and compact 4 inches of HMA in 2-inch lifts, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
NC-AC-4	New Construction, 4 inches AC	SqFt		Perform site preparation and grading, compact subgrade to UFC 3-260-02 requirements, place and compact 6 inches of base course, place and compact 4 inches of HMA in 2-inch lifts, and place pavement markings.
NC-AC-6	New Construction, 6 inches AC	SqFt		Perform site preparation and grading, compact subgrade to UFC 3-260-02 requirements, place and compact 4 inches of subbase, place and compact 6 inches of base course, place and compact 6 inches of HMA in 2-inch lifts, and place pavement markings.
NC-AC-8	New Construction, 8 inches AC	SqFt		Perform site preparation and grading, compact subgrade to UFC 3-260-02 requirements, place and compact 6 inches of subbase, place and compact 8 inches of base course, place and compact 8 inches of HMA in 2-inch lifts, and place pavement markings.
NC-PC-8	New Construction, 8 inches PCC	SqFt		Perform site preparation and grading, compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 6 inches of new base course and place new 8-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
NC-PC-12	New Construction, 12 inches PCC	SqFt		Perform site preparation and grading, compact top 6 inches of subgrade to UFC 3-260-02 requirements Place and compact 8 inches of new base course and place new 12-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
NC-PC-18	New Construction, 18 inches PCC	SqFt		Perform site preparation and grading, compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 12 inches of new base course and place new 18-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
NC-PC-24	New Construction, 24 inches PCC	SqFt		Perform site preparation and grading, compact top 6 inches of subgrade to UFC 3-260-02 requirements. Place and compact 16 inches of new base course and place new 24-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
NONE	No Major M & R	SqFt	0.00	No work type elements
NU-IN	New Construction - Initial	SqFt		No work type elements
NU-US	New Construction - Unsurfaced	SqFt		Perform site preparation and grading, compact subgrade to UFC 3-260-09 requirements, place and compact 6 inches of base course, place and compact 4 inches of aggregate surface layer.
OL-AF	Overlay - AC Fabric	SqFt		Remove all loose material, place tack coat, place geofabric, place and compact 2 inches of HMA, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
OL-AS	Overlay - AC Structural	SqFt		Remove all loose material, place tack coat, place and compact 4 inches of HMA in 2-inch lifts, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
OL-AT	Overlay - AC Thin	SqFt		Remove all loose material, place tack coat, place geofabric, place and compact 2 inches of HMA, and place pavement markings. All structural distress and crack repairs are covered by separate localized repair line items.
OL-PF	Overlay - PCC Fully Bonded	SqFt		Cold mill or shotblast the base slab to remove all deteriorated or defective concrete and all surface contamination and thoroughly clean the surface by sandblasting followed by air blasting and water blasting. Pneumatically apply a portland cement grout ahead of the concrete placement, ensuring the grout is not dry prior to placement. Place a 5-inch plain PCC overlay, apply curing compound, saw joints to match joints in base slabs, place compression joint seals at all joints, and place pavement markings.

Code	Name	Work Unit	Unit Cost ($)	Work Type Elements
OL-PP	Overlay - PCC Partially Bonded	SqFt		Remove all loose material, place a 6-inch plain PCC overlay, apply curing compound, saw joints to match joints in base slabs, place compression joint seals at all joints, and place pavement markings. All structural distress and crack repairs in the existing pavement are covered by separate localized repair line items.
OL-PU	Overlay - PCC Unbonded	SqFt		Remove all loose material, place a 2-inch asphalt bond-breaker and a 6-inch plain PCC overlay, apply curing compound, saw joints to match joints in base slabs, place compression joint seals at all joints, and place pavement markings. All structural distress and crack repairs in the existing pavement are covered by separate localized repair line items.
SR-AC	Surface Reconstruction - AC	SqFt		Mill the full depth of the existing asphalt surface to the base course, scarify and recompact the base, place a prime coat and place and compact 4 inches of HMA in 2-inch lifts, and place pavement markings.
SR-PC	Surface Reconstruction - PCC	SqFt		Remove existing plain PCC pavement, scarify and recompact the base, place new 8-inch plain PCC using slip form paving procedures with dowels at longitudinal joints and sawn transverse joints, apply curing compound, saw transverse joints, place compression joint seals at all joints, and place pavement markings.
SU-AC	Surface Course - AC	SqFt		No work type elements
SU-DB	Surface Course - Double Bitum.	SqFt		Remove all loose material on surface, place binder using a distributor calibrated to deliver the material at the specified rate. Apply the aggregate immediately after the binder and roll with a rubber-tired roller immediately after applying the aggregate to seat the aggregate in the binder. Repeat the process, applying another layer of binder and aggregate then roll with a rubber-tired roller immediately after applying the second layer of aggregate and place pavement markings. All structural distresses and crack repairs are covered by separate localized repair line items.
SU-PC	Surface Course - PCC	SqFt		No work type elements
SU-PF	Surface Course - Porous Friction	SqFt		Remove all loose material from existing AC pavement, place tack coat, place and compact 1 inch of porous friction course, and place pavement markings. All structural distresses and crack repairs are covered by separate localized repair line items.

A-3 M&R DISTRESS MAINTENANCE POLICY TABLES.

Service POCs drafted and agreed to the following Maintenance Policy tables. These policies cover most typical situations. Notes are provided to clarify alternatives.

A-3.1 Localized Operational Maintenance Policies.

Tables A-4 through A-7 provide standard localized operational maintenance policies for airfields, roads, and parking.

Table A-4 Asphalt Airfield Operational M&R Policy

Operational M&R Distress Maintenance Policy - Airfield Asphalt					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
41	Low	ALLIGATOR CRACKING	NONE	No Localized M & R	---
41	Medium	ALLIGATOR CRACKING	NONE	No Localized M & R	---
41	High	ALLIGATOR CRACKING	PA-AD	Patching - AC Deep	SqFt
42	N/A	BLEEDING	NONE	No Localized M & R	---
43	Low	BLOCK CRACKING	NONE	No Localized M & R	---
43	Medium	BLOCK CRACKING	NONE	No Localized M & R	---
43	High	BLOCK CRACKING	PA-AS	Patching - AC Shallow	SqFt
44	Low	CORRUGATION	NONE	No Localized M & R	---
44	Medium	CORRUGATION	NONE	No Localized M & R	---
44	High	CORRUGATION	PA-AS	Patching - AC Shallow	SqFt
45	Low	DEPRESSION	NONE	No Localized M & R	---
45	Medium	DEPRESSION	NONE	No Localized M & R	---
45	High	DEPRESSION	PA-AS	Patching - AC Shallow	SqFt
46	N/A	JET BLAST	PA-AS	Patching - AC Shallow	SqFt
47	Low	JOINT REFLECTIVE CRACKING	NONE	No Localized M & R	---
47	Medium	JOINT REFLECTIVE CRACKING	NONE	No Localized M & R	Ft
47	High	JOINT REFLECTIVE CRACKING	PA-AS	Crack Sealing - AC	SqFt
48	Low	LONGITUDINAL AND TRANSVERSE CRACKING	NONE	No Localized M & R	---
48	Medium	LONGITUDINAL AND TRANSVERSE CRACKING	NONE	No Localized M & R	---
48	High	LONGITUDINAL AND TRANSVERSE CRACKING	CS-AC	Crack Sealing - AC	Ft

Operational M&R Distress Maintenance Policy - Airfield Asphalt					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
49	N/A	OIL SPILLAGE	NONE	No Localized M & R	---
50	Low	PATCHING	NONE	No Localized M & R	---
50	Medium	PATCHING	PA-AS	Patching - AC Shallow	SqFt
50	High	PATCHING	PA-AS	Patching - AC Shallow	SqFt
51	N/A	POLISHED AGGREGATE	NONE	No Localized M & R	---
52	Low	RAVELING	NONE	No Localized M & R	---
52	Medium	RAVELING	NONE	No Localized M & R	---
52	High	RAVELING	NONE	No Localized M & R	---
53	Low	RUTTING	NONE	No Localized M & R	---
53	Medium	RUTTING	NONE	No Localized M & R	---
53	High	RUTTING	PA-AD	Patching - AC Deep	SqFt
54	Low	SHOVING	NONE	No Localized M & R	---
54	Medium	SHOVING	NONE	No Localized M & R	---
54	High	SHOVING	PA-AD	Patching - AC Deep	SqFt
55	N/A	SLIPPAGE CRACKING	NONE	No Localized M & R	---
56	Low	SWELLING	NONE	No Localized M & R	---
56	Medium	SWELLING	NONE	No Localized M & R	---
56	High	SWELLING	PA-AD	Patching - AC Deep	SqFt
57	Low	WEATHERING	NONE	No Localized M & R	---
57	Medium	WEATHERING	NONE	No Localized M & R	---
57	High	WEATHERING	NONE	No Localized M & R	---

Table A-5 Concrete Airfield Operational M&R Policy

Operational Pavement Distress Maintenance Policy - Airfield Concrete					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
61	Low	BLOW-UP	NONE	No Localized M & R	---
61	Medium	BLOW-UP	NONE	No Localized M & R	---
61	High	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
62	Low	CORNER BREAK	NONE	No Localized M & R	---
62	Medium	CORNER BREAK	NONE	No Localized M & R	---
62	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
63	Low	LINEAR CRACKING	NONE	No Localized M & R	---
63	Medium	LINEAR CRACKING	NONE	No Localized M & R	---
63	High	LINEAR CRACKING	CS-PC	Crack Sealing - PCC	Ft
64	Low	DURABILITY CRACKING	NONE	No Localized M & R	---
64	Medium	DURABILITY CRACKING	PA-PF	Patching - PCC Full Depth	SqFt
64	High	DURABILITY CRACKING	SL-PC	Slab Replacement - PCC	SqFt
65	Low	JOINT SEAL DAMAGE	NONE	No Localized M & R	---
65	Medium	JOINT SEAL DAMAGE	NONE	No Localized M & R	---
65	High	JOINT SEAL DAMAGE	NONE	No Localized M & R	---
66	Low	SMALL PATCH	NONE	No Localized M & R	---
66	Medium	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
66	High	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
67	Low	LARGE PATCH	NONE	No Localized M & R	---
67	Medium	LARGE PATCH	NONE	No Localized M & R	---
67	High	LARGE PATCH	PA-PF	Patching - PCC Full Depth	SqFt
68	N/A	POPOUTS	NONE	No Localized M & R	---
69	N/A	PUMPING	NONE	No Localized M & R	---
70	Low	SCALING	NONE	No Localized M & R	---
70	Medium	SCALING	NONE	No Localized M & R	---
70	High	SCALING	SL-PC	Slab Replacement - PCC	SqFt
71	Low	FAULTING	NONE	No Localized M & R	---
71	Medium	FAULTING	NONE	No Localized M & R	---

Operational Pavement Distress Maintenance Policy - Airfield Concrete					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
71	High	FAULTING	GR-PP	Grinding (Localized)	Ft
72	Low	SHATTERED SLAB	NONE	No Localized M & R	---
72	Medium	SHATTERED SLAB	NONE	No Localized M & R	---
72	High	SHATTERED SLAB	SL-PC	Slab Replacement - PCC	SqFt
73	N/A	SHRINKAGE CRACKING	NONE	No Localized M & R	---
74	Low	JOINT SPALL	NONE	No Localized M & R	---
74	Medium	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
74	High	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	Low	CORNER SPALL	NONE	No Localized M & R	---
75	Medium	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	High	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
76	Low	ASR	NONE	No Localized M & R	---
76	Medium	ASR	PA-PP	Patching - PCC Partial Depth	SqFt
76	High	ASR	SL-PC	Slab Replacement - PCC	SqFt

Table A-6 Asphalt Road and Parking Operational M&R Policy

Operational Pavement Distress Maintenance Policy - Asphalt Road and Parking					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
1	Low	ALLIGATOR CR	NONE	No Localized M & R	---
1	Medium	ALLIGATOR CR	NONE	No Localized M & R	---
1	High	ALLIGATOR CR	PA-AD	Patching - AC Deep	SqFt
2	Low	BLEEDING	NONE	No Localized M & R	---
2	Medium	BLEEDING	NONE	No Localized M & R	---
2	High	BLEEDING	NONE	No Localized M & R	---
3	Low	BLOCK CRACKING	NONE	No Localized M & R	---
3	Medium	BLOCK CRACKING	NONE	No Localized M & R	---
3	High	BLOCK CRACKING	NONE	No Localized M & R	---
4	Low	BUMPS AND SAGS	NONE	No Localized M & R	---

Operational Pavement Distress Maintenance Policy - Asphalt Road and Parking					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
4	Medium	BUMPS AND SAGS	NONE	No Localized M & R	---
4	High	BUMPS AND SAGS	PA-AS	Patching-AC Shallow	SqFt
5	Low	CORRUGATION	NONE	No Localized M & R	---
5	Medium	CORRUGATION	NONE	No Localized M & R	---
5	High	CORRUGATION	PA-AS	Patching - AC Shallow	SqFt
6	Low	DEPRESSION	NONE	No Localized M & R	---
6	Medium	DEPRESSION	NONE	No Localized M & R	---
6	High	DEPRESSION	PA-AD	Patching - AC Deep	SqFt
7	Low	EDGE CRACKING	NONE	No Localized M & R	---
7	Medium	EDGE CRACKING	NONE	No Localized M & R	---
7	High	EDGE CRACKING	PA-AS	Patching - AC Shallow	SqFt
8	Low	JOINT REFLECTION CRACKING	NONE	No Localized M & R	---
8	Medium	JOINT REFLECTION CRACKING	NONE	No Localized M & R	---
8	High	JOINT REFLECTION CRACKING	CS-AC	Crack Sealing - AC	SqFt
9	Low	LANE/SHOULDER DROP-OFF	NONE	No Localized M & R	---
9	Medium	LANE/SHOULDER DROP-OFF	SH-LE	Shoulder leveling	Ft
9	High	LANE/SHOULDER DROP-OFF	SH-LE	Shoulder leveling	Ft
10	Low	LONG & TRANS CRACKING	NONE	No Localized M & R	---
10	Medium	LONG & TRANS CRACKING	NONE	No Localized M & R	---
10	High	LONG & TRANS CRACKING	CS-AC	Crack Sealing - AC	SqFt
11	Low	PATCHING & UTILITY CUT PATCHING	NONE	No Localized M & R	---
11	Medium	PATCHING & UTILITY CUT PATCHING	NONE	No Localized M & R	---
11	High	PATCHING & UTILITY CUT PATCHING	PA-AD	Patching - AC Deep	SqFt
12	N/A	POLISHED AGGREGATE	NONE	No Localized M & R	---
13	Low	POTHOLES	NONE	No Localized M & R	---
13	Medium	POTHOLES	PA-AD	Patching - AC Deep	SqFt
13	High	POTHOLES	PA-AD	Patching - AC Deep	SqFt
14	Low	RAILROAD CROSSING	NONE	No Localized M & R	---
14	Medium	RAILROAD CROSSING	NONE	No Localized M & R	---

Operational Pavement Distress Maintenance Policy - Asphalt Road and Parking					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
14	High	RAILROAD CROSSING	NONE	No Localized M & R	---
15	Low	RUTTING	NONE	No Localized M & R	---
15	Medium	RUTTING	NONE	No Localized M & R	---
15	High	RUTTING	PA-AD	Patching - AC Deep	SqFt
16	Low	SHOVING	NONE	No Localized M & R	---
16	Medium	SHOVING	NONE	No Localized M & R	---
16	High	SHOVING	PA-AS	Patching - AC Shallow	SqFt
17	Low	SLIPPAGE CRACKING	NONE	No Localized M & R	---
17	Medium	SLIPPAGE CRACKING	NONE	No Localized M & R	---
17	High	SLIPPAGE CRACKING	NONE	No Localized M & R	---
18	Low	SWELL	NONE	No Localized M & R	---
18	Medium	SWELL	NONE	No Localized M & R	---
18	High	SWELL	PA-AS	Patching-AC Shallow	SqFt
19	Low	RAVELING	NONE	No Localized M & R	---
19	Medium	RAVELING	NONE	No Localized M & R	---
19	High	RAVELING	NONE	No Localized M & R	---
20	Low	WEATHERING	NONE	No Localized M & R	---
20	Medium	WEATHERING	NONE	No Localized M & R	---
20	High	WEATHERING	NONE	No Localized M & R	---

Table A-7 Concrete Road and Parking Operational M&R Policy

Operational Pavement Distress Maintenance Policy - Concrete Road and Parking					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
21	Low	BLOWUP/BUCKLING	NONE	No Localized M & R	---
21	Medium	BLOWUP/BUCKLING	NONE	No Localized M & R	SqFt
21	High	BLOWUP/BUCKLING	PA-PF	Patching - PCC Full Depth	SqFt
22	Low	CORNER BREAK	NONE	No Localized M & R	-
22	Medium	CORNER BREAK	NONE	No Localized M & R	SqFt
22	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
23	Low	DIVIDED SLAB	NONE	No Localized M & R	-
23	Medium	DIVIDED SLAB	NONE	No Localized M & R	SqFt
23	High	DIVIDED SLAB	SL-PC	Slab Replacement - PCC	SqFt
24	Low	DURABILITY CRACK	NONE	No Localized M & R	-
24	Medium	DURABILITY CRACK	PA-PP	Patching - PCC Partial Depth	SqFt
24	High	DURABILITY CRACK	PA-PF	Patching - PCC Full Depth	SqFt
25	Low	FAULTING	NONE	No Localized M & R	-
25	Medium	FAULTING	NONE	No Localized M & R	SqFt
25	High	FAULTING	GR-PC	Grinding (Localized)	Ft
26	Low	JOINT SEAL DAMAGE	NONE	No Localized M & R	-
26	Medium	JOINT SEAL DAMAGE	NONE	No Localized M & R	Ft
26	High	JOINT SEAL DAMAGE	NONE	No Localized M & R	Ft
27	Low	LANE/SHOULDER DROP	NONE	No Localized M & R	-
27	Medium	LANE/SHOULDER DROP	SH-LE	Shoulder leveling	Ft
27	High	LANE/SHOULDER DROP	SH-LE	Shoulder leveling	Ft
28	Low	LINEAR CRACKING	NONE	No Localized M & R	-
28	Medium	LINEAR CRACKING	NONE	No Localized M & R	Ft
28	High	LINEAR CRACKING	CS-PC	Crack Sealing - PCC	SqFt
29	Low	PATCHING (LARGE)	NONE	No Localized M & R	-
29	Medium	PATCHING (LARGE)	NONE	No Localized M & R	-
29	High	PATCHING (LARGE)	PA-PF	Patching - PCC Full Depth	SqFt
30	Low	PATCHING (SMALL)	NONE	No Localized M & R	-

Operational Pavement Distress Maintenance Policy - Concrete Road and Parking					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
30	Medium	PATCHING (SMALL)	NONE	No Localized M & R	-
30	High	PATCHING (SMALL)	PA-PP	Patching - PCC Partial Depth	SqFt
31	NA	POLISHED AGGREGATE	NONE	No Localized M & R	-
32	NA	POPOUTS	NONE	No Localized M & R	-
33	NA	PUMPING	NONE	No Localized M & R	Ft
34	Low	PUNCHOUT	NONE	No Localized M & R	-
34	Medium	PUNCHOUT	NONE	No Localized M & R	SqFt
34	High	PUNCHOUT	PA-PF	Patching-PCC Full Depth	SqFt
35	Low	RAILROAD CROSSING	NONE	No Localized M & R	-
35	Medium	RAILROAD CROSSING	NONE	No Localized M & R	-
35	High	RAILROAD CROSSING	NONE	No Localized M & R	-
36	Low	SCALING	NONE	No Localized M & R	-
36	Medium	SCALING	NONE	No Localized M & R	-
36	High	SCALING	PA-PP	Patching - PCC Partial Depth	SqFt
37	NA	SHRINKAGE CRACKS	NONE	No Localized M & R	-
38	Low	SPALLING, CORNER	NONE	No Localized M & R	-
38	Medium	SPALLING, CORNER	NONE	No Localized M & R	SqFt
38	High	SPALLING, CORNER	PA-PP	Patching - PCC Partial Depth	SqFt
39	Low	SPALLING, JOINT	NONE	No Localized M & R	-
39	Medium	SPALLING, JOINT	NONE	No Localized M & R	SqFt
39	High	SPALLING, JOINT	PA-PP	Patching - PCC Partial Depth	SqFt

A-3.2 Localized Preventive Maintenance (PM) Policies.

Tables A-8 through A-13 provide standard localized PM policies for airfields, roads, and parking as well as notes to supplement the policies based on other considerations for specific scenarios.

Table A-8 Asphalt Airfield Preventive M&R Policy

Preventive Pavement Distress Maintenance Policy - Asphalt Airfield					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
41	Low	ALLIGATOR CRACKING	NONE	No Localized M & R	---
41	Medium	ALLIGATOR CRACKING	PA-AD	Patching - AC Deep	SqFt
41	High	ALLIGATOR CRACKING	PA-AD	Patching - AC Deep	SqFt
42	N/A	BLEEDING	NONE	No Localized M & R	---
43	Low	BLOCK CRACKING	NONE	No Localized M & R	---
43	Medium	BLOCK CRACKING	CS-AC	Crack Sealing - AC	Ft
43	High	BLOCK CRACKING	PA-AS	Patching - AC Shallow	SqFt
44	Low	CORRUGATION	NONE	No Localized M & R	---
44	Medium	CORRUGATION	GR-PP	Grinding (Localized)	Ft
44	High	CORRUGATION	PA-AD	Patching - AC Deep	SqFt
45	Low	DEPRESSION	NONE	No Localized M & R	---
45	Medium	DEPRESSION	PA-AD	Patching - AC Deep	SqFt
45	High	DEPRESSION	PA-AD	Patching - AC Deep	SqFt
46	N/A	JET BLAST	PA-AS	Patching - AC Shallow	SqFt
47	Low	JOINT REFLECTIVE CRACKING	NONE	No Localized M & R	---
47	Medium	JOINT REFLECTIVE CRACKING	CS-AC	Crack Sealing - AC	Ft
47	High	JOINT REFLECTIVE CRACKING	CS-AC	Crack Sealing - AC	SqFt
48	Low	LONGITUDINAL AND TRANSVERSE CRACKING	NONE	No Localized M & R	---
48	Medium	LONGITUDINAL AND TRANSVERSE CRACKING	CS-AC	Crack Sealing - AC	Ft
48	High	LONGITUDINAL AND TRANSVERSE CRACKING	CS-AC	Crack Sealing - AC	Ft
49	N/A	OIL SPILLAGE	PA-AS	Patching - AC Shallow	SqFt
50	Low	PATCHING	NONE	No Localized M & R	---
50	Medium	PATCHING	PA-AD	Patching - AC Deep	SqFt
50	High	PATCHING	PA-AD	Patching - AC Deep	SqFt
51	N/A	POLISHED AGGREGATE	NONE	No Localized M & R	---
52	Low	RAVELING	NONE	No Localized M & R	---

Preventive Pavement Distress Maintenance Policy - Asphalt Airfield					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
52	Medium	RAVELING	PA-AS	Patching - AC Shallow	SqFt
52	High	RAVELING	PA-AS	Patching - AC Shallow	SqFt
53	Low	RUTTING	NONE	No Localized M & R	---
53	Medium	RUTTING	PA-AD	Patching - AC Deep	SqFt
53	High	RUTTING	PA-AD	Patching - AC Deep	SqFt
54	Low	SHOVING	NONE	No Localized M & R	---
54	Medium	SHOVING	PA-AS	Patching - AC Shallow	SqFt
54	High	SHOVING	PA-AD	Patching - AC Deep	SqFt
55	N/A	SLIPPAGE CRACKING	PA-AS	Patching - AC Shallow	SqFt
56	Low	SWELLING	NONE	No Localized M & R	---
56	Medium	SWELLING	PA-AD	Patching - AC Deep	SqFt
56	High	SWELLING	PA-AD	Patching - AC Deep	SqFt
57	Low	WEATHERING	NONE	No Localized M & R	---
57	Medium	WEATHERING	NONE	No Localized M & R	---
57	High	WEATHERING	PA-AS	Patching - AC Shallow	SqFt

Table A-9 Other Considerations - Asphalt Airfield Preventive M&R Policy

<table>
<tr><th colspan="4">Airfield Asphalt Pavement Localized Preventive M&R Policy - Other Considerations</th></tr>
<tr><th>Distress</th><th>Distress Severity</th><th>Description</th><th>Work Type Adjustments</th></tr>
<tr><td>41</td><td>Low</td><td>ALLIGATOR CRACKING</td><td>Alligator (fatigue) cracking is a structural distress. Ideally, we want to slow the progression of the distress, but sealing a low-severity asphalt crack typically requires overbanding, which presents a FOD hazard to some aircraft so the "No Localized" work type is recommended. Depending on the extent of the alligator cracking, a global surface treatment can be effective, e.g., with >1% low severity alligator cracking the PCI would drop to an 80.</td></tr>
<tr><td>43</td><td>Low</td><td>BLOCK CRACKING</td><td rowspan="3">When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of the pavement when block cracking is present. When a high percentage of the area is block cracked, the PCI will go below critical, which will trigger major M&R, e.g., mill and overlay. If the block cracking is localized, Patching AC-Deep is recommended.</td></tr>
<tr><td>43</td><td>Medium</td><td>BLOCK CRACKING</td></tr>
<tr><td>43</td><td>High</td><td>BLOCK CRACKING</td></tr>
<tr><td>44</td><td>Low</td><td>CORRUGATION</td><td rowspan="3">Corrugation is an indication of delaminated asphalt layers or instability in the base or subbase. It can be caused by an unstable mix or improper compaction. Depending on the cause, grinding may be used as an initial treatment; however, it will not address the root cause, so a shallow or deep patch is recommended. When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of the pavement when corrugation is present. In these cases, use Patching AC-Deep for all severity levels.</td></tr>
<tr><td>44</td><td>Medium</td><td>CORRUGATION</td></tr>
<tr><td>44</td><td>High</td><td>CORRUGATION</td></tr>
<tr><td>46</td><td></td><td>JET BLAST</td><td>When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can be eroded up to 0.5 inch in depth. This causes smoothness and FOD concerns for any FOD-susceptible aircraft due to the greater potential of raveling. However, the treatment may range from no localized M&R to AC shallow patch and include surface treatments or shallow depth fuel-resistant asphalt for V-22 FARPs. When the standard shallow patch is applied, it must have a seal around the edge and a surface treatment to reduce the possibility of re-occurrence or at least slow the progression.</td></tr>
<tr><td>47</td><td>High</td><td>JOINT REFLECTIVE CRACKING</td><td>When joint reflective cracks are greater than 0.25 inch and less than 2 inches, routing and sealing the cracks is the standard policy. However, when cracks are greater than or equal to 2 inches or with significant raveling (FOD potential for susceptible aircraft) that cannot be mitigated by routing and sealing, the distress should be repaired using a shallow patch. UFC 3-270-01 requires the use of a well-compacted sand asphalt or a fine-grained asphalt mix when repairing cracks 2 inches wide and larger, which qualifies as a shallow patch. Note: In tertiary areas or LZs used by C-130s and C-17s, crack sealing high-severity cracks is permissible.</td></tr>
</table>

Airfield Asphalt Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	**Distress Severity**	**Description**	**Work Type Adjustments**
48	High	LONGITUDINAL AND TRANSVERSE CRACKING	When longitudinal and transverse cracks are greater than 0.25 inch and less than 2 inches, routing and sealing the cracks is the standard policy. However, when cracks are greater than or equal to 2 inches or with significant raveling (FOD potential for susceptible aircraft) that cannot be mitigated by routing and sealing, the distress should be repaired using a shallow patch. UFC 3-270-01 requires the use of a well-compacted sand asphalt or a fine-grained asphalt mix when repairing cracks 2 inches wide and larger, which qualifies as a shallow patch. **Note:** In tertiary areas or LZs used by C-130s and C-17s, crack sealing high-severity cracks is permissible.
51	N/A	POLISHED AGGREGATE	While the standard policy is No Localized M&R, if the extent of distress is significant enough that it poses a safety issue to aircraft when braking, consider water blasting, grinding, microsurfacing, or shallow patch. The repair will depend on the quality of the asphalt. Oftentimes, if the aggregate is polished then the asphalt is likely too oxidized for water blasting or grinding. If so, then consider mill and overlay or microsurfacing (depending on the location on the airfield and the FOD susceptibility of the mission aircraft).
52	Low	RAVELING	While the standard policy is No Localized M&R, when the distress density exceeds 4 percent and the section PCI is above critical, global M&R is recommended
52	Medium	RAVELING	While the standard policy is Patching - AC Shallow, when the distress density exceeds 1 percent and the section PCI is above critical, global M&R is recommended. if the distress density exceeds 1 percent and the section PCI is below critical, major M&R is recommended, e.g., mill and overlay.
52	High	RAVELING	While the standard policy is Patching - AC Shallow, when the distress density exceeds 0.5 percent and the section PCI is above critical, global M&R is recommended. If the distress density exceeds 0.5 percent and the section PCI is below critical, major M&R is recommended, e.g., mill and overlay.
54	Medium	SHOVING	The standard policy is Patching - AC Shallow because it addresses the AC to PCC interface issues but, depending on the thickness of the pavement and the aircraft operating on the airfield, grinding and reestablishing and sealing the joint at the AC to PCC interface can be an acceptable solution.
55	N/A	SLIPPAGE CRACKING	The standard policy is Patching - AC Shallow, but the depth of the repair is a function of where the slip occurred. Slippage crack repair would likely not expose the base but, if the issue was a degraded underlying layer, then Patching - AC Deep is the appropriate solution.
56	Medium	SWELLING	The standard policy is Patching - AC Deep based on the assumption that the swelling is occurring due to frost action in the subgrade or by swelling soil, but a small swell can also occur on the surface of an asphalt overlay (over PCC) as a

Airfield Asphalt Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	Distress Severity	Description	Work Type Adjustments
56	High	SWELLING	result of a blowup in the PCC. In this case, the appropriate repair is to replace the AC and PCC to the base. Swelling can also occur when there is delamination and water infiltration in the asphalt or AC/PCC interface combined with extreme high or freezing temperatures. In this case, Patching - AC Shallow is appropriate to replace the delaminated asphalt.
57	Low	WEATHERING	While the standard policy is No Localized M&R, global M&R is recommended to slow the rate of weathering/deterioration of the asphalt.
57	Medium	WEATHERING	While the standard policy is No Localized M&R, global M&R is recommended to slow the rate of weathering/deterioration of the asphalt.
57	High	WEATHERING	While the standard policy is Patching - AC Shallow, when the distress density exceeds 0.5 percent and the section PCI is above critical, global M&R is recommended. If the distress density exceeds 0.5 percent and the section PCI is below critical, major M&R is recommended, e.g., mill and overlay.

Table A-10 Concrete Airfield Preventive M&R Policy

Pavement Distress Maintenance Policy – Concrete Airfield					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
61	Low	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
61	Medium	BLOW-UP	PA-PF	Patching - PCC Full Depth	SqFt
61	High	BLOW-UP	SL-PC	Slab Replacement - PCC	SqFt
62	Low	CORNER BREAK	NONE	No Localized M & R	---
62	Medium	CORNER BREAK	CS-PC	Crack Sealing - PCC	Ft
62	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
63	Low	LINEAR CRACKING	NONE	No Localized M & R	---
63	Medium	LINEAR CRACKING	CS-PC	Crack Sealing - PCC	Ft
63	High	LINEAR CRACKING	CS-PC	Crack Sealing - PCC	Ft
64	Low	DURABILITY CRACKING	NONE	No Localized M & R	---
64	Medium	DURABILITY CRACKING	PA-PF	Patching - PCC Full Depth	SqFt
64	High	DURABILITY CRACKING	SL-PC	Slab Replacement - PCC	SqFt
65	Low	JOINT SEAL DAMAGE	NONE	No Localized M & R	---
65	Medium	JOINT SEAL DAMAGE	JS-LC	Joint Seal (Localized)	Ft
65	High	JOINT SEAL DAMAGE	JS-LC	Joint Seal (Localized)	Ft
66	Low	SMALL PATCH	NONE	No Localized M & R	---
66	Medium	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
66	High	SMALL PATCH	PA-PP	Patching - PCC Partial Depth	SqFt

Pavement Distress Maintenance Policy – Concrete Airfield					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
67	Low	LARGE PATCH	NONE	No Localized M & R	---
67	Medium	LARGE PATCH	PA-PP	Patching - PCC Partial Depth	SqFt
67	High	LARGE PATCH	PA-PF	Patching - PCC Full Depth	SqFt
68	N/A	POPOUTS	NONE	No Localized M & R	---
69	N/A	PUMPING	JS-LC	Joint Seal Localized	Ft
70	Low	SCALING	NONE	No Localized M & R	---
70	Medium	SCALING	PA-PP	Patching - PCC Partial Depth	SqFt
70	High	SCALING	SL-PC	Slab Replacement - PCC	SqFt
71	Low	FAULTING	NONE	No Localized M & R	---
71	Medium	FAULTING	GR-PP	Grinding (Localized)	Ft
71	High	FAULTING	GR-PP	Grinding (Localized)	Ft
72	Low	SHATTERED SLAB	NONE	No Localized M & R	---
72	Medium	SHATTERED SLAB	SL-PC	Slab Replacement - PCC	SqFt
72	High	SHATTERED SLAB	SL-PC	Slab Replacement - PCC	SqFt
73	N/A	SHRINKAGE CRACKING	NONE	No Localized M & R	---
74	Low	JOINT SPALL	NONE	No Localized M & R	---
74	Medium	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
74	High	JOINT SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	Low	CORNER SPALL	NONE	No Localized M & R	---
75	Medium	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
75	High	CORNER SPALL	PA-PP	Patching - PCC Partial Depth	SqFt
76	Low	ASR	NONE	No Localized M & R	---
76	Medium	ASR	PA-PP	Patching - PCC Partial Depth	SqFt
76	High	ASR	SL-PC	Slab Replacement - PCC	SqFt

Table A-11 Other Considerations - Concrete Airfield Preventive M&R Policy

Airfield Concrete Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	**Distress Severity**	**Description**	**Work Type Adjustments**
61	Low	BLOW-UP	The standard policy is Patching - PCC Full Depth, but depending on the location, thickness, and the aircraft using the pavement, a partial-depth PCC patch can be used on pavement greater than 12 inches when the pavement is outside the traffic area or when the aircraft using the aircraft are not susceptible to roughness or FOD issues. The primary concern is that a partial-depth patch may not address the root cause and may have shear/delamination issues.
61	High	BLOW-UP	The standard policy is slab replacement, but in some cases a full-depth patch can be used, depending on the existing damage. Whether you are doing a full-depth patch or slab replacement, it is important to install compression boards to prevent reoccurrence of the distress.
62	Low	CORNER BREAK	The standard policy is No Localized M&R because trying to do a repair on very narrow cracks can do more harm than good, but if cracks are approaching 1/8 inch (bordering on medium severity), crack sealing is appropriate to reduce the infiltration of water and slow the progression of the distress. The decision to seal the crack is also a function of the environment/pavement design. Does it have a working drainage layer or does the soil drain well? Is it subject to freeze thaw or snow plows? How will it affect the mission, e.g., is it close to arresting system or is it on a tertiary pavement?
62	Medium	CORNER BREAK	The standard policy is crack sealing, however in cases where there is faulting or the airfield is used by fighter aircraft, use a full-depth repair.
63	High	LINEAR CRACKING	The standard policy is crack sealing, but if the crack is greater than 2 inches, a full-depth patch or slab replacement is recommended, depending on the location of the crack and other factors. For instance, sympathetic cracking on a number of slabs would warrant full-depth repairs or slab replacement with a reinforced slab to stop crack propagation.
65	Medium	JOINT SEAL DAMAGE	The standard policy is Joint Seal (Localized) repair when the distress density is less than 33 percent medium and high severity. If the distress density is more than 33 percent and less than 66 percent, plan for global joint seal replacement in two to three years. When the medium- and high-severity density is greater than 66 percent, plan for global joint seal replacement in year one. For sections that do not have a drainage layer and have a history of pumping, faulting, swelling soils, or that require undersealing, plan for immediate localized repairs or global repairs in year one when the distress density is more than 33 percent and less than 66 percent.
65	High	JOINT SEAL DAMAGE	
66	Medium	SMALL PATCH	The standard policy is Patching PCC - Partial Depth, but when aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.

Airfield Concrete Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	**Distress Severity**	**Description**	**Work Type Adjustments**
66	High	SMALL PATCH	The standard policy is Patching PCC - Partial Depth, but when the aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.
67	Medium	LARGE PATCH	The standard policy is Partial Depth PCC Patch, but if the patch is already full depth or if the pavement thickness is less than 8 inches, a full-depth patch is recommended. A partial-depth repair over an entire slab is, in effect, a fully bonded overlay, which is not typically allowed but may be considered for V-22 and B-1 parking positions. Note that if the base slab is damaged when doing a partial-depth repair, a full-depth repair is required. When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.
69	N/A	PUMPING	The standard policy is Joint Seal (Localized) repair, but when pumping is significant or small voids are suspected, undersealing is required in addition to the joint seal.
70	Low	SCALING	In cases where scaling is widespread, grinding can be used to mitigate ponding issues and plow damage.
70	Medium	SCALING	The standard is a partial-depth patch, but when the scaling occurs on more than 50 percent of the slab, consider grinding or slab replacement.
71	Low	FAULTING	The standard is No Localized M&R, but when Low Severity Faulting occurs within 200 feet of an arresting system, it must be repaired. Consider grinding, slab jacking, or slab replacement to reestablish grade in these areas. Microsurfacing may be considered as an expedient solution until permanent repairs can be conducted.
71	Medium	FAULTING	The standard policy is grinding, but depending on the mission aircraft, location, and environment, consider slab jacking or slab replacement. Microsurfacing may be considered as an expedient solution until permanent repairs can be conducted.
71	High	FAULTING	The standard policy is grinding, but depending on the mission aircraft, location, and environment, consider slab jacking or slab replacement. For example, if faulting is greater than 1 inch on a runway or 2 inches on an apron, if the faulting is in a corner or if multiple slabs have faulting, replace slabs. Microsurfacing may be considered as an expedient solution until permanent repairs can be conducted.

Airfield Concrete Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	**Distress Severity**	**Description**	**Work Type Adjustments**
72	Low	SHATTERED SLAB	The standard policy is No Localized because trying to do a repair on very narrow cracks can do more harm than good, but if cracks are approaching 1/8 inch (bordering on medium severity), crack sealing is appropriate to reduce the infiltration of water, which reduces potential of damage to the subgrade, freeze thaw damage, and reduces the likelihood that incompressible material will enter the crack and spall. In many cases, the cracking is not load related but a result of poor joint lay out, warping and curling, improper doweling, or other non-load-related stresses on the slab. This is especially true with 25-foot slabs that are less than 10 inches thick. As a result, the cracks may not be working cracks that generate FOD, but are functioning as joints.
72	Medium	SHATTERED SLAB	The standard policy is slab replacement, but if cracks are a result of slab geometry and are not working cracks (generating FOD), crack sealing is appropriate to reduce the infiltration of water, which reduces potential of damage to the subgrade, freeze thaw damage, and reduce the likelihood that incompressible material will enter the crack and spall. In many cases, the cracking is not load related but a result of poor joint lay out, warping and curling, improper doweling, or other non-load-related stresses on the slab. This is especially true with 25-foot slabs that are less than 10 inches thick. As a result, the cracks may not be working cracks that generate FOD, but are functioning as joints.
74	Low	JOINT SPALL	The standard policy is No Localized M&R, but some low-severity spalls may be repaired during joint resealing projects. The joint face preparation may remove some of the spall and joint seal material can be used to fill it. Note that if a joint spall is small enough to be filled during a joint seal repair, it is typically not recorded.
74	Medium	JOINT SPALL	The standard policy is Patching PCC - Partial Depth, but when aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.
74	High	JOINT SPALL	The standard policy is Patching PCC - Partial Depth, but when aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.
75	Low	CORNER SPALL	The standard policy is No Localized M&R, but if the crack associated with the corner spall is approaching 1/8 inch, crack sealing may be appropriate. When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.

Airfield Concrete Pavement Localized Preventive M&R Policy - Other Considerations			
Distress	Distress Severity	Description	Work Type Adjustments
75	High	CORNER SPALL	The standard policy is Patching - PCC Partial Depth, but a full-depth patch is required if the partial-depth repair requires removal of more than 1/3 the slab thickness or if the repair is deep enough to expose the dowels. When aircraft operating on an airfield use thrust vectoring, e.g., the F-35, the jet blast can cause delamination of partial-depth pavement repairs so a full-depth patch is required.
76	Low	ASR	The standard policy is No Localized M&R, but recommend when work is performed, cut additional expansion joints to accommodate expansion and isolate structures such as drains, sunshades, POL, and manholes.
76	Medium	ASR	The standard policy is Partial Depth PCC Patch, but if the ASR extends across more than half of the slab, slab replacement is appropriate. In addition, if replacing areas around patches that now have ASR, consider slab replacement.

Table A-12 Asphalt Road and Parking Preventive M&R Policy

Preventive Pavement Distress Maintenance Policy - Asphalt Road and Parking					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
1	Low	ALLIGATOR CR	NONE	No Localized M & R	-
1	Medium	ALLIGATOR CR	PA-AD	Patching - AC Deep	SqFt
1	High	ALLIGATOR CR	PA-AD	Patching - AC Deep	SqFt
2	Low	BLEEDING	NONE	No Localized M & R	-
2	Medium	BLEEDING	NONE	No Localized M & R	-
2	High	BLEEDING	SS-SG	Spread Sand or Gravel	SqFt
3	Low	BLOCK CRACKING	NONE	No Localized M & R	-
3	Medium	BLOCK CRACKING	CS-AC	Crack Sealing - AC	Ft
3	High	BLOCK CRACKING	CS-AC	Crack Sealing - AC	Ft
4	Low	BUMPS AND SAGS	NONE	No Localized M & R	-
4	Medium	BUMPS AND SAGS	PA-AS	Patching - AC Shallow	SqFt
4	High	BUMPS AND SAGS	PA-AS	Patching-AC Shallow	SqFt
5	Low	CORRUGATION	NONE	No Localized M & R	-
5	Medium	CORRUGATION	PA-AS	Patching - AC Shallow	SqFt
5	High	CORRUGATION	PA-AS	Patching - AC Shallow	SqFt
6	Low	DEPRESSION	NONE	No Localized M & R	-
6	Medium	DEPRESSION	PA-AD	Patching - AC Deep	SqFt
6	High	DEPRESSION	PA-AD	Patching - AC Deep	SqFt
7	Low	EDGE CRACKING	CS-AC	Crack Sealing - AC	Ft
7	Medium	EDGE CRACKING	CS-AC	Crack Sealing - AC	Ft
7	High	EDGE CRACKING	PA-AS	Patching - AC Shallow	SqFt

Preventive Pavement Distress Maintenance Policy - Asphalt Road and Parking					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
8	Low	JOINT REFLECTION CRACKING	NONE	No Localized M & R	-
8	Medium	JOINT REFLECTION CRACKING	CS-AC	Crack Sealing - AC	Ft
8	High	JOINT REFLECTION CRACKING	PA-AS	Patching - AC Shallow	SqFt
9	Low	LANE/SHOULDER DROP-OFF	NONE	No Localized M & R	-
9	Medium	LANE/SHOULDER DROP-OFF	SH-LE	Shoulder leveling	Ft
9	High	LANE/SHOULDER DROP-OFF	SH-LE	Shoulder leveling	Ft
10	Low	LONG & TRANS CRACKING	NONE	No Localized M & R	-
10	Medium	LONG & TRANS CRACKING	CS-AC	Crack Sealing - AC	Ft
10	High	LONG & TRANS CRACKING	PA-AS	Patching-AC Shallow	SqFt
11	Low	PATCHING & UTILITY CUT PATCHING	NONE	No Localized M & R	-
11	Medium	PATCHING & UTILITY CUT PATCHING	NONE	No Localized M & R	-
11	High	PATCHING & UTILITY CUT PATCHING	PA-AD	Patching - AC Deep	SqFt
12	N/A	POLISHED AGGREGATE	NONE	No Localized M & R	-
13	Low	POTHOLES	PA-AS	Patching - AC Shallow	SqFt
13	Medium	POTHOLES	PA-AD	Patching - AC Deep	SqFt
13	High	POTHOLES	PA-AD	Patching - AC Deep	SqFt
14	Low	RAILROAD CROSSING	NONE	No Localized M & R	-
14	Medium	RAILROAD CROSSING	NONE	No Localized M & R	-
14	High	RAILROAD CROSSING	NONE	No Localized M & R	-
15	Low	RUTTING	NONE	No Localized M & R	-
15	Medium	RUTTING	PA-AD	Patching - AC Deep	SqFt
15	High	RUTTING	PA-AD	Patching - AC Deep	SqFt
16	Low	SHOVING	NONE	No Localized M & R	-
16	Medium	SHOVING	PA-AS	Patching - AC Shallow	SqFt
16	High	SHOVING	PA-AS	Patching - AC Shallow	SqFt
17	Low	SLIPPAGE CRACKING	NONE	No Localized M & R	-
17	Medium	SLIPPAGE CRACKING	PA-AS	Patching – AC Shallow	SqFt
17	High	SLIPPAGE CRACKING	PA-AS	Patching- AC Shallow	SqFt
18	Low	SWELL	NONE	No Localized M & R	-
18	Medium	SWELL	NONE	No Localized M & R	-
18	High	SWELL	PA-AS	Patching-AC Shallow	SqFt
19	Low	RAVELING	NONE	No Localized M & R	-
19	Medium	RAVELING	NONE	No Localized M & R	-
19	High	RAVELING	NONE	No Localized M & R	-
20	Low	WEATHERING	NONE	No Localized M & R	-
20	Medium	WEATHERING	NONE	No Localized M & R	-
20	High	WEATHERING	NONE	No Localized M & R	-

Table A-13 Concrete Road and Parking Preventive M&R Policy

Road and Parking Concrete Pavement Distress Maintenance Policy					
Distress	Distress Severity	Description	Code	Work Type	Work Unit
21	Low	BLOWUP/BUCKLING	NONE	No Localized M & R	-
21	Medium	BLOWUP/BUCKLING	PA-PF	Patching - PCC Full Depth	SqFt
21	High	BLOWUP/BUCKLING	SL-PC	Slab Replacement - PCC	SqFt
22	Low	CORNER BREAK	NONE	No Localized M & R	-
22	Medium	CORNER BREAK	CS-PC	Crack Sealing - PCC	SqFt
22	High	CORNER BREAK	PA-PF	Patching - PCC Full Depth	SqFt
23	Low	DIVIDED SLAB	NONE	No Localized M & R	-
23	Medium	DIVIDED SLAB	SL-PC	Slab Replacement - PCC	SqFt
23	High	DIVIDED SLAB	SL-PC	Slab Replacement - PCC	SqFt
24	Low	DURABILITY CRACK	NONE	No Localized M & R	-
24	Medium	DURABILITY CRACK	PA-PP	Patching - PCC Partial Depth	SqFt
24	High	DURABILITY CRACK	PA-PF	Patching - PCC Full Depth	SqFt
25	Low	FAULTING	NONE	No Localized M & R	-
25	Medium	FAULTING	GR-PP	Grinding (Localized)	SqFt
25	High	FAULTING	GR-PP	Grinding (Localized)	Ft
26	Low	JOINT SEAL DAMAGE	NONE	No Localized M & R	-
26	Medium	JOINT SEAL DAMAGE	JS-LC	Joint Seal (Localized)	Ft
26	High	JOINT SEAL DAMAGE	JS-LC	Joint Seal (Localized)	Ft
27	Low	LANE/SHOULDER DROP	NONE	No Localized M & R	-
27	Medium	LANE/SHOULDER DROP	SH-LE	Shoulder leveling	Ft
27	High	LANE/SHOULDER DROP	SH-LE	Shoulder leveling	Ft
28	Low	LINEAR CRACKING	NONE	No Localized M & R	-
28	Medium	LINEAR CRACKING	CS-PC	Crack Sealing - PCC	Ft
28	High	LINEAR CRACKING	SL-PC	Slab Replacement - PCC	SqFt
29	Low	PATCHING (LARGE)	NONE	No Localized M & R	-
29	Medium	PATCHING (LARGE)	NONE	No Localized M & R	-
29	High	PATCHING (LARGE)	PA-PF	Patching - PCC Full Depth	SqFt
30	Low	PATCHING (SMALL)	NONE	No Localized M & R	-
30	Medium	PATCHING (SMALL)	NONE	No Localized M & R	-
30	High	PATCHING (SMALL)	PA-PP	Patching - PCC Partial Depth	SqFt
31	NA	POLISHED AGGREGATE	NONE	No Localized M & R	-
32	NA	POPOUTS	NONE	No Localized M & R	-
33	NA	PUMPING	JS-LC	Joint Seal (Localized)	Ft
34	Low	PUNCHOUT	NONE	No Localized M & R	-
34	Medium	PUNCHOUT	PA-PF	Patching-PCC Full Depth	SqFt
34	High	PUNCHOUT	SL-PC	Slab Replacement - PCC	SqFt
35	Low	RAILROAD CROSSING	NONE	No Localized M & R	-
35	Medium	RAILROAD CROSSING	NONE	No Localized M & R	-

Road and Parking Concrete Pavement Distress Maintenance Policy					
Distress	**Distress Severity**	**Description**	**Code**	**Work Type**	**Work Unit**
35	High	RAILROAD CROSSING	NONE	No Localized M & R	-
36	Low	SCALING	NONE	No Localized M & R	-
36	Medium	SCALING	NONE	No Localized M & R	-
36	High	SCALING	PA-PP	Patching - PCC Partial Depth	SqFt
37	NA	SHRINKAGE CRACKS	NONE	No Localized M & R	-
38	Low	SPALLING, CORNER	NONE	No Localized M & R	-
38	Medium	SPALLING, CORNER	PA-PP	Patching - PCC Partial Depth	SqFt
38	High	SPALLING, CORNER	PA-PP	Patching - PCC Partial Depth	SqFt
39	Low	SPALLING, JOINT	NONE	No Localized M & R	-
39	Medium	SPALLING, JOINT	PA-PP	Patching - PCC Partial Depth	SqFt
39	High	SPALLING, JOINT	PA-PP	Patching - PCC Partial Depth	SqFt

A-3.3 Global Maintenance Policies.

Tables A-14 through A-17 provide standard global maintenance and repair policies for asphalt and concrete airfield and road and parking pavement. See UFC 3-270-01 and UFC 3-250-03 for more details on global policy.

Table A-14 Asphalt Airfield Global M&R Policy

Global M&R Policy - Asphalt Airfield	
Distress Type	**Work Type**
Work type for minimal distress	Surface seal - fog seal
Work type for climate-related distress	Surface seal - rejuvenating
Work type for skid-causing distress	Surface treatment - slurry seal

Table A-15 Concrete Airfield Global M&R Policy

Global M&R Policy - Concrete Airfield	
Distress Type	**Work Type**
Work type for minimal distress	No global M&R
Work type for climate-related distress	Joint seal - silicone
Work type for skid-causing distress	No global M&R

Table A-16 Asphalt Road and Parking Global M&R Policy

Global M&R Policy - Asphalt Roads and Parking	
Distress Type	**Work Type**
Work type for minimal distress	Surface seal - fog seal
Work type for climate-related distress	Surface seal - rejuvenating
Work type for skid-causing distress	Surface treatment - slurry seal

Table A-17 Concrete Road and Parking Global M&R Policy

Global M&R Policy - Concrete Roads and Parking	
Distress Type	**Work Type**
Work type for minimal distress	No global M&R
Work type for climate-related distress	Joint seal - silicone
Work type for skid-causing distress	No global M&R

A-4 CONSEQUENCE OF MAINTENANCE POLICY TABLES.

The following consequence of maintenance policy tables (Tables A-18 through A-28) do not cover all potential alternatives for all distresses and work types but focus on the implementation of standard maintenance policy tables in this UFC.

Table A-18 Crack Sealing - AC

Crack Sealing - AC Consequence of Maintenance Policy					
Distress	**Description**	**Severity**	**New Distress**	**New Description**	**New Severity**
3	BLOCK CR	Low	3	BLOCK CR	Low
3	BLOCK CR	Medium	3	BLOCK CR	Low
3	BLOCK CR	High	3	BLOCK CR	Medium
7	EDGE CR	Low	7	EDGE CR	Low
7	EDGE CR	Medium	7	EDGE CR	Low
7	EDGE CR	High	7	EDGE CR	Medium
8	JT REF. CR	Low	8	JT REF. CR	Low
8	JT REF. CR	Medium	8	JT REF. CR	Low
8	JT REF. CR	High	8	JT REF. CR	Medium
10	L & T CR	Low	10	L & T CR	Low
10	L & T CR	Medium	10	L & T CR	Low
10	L & T CR	High	10	L & T CR	Medium
43	BLOCK CR	Low	43	BLOCK CR	Low
43	BLOCK CR	Medium	43	BLOCK CR	Low

Crack Sealing - AC Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
43	BLOCK CR	High	43	BLOCK CR	Medium
47	JT REF. CR	Low	47	JT REF. CR	Low
47	JT REF. CR	Medium	47	JT REF. CR	Low
47	JT REF. CR	High	47	JT REF. CR	Medium
48	L & T CR	Low	48	L & T CR	Low
48	L & T CR	Medium	48	L & T CR	Low
48	L & T CR	High	48	L & T CR	Medium

Table A-19 Grinding (Localized)

Grinding (Localized) Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
44	CORRUGATION	Low	0	0	N/A
44	CORRUGATION	Medium	0	0	N/A
44	CORRUGATION	High	0	0	N/A
25	FAULTING	Low	0	0	N/A
25	FAULTING	Medium	0	0	N/A
25	FAULTING	High	0	0	N/A
71	FAULTING	Low	0	0	N/A
71	FAULTING	Medium	0	0	N/A
71	FAULTING	High	0	0	N/A

Table A-20 Patching – AC Deep

Patching - AC Deep Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
1	ALLIGATOR CR	Low	11	PATCH/UT CUT	Low
1	ALLIGATOR CR	Medium	11	PATCH/UT CUT	Low
1	ALLIGATOR CR	High	11	PATCH/UT CUT	Low
6	DEPRESSION	Low	11	PATCH/UT CUT	Low
6	DEPRESSION	Medium	11	PATCH/UT CUT	Low
6	DEPRESSION	High	11	PATCH/UT CUT	Low
11	PATCH/UT CUT	Low	11	PATCH/UT CUT	Low
11	PATCH/UT CUT	Medium	11	PATCH/UT CUT	Low
11	PATCH/UT CUT	High	11	PATCH/UT CUT	Low
13	POTHOLE	Low	11	PATCH/UT CUT	Low
13	POTHOLE	Medium	11	PATCH/UT CUT	Low
13	POTHOLE	High	11	PATCH/UT CUT	Low
15	RUTTING	Low	11	PATCH/UT CUT	Low
15	RUTTING	Medium	11	PATCH/UT CUT	Low
15	RUTTING	High	11	PATCH/UT CUT	Low
41	ALLIGATOR CR	Low	50	PATCHING	Low

Patching - AC Deep Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
41	ALLIGATOR CR	Medium	50	PATCHING	Low
41	ALLIGATOR CR	High	50	PATCHING	Low
44	CORRUGATION	Low	50	PATCHING	Low
44	CORRUGATION	Medium	50	PATCHING	Low
44	CORRUGATION	High	50	PATCHING	Low
45	DEPRESSION	Low	50	PATCHING	Low
45	DEPRESSION	Medium	50	PATCHING	Low
45	DEPRESSION	High	50	PATCHING	Low
50	PATCHING	Low	50	PATCHING	Low
50	PATCHING	Medium	50	PATCHING	Low
50	PATCHING	High	50	PATCHING	Low
53	RUTTING	Low	50	PATCHING	Low
53	RUTTING	Medium	50	PATCHING	Low
53	RUTTING	High	50	PATCHING	Low
54	SHOVING	Low	50	PATCHING	Low
54	SHOVING	Medium	50	PATCHING	Low
54	SHOVING	High	50	PATCHING	Low
56	SWELLING	Low	50	PATCHING	Low
56	SWELLING	Medium	50	PATCHING	Low
56	SWELLING	High	50	PATCHING	Low

Table A-21 Patching – AC Shallow

Patching - AC Shallow Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
4	BUMPS/SAGS	Low	11	PATCH/UT CUT	Low
4	BUMPS/SAGS	Medium	11	PATCH/UT CUT	Low
4	BUMPS/SAGS	High	11	PATCH/UT CUT	Low
5	CORRUGATION	Low	11	PATCH/UT CUT	Low
5	CORRUGATION	Medium	11	PATCH/UT CUT	Low
5	CORRUGATION	High	11	PATCH/UT CUT	Low
7	EDGE CR	Low	11	PATCH/UT CUT	Low
7	EDGE CR	Medium	11	PATCH/UT CUT	Low
7	EDGE CR	High	11	PATCH/UT CUT	Low
8	JT REF. CR	Low	11	PATCH/UT CUT	Low
8	JT REF. CR	Medium	11	PATCH/UT CUT	Low
8	JT REF. CR	High	11	PATCH/UT CUT	Low
10	L & T CR	Low	11	PATCH/UT CUT	Low
10	L & T CR	Medium	11	PATCH/UT CUT	Low
10	L & T CR	High	11	PATCH/UT CUT	Low

Patching - AC Shallow Consequence of Maintenance Policy					
Distress	**Description**	**Severity**	**New Distress**	**New Description**	**New Severity**
13	POTHOLE	Low	11	PATCH/UT CUT	Low
13	POTHOLE	Medium	11	PATCH/UT CUT	Low
13	POTHOLE	High	11	PATCH/UT CUT	Low
16	SHOVING	Low	11	PATCH/UT CUT	Low
16	SHOVING	Medium	11	PATCH/UT CUT	Low
16	SHOVING	High	11	PATCH/UT CUT	Low
17	SLIPPAGE CR	Low	11	PATCH/UT CUT	Low
17	SLIPPAGE CR	Medium	11	PATCH/UT CUT	Low
17	SLIPPAGE CR	High	11	PATCH/UT CUT	Low
18	SWELL	Low	11	PATCH/UT CUT	Low
18	SWELL	Medium	11	PATCH/UT CUT	Low
18	SWELL	High	11	PATCH/UT CUT	Low
19	RAVELING	Low	11	PATCH/UT CUT	Low
19	RAVELING	Medium	11	PATCH/UT CUT	Low
19	RAVELING	High	11	PATCH/UT CUT	Low
20	WEATHERING	Low	11	PATCH/UT CUT	Low
20	WEATHERING	Medium	11	PATCH/UT CUT	Low
20	WEATHERING	High	11	PATCH/UT CUT	Low
43	BLOCK CR	Low	50	PATCHING	Low
43	BLOCK CR	Medium	50	PATCHING	Low
43	BLOCK CR	High	50	PATCHING	Low
46	JET BLAST	X	50	PATCHING	Low
49	OIL SPILLAGE	X	50	PATCHING	Low
50	PATCHING	Low	50	PATCHING	Low
50	PATCHING	Medium	50	PATCHING	Low
50	PATCHING	High	50	PATCHING	Low
51	POLISHED AG	X	50	PATCHING	Low
52	RAVELING	Low	50	PATCHING	Low
52	RAVELING	Medium	50	PATCHING	Low
52	RAVELING	High	50	PATCHING	Low
54	SHOVING	Low	50	PATCHING	Low
54	SHOVING	Medium	50	PATCHING	Low
54	SHOVING	High	50	PATCHING	Low
55	SLIPPAGE CR	X	50	PATCHING	Low
56	SWELLING	Low	50	PATCHING	Low
56	SWELLING	Medium	50	PATCHING	Low
56	SWELLING	High	50	PATCHING	Low
57	WEATHERING	Low	50	PATCHING	Low
57	WEATHERING	Medium	50	PATCHING	Low
57	WEATHERING	High	50	PATCHING	Low

Table A-22 Shoulder Leveling

Shoulder Leveling Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
9	LANE SH DROP	Low	0	0	N/A
9	LANE SH DROP	Medium	0	0	N/A
9	LANE SH DROP	High	0	0	N/A
27	LAND SH DROP	Low	0	0	N/A
27	LAND SH DROP	Medium	0	0	N/A
27	LAND SH DROP	High	0	0	N/A

Table A-23 Spread Sand or Gravel

Spread Sand or Gravel Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
2	BLEEDING	Low	2	BLEEDING	Low
2	BLEEDING	Medium	2	BLEEDING	Low
2	BLEEDING	High	2	BLEEDING	Medium

Table A-24 Joint Seal Localized

Joint Seal (Localized) Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
26	JT SEAL DMG	Low	0	0	N/A
26	JT SEAL DMG	Medium	0	0	N/A
26	JT SEAL DMG	High	0	0	N/A
33	PUMPING	X	0	0	N/A
65	JT SEAL DMG	Low	0	0	N/A
65	JT SEAL DMG	Medium	0	0	N/A
65	JT SEAL DMG	High	0	0	N/A
69	PUMPING	X	0	0	N/A

Table A-25 Crack Sealing PCC

Crack Sealing PCC Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
22	CORNER BREAK	Low	22	CORNER BREAK	Low
22	CORNER BREAK	Medium	22	CORNER BREAK	Low
22	CORNER BREAK	High	22	CORNER BREAK	Medium
28	LINEAR CR	Low	28	LINEAR CR	Low
28	LINEAR CR	Medium	28	LINEAR CR	Low
28	LINEAR CR	High	28	LINEAR CR	Medium
62	CORNER BREAK	Low	62	CORNER BREAK	Low
62	CORNER BREAK	Medium	62	CORNER BREAK	Low
62	CORNER BREAK	High	62	CORNER BREAK	Medium
63	LINEAR CR	Low	63	LINEAR CR	Low
63	LINEAR CR	Medium	63	LINEAR CR	Low
63	LINEAR CR	High	63	LINEAR CR	Medium

Table A-26 Patching - PCC Full Depth

Patching - PCC Full Depth Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
21	BLOW UP	High	29	LARGE PATCH	Low
21	BLOW UP	Low	29	LARGE PATCH	Low
21	BLOW UP	Medium	29	LARGE PATCH	Low
22	CORNER BREAK	High	29	LARGE PATCH	Low
22	CORNER BREAK	Low	29	LARGE PATCH	Low
22	CORNER BREAK	Medium	29	LARGE PATCH	Low
24	DURABIL. CR	High	29	LARGE PATCH	Low
24	DURABIL. CR	Low	29	LARGE PATCH	Low
24	DURABIL. CR	Medium	29	LARGE PATCH	Low
29	LARGE PATCH	High	29	LARGE PATCH	Low
29	LARGE PATCH	Medium	29	LARGE PATCH	Low
30	SMALL PATCH	High	30	SMALL PATCH	Low
34	PUNCHOUT	High	29	LARGE PATCH	Low
34	PUNCHOUT	Low	29	LARGE PATCH	Low
34	PUNCHOUT	Medium	29	LARGE PATCH	Low
61	BLOW-UP	High	67	LARGE PATCH	Low
61	BLOW-UP	Low	67	LARGE PATCH	Low
61	BLOW-UP	Medium	67	LARGE PATCH	Low
62	CORNER BREAK	High	67	LARGE PATCH	Low
62	CORNER BREAK	Low	67	LARGE PATCH	Low
62	CORNER BREAK	Medium	67	LARGE PATCH	Low
64	DURABIL. CR	High	67	LARGE PATCH	Low

Patching - PCC Full Depth Consequence of Maintenance Policy					
Distress	**Description**	**Severity**	**New Distress**	**New Description**	**New Severity**
64	DURABIL. CR	Low	67	LARGE PATCH	Low
64	DURABIL. CR	Medium	67	LARGE PATCH	Low
66	SMALL PATCH	High	67	LARGE PATCH	Low
66	SMALL PATCH	Low	67	LARGE PATCH	Low
66	SMALL PATCH	Medium	67	LARGE PATCH	Low
67	LARGE PATCH	High	67	LARGE PATCH	Low
67	LARGE PATCH	Medium	67	LARGE PATCH	Low
68	POPOUTS	X	67	LARGE PATCH	Low
76	ASR	High	67	LARGE PATCH	Low
76	ASR	Low	67	LARGE PATCH	Low
76	ASR	Medium	67	LARGE PATCH	Low

Table A-27 Patching – PCC Partial Depth

Patching - PCC Partial-Depth Consequence of Maintenance Policy					
Distress	**Description**	**Severity**	**New Distress**	**New Description**	**New Severity**
24	DURABIL. CR	Low	29	LARGE PATCH	Low
24	DURABIL. CR	Medium	29	LARGE PATCH	Low
24	DURABIL. CR	High	29	LARGE PATCH	Low
30	SMALL PATCH	Low	30	SMALL PATCH	Low
30	SMALL PATCH	Medium	30	SMALL PATCH	Low
30	SMALL PATCH	High	30	SMALL PATCH	Low
36	SCALING	Low	29	LARGE PATCH	Low
36	SCALING	Medium	29	LARGE PATCH	Low
36	SCALING	High	29	LARGE PATCH	Low
38	CORNER SPALL	Low	30	SMALL PATCH	Low
38	CORNER SPALL	Medium	30	SMALL PATCH	Low
38	CORNER SPALL	High	29	LARGE PATCH	Low
39	JOINT SPALL	Low	30	SMALL PATCH	Low
39	JOINT SPALL	Medium	29	LARGE PATCH	Low
39	JOINT SPALL	High	29	LARGE PATCH	Low
66	SMALL PATCH	Low	67	LARGE PATCH	Low
66	SMALL PATCH	Medium	67	LARGE PATCH	Low
66	SMALL PATCH	High	67	LARGE PATCH	Low
67	LARGE PATCH	Low	67	LARGE PATCH	Low
67	LARGE PATCH	Medium	67	LARGE PATCH	Low
67	LARGE PATCH	High	67	LARGE PATCH	Low
70	SCALING	Low	67	LARGE PATCH	Low
70	SCALING	Medium	67	LARGE PATCH	Low
70	SCALING	High	67	LARGE PATCH	Low
74	JOINT SPALL	Low	66	SMALL PATCH	Low

Patching - PCC Partial-Depth Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
74	JOINT SPALL	Medium	67	LARGE PATCH	Low
74	JOINT SPALL	High	67	LARGE PATCH	Low
75	CORNER SPALL	Low	66	SMALL PATCH	Low
75	CORNER SPALL	Medium	66	SMALL PATCH	Low
75	CORNER SPALL	High	67	LARGE PATCH	Low
76	ASR	Low	67	LARGE PATCH	Low
76	ASR	Medium	67	LARGE PATCH	Low
76	ASR	High	67	LARGE PATCH	Low

Table A-28 Slab Replacement PCC

Slab Replacement - PCC Consequence of Maintenance Policy					
Distress	Description	Severity	New Distress	New Description	New Severity
21	BLOW UP	Low	0	0	N/A
21	BLOW UP	Medium	0	0	N/A
21	BLOW UP	High	0	0	N/A
22	CORNER BREAK	Low	0	0	N/A
22	CORNER BREAK	Medium	0	0	N/A
22	CORNER BREAK	High	0	0	N/A
23	DIVIDED SLAB	Low	0	0	N/A
23	DIVIDED SLAB	Medium	0	0	N/A
23	DIVIDED SLAB	High	0	0	N/A
24	DURABIL. CR	Low	0	0	N/A
24	DURABIL. CR	Medium	0	0	N/A
24	DURABIL. CR	High	0	0	N/A
25	FAULTING	Low	0	0	N/A
25	FAULTING	Medium	0	0	N/A
25	FAULTING	High	0	0	N/A
28	LINEAR CR	Low	0	0	N/A
28	LINEAR CR	Medium	0	0	N/A
28	LINEAR CR	High	0	0	N/A
29	LARGE PATCH	Low	0	0	N/A
29	LARGE PATCH	Medium	0	0	N/A
29	LARGE PATCH	High	0	0	N/A
30	SMALL PATCH	Low	0	0	N/A
30	SMALL PATCH	Medium	0	0	N/A
30	SMALL PATCH	High	0	0	N/A
32	POPOUTS	X	0	0	N/A
33	PUMPING	X	0	0	N/A
34	PUNCHOUT	Low	0	0	N/A
34	PUNCHOUT	Medium	0	0	N/A

Slab Replacement - PCC Consequence of Maintenance Policy					
Distress	**Description**	**Severity**	**New Distress**	**New Description**	**New Severity**
34	PUNCHOUT	High	0	0	N/A
36	SCALING	Low	0	0	N/A
36	SCALING	Medium	0	0	N/A
36	SCALING	High	0	0	N/A
37	SHRINK CR	X	0	0	N/A
61	BLOW-UP	Low	0	0	N/A
61	BLOW-UP	Medium	0	0	N/A
61	BLOW-UP	High	0	0	N/A
62	CORNER BREAK	Low	0	0	N/A
62	CORNER BREAK	Medium	0	0	N/A
62	CORNER BREAK	High	0	0	N/A
63	LINEAR CR	Low	0	0	N/A
63	LINEAR CR	Medium	0	0	N/A
63	LINEAR CR	High	0	0	N/A
64	DURABIL. CR	Low	0	0	N/A
64	DURABIL. CR	Medium	0	0	N/A
64	DURABIL. CR	High	0	0	N/A
66	SMALL PATCH	Low	0	0	N/A
66	SMALL PATCH	Medium	0	0	N/A
66	SMALL PATCH	High	0	0	N/A
67	LARGE PATCH	Low	0	0	N/A
67	LARGE PATCH	Medium	0	0	N/A
67	LARGE PATCH	High	0	0	N/A
68	POPOUTS	X	0	0	N/A
69	PUMPING	X	0	0	N/A
70	SCALING	Low	0	0	N/A
70	SCALING	Medium	0	0	N/A
70	SCALING	High	0	0	N/A
71	FAULTING	Low	0	0	N/A
71	FAULTING	Medium	0	0	N/A
71	FAULTING	High	0	0	N/A
72	SHAT. SLAB	Low	0	0	N/A
72	SHAT. SLAB	Medium	0	0	N/A
72	SHAT. SLAB	High	0	0	N/A
73	SHRINKAGE CR	X	0	0	N/A
76	ASR	Low	0	0	N/A
76	ASR	Medium	0	0	N/A
76	ASR	High	0	0	N/A

A-5 ONE-YEAR UNCONSTRAINED WORK PLAN.

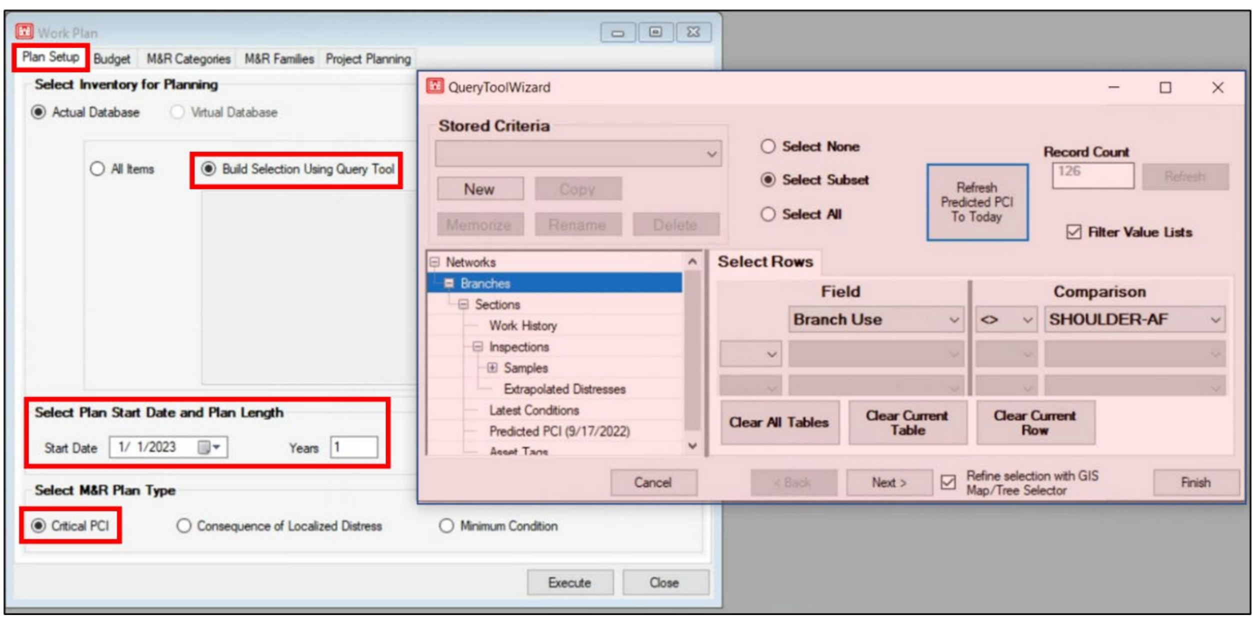
As described in paragraph 7-5.3, the one-year unconstrained work plan identifies all M&R requirements in all M&R categories to repair all sections in the current year. It is not typically used as the optimal critical PCI work plan because it is unrealistic to make all repairs in one year given funding, manpower, and contracting limitations. However, this work plan provides an indication of the magnitude of the requirements and, per paragraph 7-5.3, can be used to determine the facility condition index and develop Major M&R cost by condition tables.

A-5.1 Plan Setup Tab

This example demonstrates the steps to create a critical PCI unconstrained work plan for an airfield network. The procedure is the same for a road and parking area network. In this example, assume shoulders are not inspected, so there is no condition data available to define M&R requirements.

- Select the **Build Selection Using Query Tool** option to filter out the shoulders as shown in Figure A-1. If all sections in the network were inspected, including shoulders, select the **All Items** option on the **Plan Setup** tab.
- Set the plan start date to the first day of the next calendar year after the current PCI inspection date when the work plan is developed in conjunction with a PCI inspection. Use the first day of the calendar year after the current date when doing interim work plan updates.
- Set the plan length to one year.

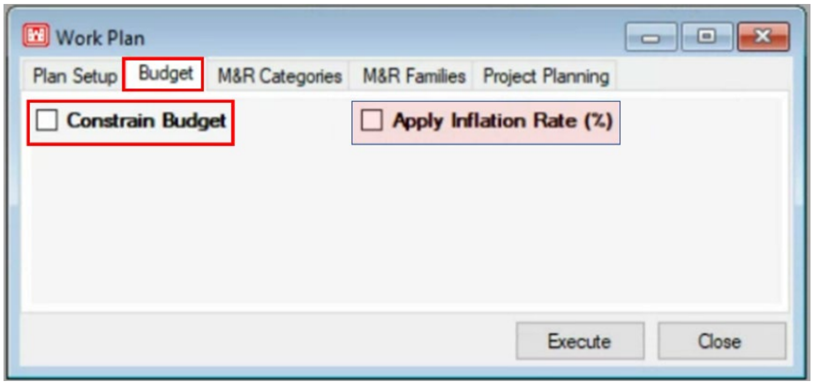
Figure A-1 Unconstrained Work Plan, Plan Setup Tab



A-5.2 Budget Tab.

Leave the **Constrain Budget** checkbox unchecked to develop an unconstrained budget. Leave the **Apply Inflation Rate (%)** checkbox unchecked as shown in Figure A-2 and discussed in paragraph 7-5.2.

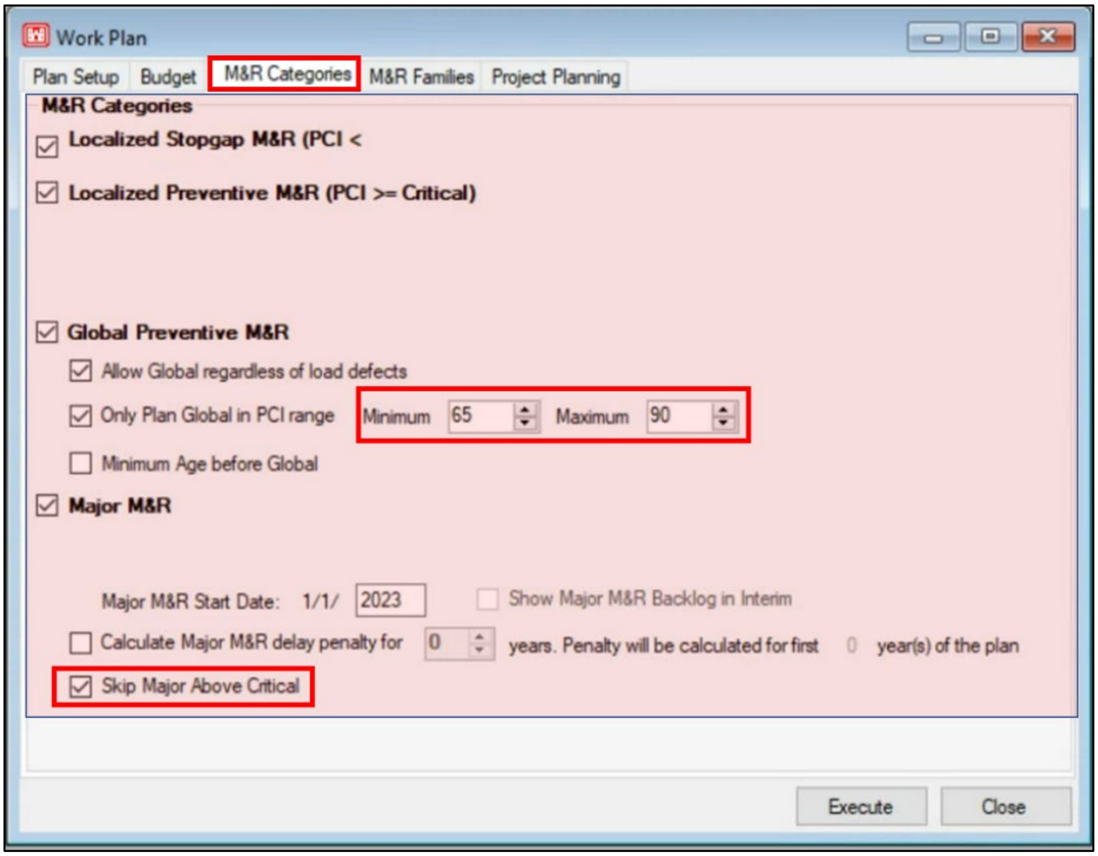
Figure A-2 Unconstrained Work Plan Setup Tab



A-5.3 M&R Categories Tab.

Since the unconstrained work plan identifies all current M&R requirements, select all M&R categories as shown in Figure A-3. This example applies global M&R regardless of load defects and generates global M&R requirements when the section PCI is between 65 and 90 (see paragraph 7-6.4). Check the **Skip Major Above Critical** box (see paragraph 7-6.4.2).

Figure A-3 Unconstrained Work Plan, M&R Categories Tab

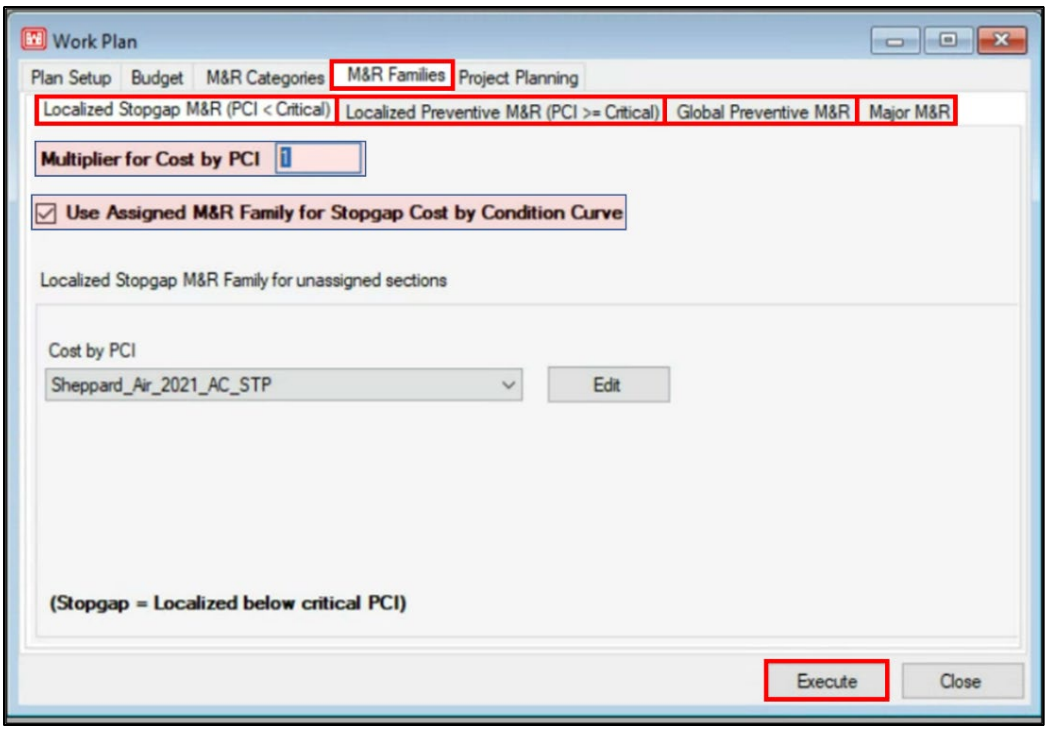


A-5.4 M&R Families Tab.

The example in Figure A-4 shows the **Localized Stopgap (M&R)** tab. Each tab for the other M&R families is similar.

- Set the value in the **Multiplier for Cost by PCI** box to 1.
- The **Use Assigned M&R Family for Stopgap Cost by Condition Curve** checkbox is checked by default for all M&R types. This example assumes all sections are assigned to the appropriate M&R families.
- The **Cost by PCI** option for unassigned sections is not used because all inspected sections are assigned to appropriate families.

Figure A-4 Unconstrained Work Plan, M&R Families Tab



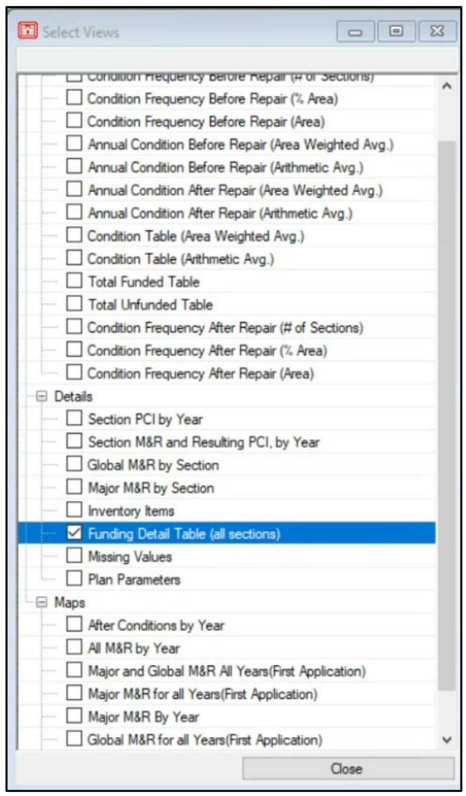
A-5.5 Project Planning Tab.

The **Project Planning** tab is not used when developing an unconstrained budget but is used when using PAVER to develop a PMP, as described in paragraph 7-8. Examples of how to use the **Project Planning** tab are provided in paragraphs A-5.5, A-6.5, A-7.5 and A-9.8.

A-5.6 Execute One-Year Unconstrained Work Plan.

Select **Execute** in the lower right-hand corner of the form as shown in Figure A-4. Once the work plan is generated, PAVER provides work plan views as shown in Figure A-5 at the Summary (Branch) level and the Detail (Section) level as well as map views of the data. These views are pre-defined reports that provide information on condition, plan parameters, missing values, M&R requirements, and costs. Any table in any of these views can be exported to Excel using a right-click and selecting the option to export to file (*.xlsx).

Figure A-5 One-Year Unconstrained Budget – Work Plan Views



- In this example, select **Funding Detail Table (all sections)**. When the table opens, right-click and select export to Excel.
- A pop-up window asks whether to include hidden columns. Respond yes.
- Open this report in Excel, unhide all of the columns.
- Find the **RPUID** column, select cut, and insert it between the **Branch ID** and **Section ID** columns.
- Sort the report by RPUID and arranging the columns as shown in Figure A-6. This allows the user to determine the M&R types and cost for each facility to determine the facility condition index or to develop Major M&R cost by condition tables, as described in paragraph 6-3.5 and paragraph 6-5.3.

Figure A-6 Funding Detail Table

Network ID	Branch ID	RPUID	Section ID	Avg Of Condition Before	Avg Of Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Work Type	Total
Sheppard	RW15R33L	524773	R09A1	85.09	85.09	$0.00	$11,659.60	$0.00	$0.00	Preventive	$11,659.60
Sheppard	RW15R33L	524773	R09A2	90.09	90.09	$0.00	$7,987.54	$0.00	$0.00	Preventive	$7,987.54
Sheppard	RW15R33L	524773	R10A1	86.09	86.09	$0.00	$7,712.88	$0.00	$0.00	Preventive	$7,712.88
Sheppard	RW15R33L	524773	R10A2	91.09	91.09	$0.00	$20,295.54	$0.00	$0.00	Preventive	$20,295.54
Sheppard	RW15R33L	524773	R11C1	88.09	88.09	$0.00	$170,972.59	$0.00	$0.00	Preventive	$170,972.59
Sheppard	RW15R33L	524773	R11C2	85.09	85.09	$0.00	$394,637.32	$0.00	$0.00	Preventive	$394,637.32
Sheppard	RW15R33L	524773	R12A1	85.09	85.09	$0.00	$6,726.84	$0.00	$0.00	Preventive	$6,726.84
Sheppard	RW15R33L	524773	R12A2	85.09	85.09	$0.00	$31,392.06	$0.00	$0.00	Preventive	$31,392.06
Sheppard	RW15R33L	524773	R13A1	82.09	82.09	$0.00	$12,708.28	$0.00	$0.00	Preventive	$12,708.28
Sheppard	RW15R33L	524773	R13A2	90.09	90.09	$0.00	$3,472.86	$0.00	$0.00	Preventive	$3,472.86
Sheppard	RW15C33C	524775	R04A1	94.09	94.09	$0.00	$7,455.88	$0.00	$0.00	Preventive	$7,455.88
Sheppard	RW15C33C	524775	R04A2	94.09	94.09	$0.00	$7,455.88	$0.00	$0.00	Preventive	$7,455.88
Sheppard	RW15C33C	524775	R05C1	67.42	100.00	$0.00	$0.00	$0.00	$109,264.93	Major Below Critical	$109,264.93
Sheppard	RW15C33C	524775	R05C2	75.42	78.81	$0.00	$3,598.83	$14,238.68	$0.00	Preventive + Global MR	$17,837.51
Sheppard	RW15C33C	524775	R06C1	64.42	100.00	$0.00	$0.00	$0.00	$33,249.59	Major Below Critical	$33,249.59
Sheppard	RW15C33C	524775	R06C2	72.42	75.81	$0.00	$1,349.12	$4,271.68	$0.00	Preventive + Global MR	$5,620.80
Sheppard	RW15C33C	524775	R07C1	65.42	100.00	$0.00	$0.00	$0.00	$717,011.18	Major Below Critical	$717,011.18
Sheppard	RW15C33C	524775	R07C2	72.42	75.81	$0.00	$29,230.76	$92,552.75	$0.00	Preventive + Global MR	$121,783.51
Sheppard	RW15C33C	524775	R08A1	96.09	96.09	$0.00	$4,932.77	$0.00	$0.00	Preventive	$4,932.77
Sheppard	RW15C33C	524775	R08A2	96.09	96.09	$0.00	$3,288.53	$0.00	$0.00	Preventive	$3,288.53
Sheppard	RW1735	524777	R14A1	86.42	89.81	$0.00	$1,100.63	$7,034.03	$0.00	Preventive + Global MR	$8,134.66

A-6 CONSTRAINED BACKLOG ELIMINATION WORK PLAN.

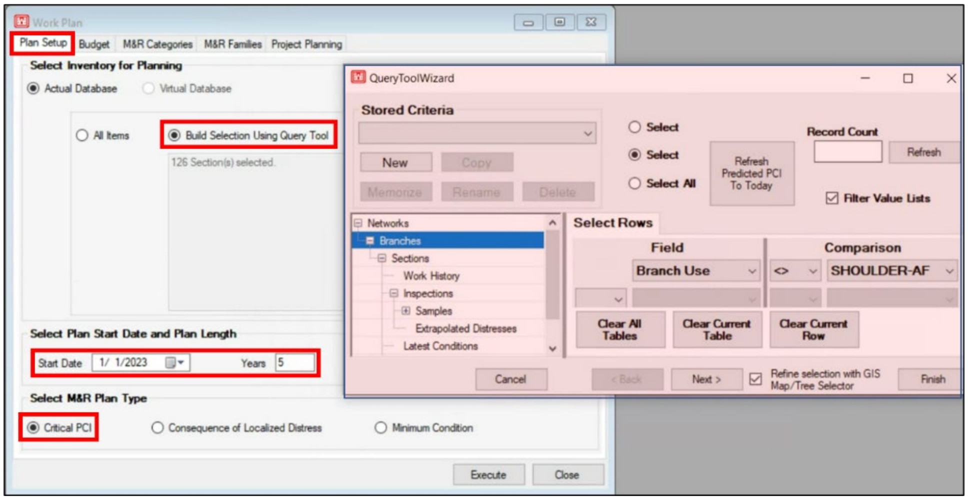
As described in paragraphs 7-5.4 and 7-5.7, the backlog elimination work plan identifies all M&R requirements in all M&R categories to repair all sections, but rather than doing it in one year, it addresses these requirements over multiple years. The standard used by the DoD is five years, although circumstances or specific mission requirements may require increasing this timeline. This work plan is typically selected as the optimal work plan used to develop the PMP when the average network PCI is below 85. The details of developing the PMP using the optimal critical PCI work plan are described in Chapter 8 and paragraph A-9.

A-6.1 Plan Setup Tab.

This example demonstrates the steps to create a critical PCI eliminate backlog work plan for an airfield network. The procedure is the same for a road and parking area network. In this example, assume shoulders are not inspected, so there is no condition data available to define M&R requirements.

- Select the **Build Selection Using Query Tool** option to filter out the shoulders, as shown in Figure A-7. If all sections in the network are inspected, select the **All Items** option on the **Plan Setup** tab.
- Set the plan start date to the first day of the next calendar year after the current PCI inspection date when the work plan is developed in conjunction with a PCI inspection. Use the first day of the calendar year after the current date when doing interim work plan updates.
- Set the plan length to five years.

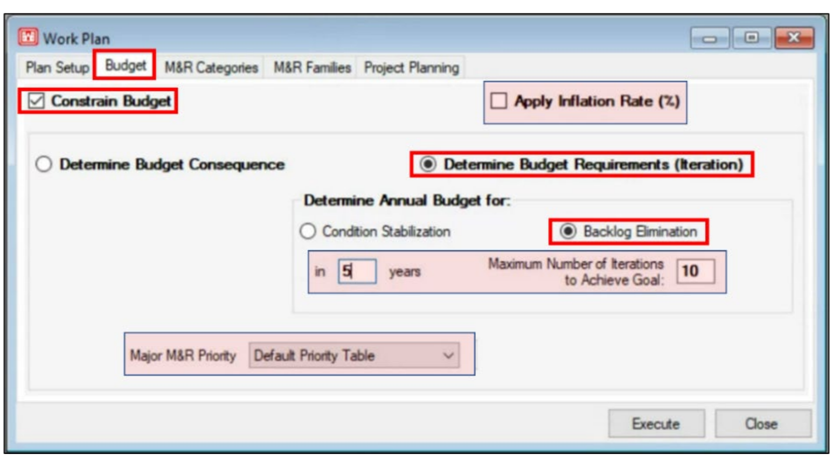
Figure A-7 Eliminate Backlog Work Plan, Plan Setup Tab



A-6.2 Budget Tab.

- Check the **Constrain Budget** checkbox to develop a constrained budget (Figure A-8).
- Leave the **Apply Inflation Rate (%)** checkbox unchecked (paragraph 7-5.2).
- Select the **Determine Budget Requirements (Iteration)** and **Backlog Elimination** options.
- Set up the plan to eliminate the backlog in five years.
- Leave **Maximum Number of Iterations to Achieve Goal** set to 10. This defines the number of times PAVER tries to develop a balanced budget in each of the five years.
- Use the **Default Priority Table** option in **Major M&R Priority** (paragraph 7-5.5).

Figure A-8 Eliminate Backlog Work Plan Setup Tab

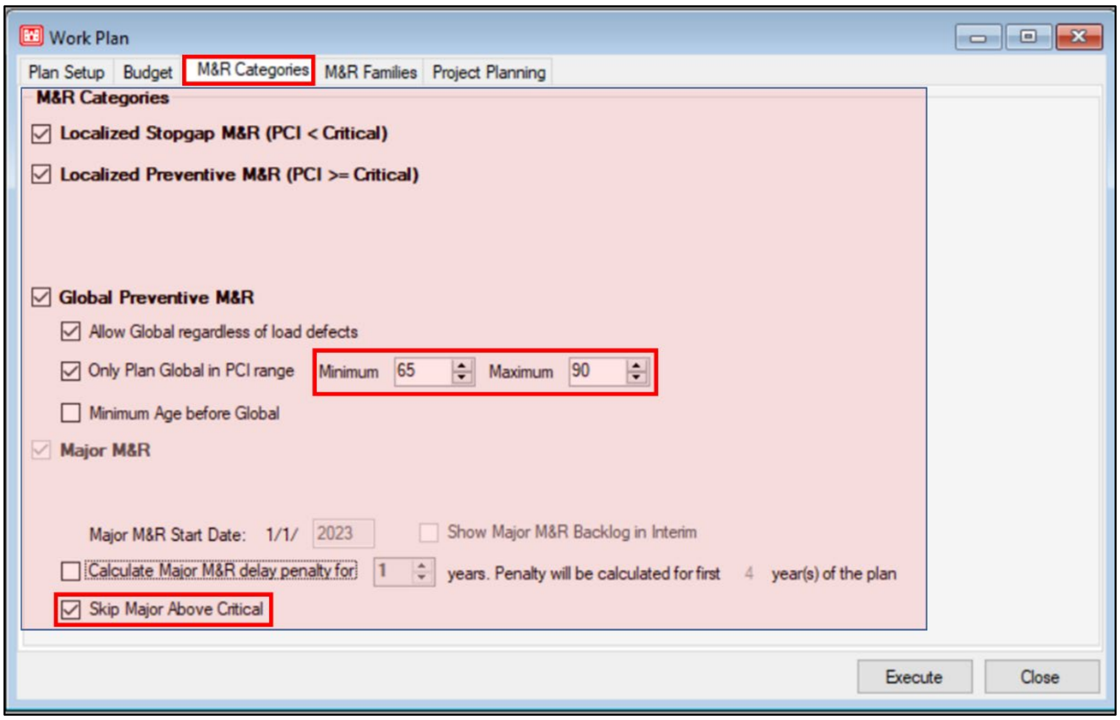


A-6.3 M&R Categories Tab.

Just as with the unconstrained work plan, the eliminate backlog work plan identifies all M&R requirements required to achieve the goal.

- Select all **M&R Categories** as shown in Figure A-9.
- This example applies global M&R regardless of load defects and generates global M&R requirements when the section PCI is between 65 and 90 (paragraph 7-6.3).
- Leave the **Calculate Major M&R delay penalty** box unchecked (paragraph 7-6.4).
- Check the **Skip Major Above Critical** box (paragraph 7-6.4.2).

Figure A-9 Eliminate Backlog Work Plan, M&R Categories Tab

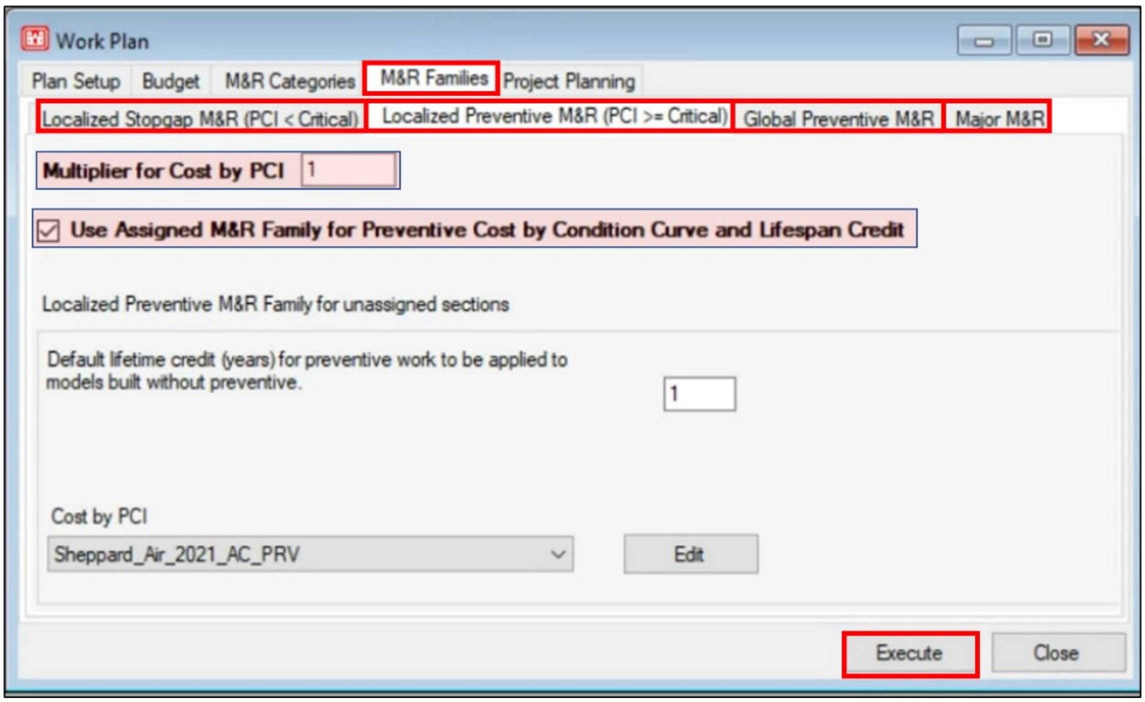


A-6.4 M&R Families Tab.

The example in Figure A-10 shows the **Localized Preventive M&R** tab. Each of the tabs for the other M&R families are similar.

- Set the value in the **Multiplier for Cost by PCI** box to 1.
- The **Use Assigned M&R Family for Preventive Cost by Condition Curve and Lifespan Credit** checkbox is checked by default for all M&R types. This example assumes all sections are assigned to the appropriate M&R families.
- The **Cost by PCI** option for unassigned sections is not used because all inspected sections are assigned to appropriate families.

Figure A-10 Eliminate Backlog Work Plan, M&R Families Tab



A-6.5 Project Planning Tab.

The **Project Planning** tab is used when using PAVER to develop a PMP, as described in paragraph 7-8. Examples of how to use the **Project Planning** tab are provided in paragraph A-9.

A-6.6 Execute Eliminate Backlog Work Plan.

Select **Execute** in the lower right-hand corner of the form, as shown in Figure A-10. Once the work plan is generated, as shown in Figure A-11, PAVER provides work plan views at the Summary (Branch) level and the Detail (Section) level as well as map views of the data. These views are pre-defined reports that provide information on condition, plan parameters, missing values, M&R requirements, and costs. Any table in any of these views can be exported to Excel using a right-click and selecting the option to export to file (*.xlsx).

- In this example, select **Funding Detail Table (all sections)**. When the table opens, right-click and select export to Excel.
- A pop-up window asks whether to include hidden columns. Respond yes.
- Open this report in Excel and unhide all of the columns.
- Use the Excel cut and insert cut functions to rearrange the columns in the table to look like the one in Figure A-12.
    - Keep **Network ID**, **Branch ID**, and **Section ID** columns (C, D, and E) in the report.
    - Either the **Date** column (F) or the **Work Year** column (I) can be used in the report to perform the sorting process outlined below.
    - Hide the **Avg. of Condition Before** column and **After** column (G and H); they can be used later in the PMP development process.
    - Move the **Branch Use** column (N), **Section Rank** column (O) and **Surface Type Current** column (P) to the right of the **Work Year** column (I).
    - Move **Work Type** (column BB) to the right of the **Surface Type Current** column.
    - Retain the **Stop Gap Funded**, **Preventive Funded**, **Global Funded**, **Major Under Critical Funded**, and **Total Funded** columns (J, L, AV, AY, and BE) in the report.
    - Delete or hide the remaining columns.
- Use the Excel sort capability to sort the report by date, then **Branch Use**, then **Section Rank**. This procedure produces a prioritized list of requirements for each year in the plan.
- When the eliminate backlog work plan is selected as the optimal work plan, it is to develop the PMP as outlined in Chapter 8 and paragraph A-9.

Figure A-11 Eliminate Backlog Work Plan Views

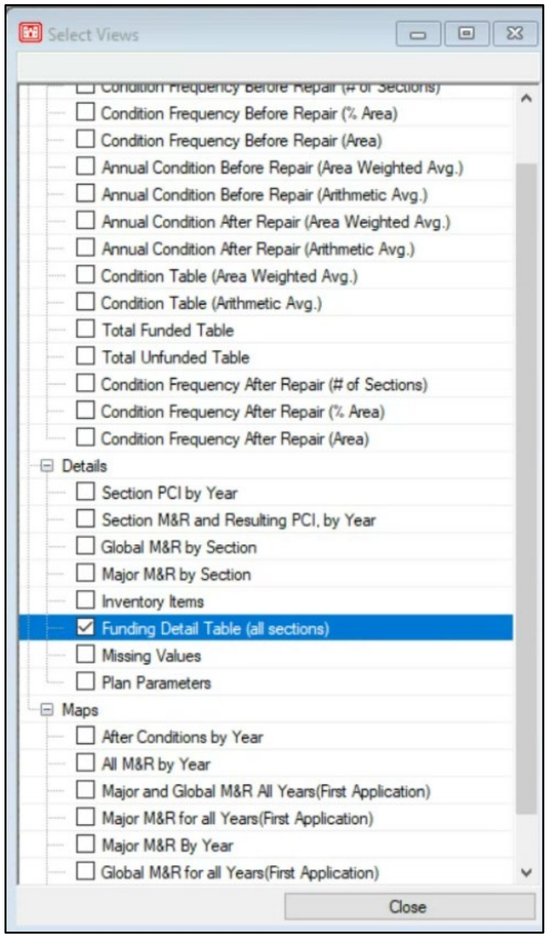


Figure A-12 Sorted Eliminate Backlog Work Plan

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Surface Type Current	Work Type	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total Funded
Sheppard	RW15C33C	R04A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R04A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R05C1	2023	RUNWAY	P	AC	Major Below Critical	$0.00	$0.00	$0.00	$109,264.93	$109,264.93
Sheppard	RW15C33C	R05C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$3,598.83	$14,238.68	$0.00	$17,837.51
Sheppard	RW15C33C	R06C1	2023	RUNWAY	P	AC	Major Below Critical	$0.00	$0.00	$0.00	$33,249.59	$33,249.59
Sheppard	RW15C33C	R06C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$1,349.12	$4,271.68	$0.00	$5,620.80
Sheppard	RW15C33C	R07C1	2023	RUNWAY	P	AC	Major Below Critical	$0.00	$0.00	$0.00	$717,011.18	$717,011.18
Sheppard	RW15C33C	R07C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$29,230.76	$92,552.75	$0.00	$121,783.51
Sheppard	RW15C33C	R08A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$4,932.77	$0.00	$0.00	$4,932.77
Sheppard	RW15C33C	R08A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$3,288.53	$0.00	$0.00	$3,288.53
Sheppard	RW15L33R	R01A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$11,058.28	$0.00	$0.00	$11,058.28
Sheppard	RW15L33R	R01A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$19,413.79	$0.00	$0.00	$19,413.79
Sheppard	RW15L33R	R02C1	2023	RUNWAY	P	AC	Preventive	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R02C2	2023	RUNWAY	P	AC	Preventive	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R03A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$14,052.28	$0.00	$0.00	$14,052.28
Sheppard	RW15L33R	R03A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$17,179.11	$0.00	$0.00	$17,179.11
Sheppard	RW15R33L	R09A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$11,659.60	$0.00	$0.00	$11,659.60
Sheppard	RW15R33L	R09A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,987.54	$0.00	$0.00	$7,987.54
Sheppard	RW15R33L	R10A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,712.88	$0.00	$0.00	$7,712.88
Sheppard	RW15R33L	R10A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$20,295.54	$0.00	$0.00	$20,295.54
Sheppard	RW15R33L	R11C1	2023	RUNWAY	P	PCC	Preventive	$0.00	$170,972.59	$0.00	$0.00	$170,972.59
Sheppard	RW15R33L	R11C2	2023	RUNWAY	P	PCC	Preventive	$0.00	$394,637.32	$0.00	$0.00	$394,637.32
Sheppard	RW15R33L	R12A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$6,726.84	$0.00	$0.00	$6,726.84

A-7 CONSTRAINED CONDITION STABILIZATION WORK PLAN.

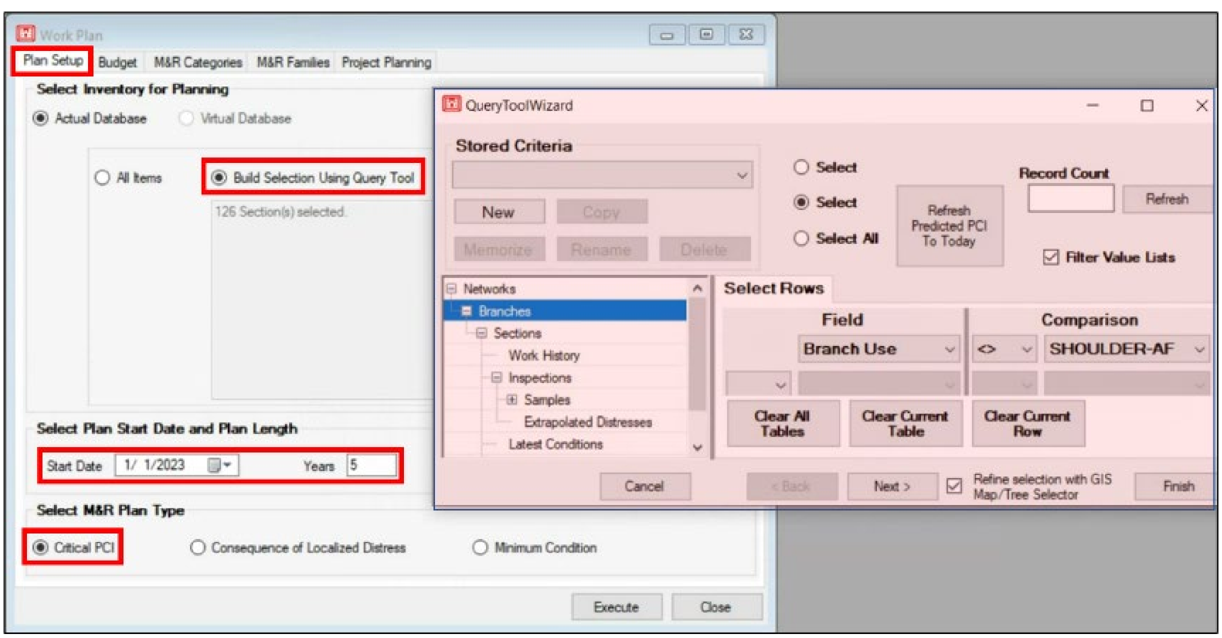
As described in paragraphs 7-5.4, 7-5.7, and 7-5.7.2, the condition stabilization work plan identifies all M&R requirements to maintain the condition of all sections within a defined tolerance for the defined number of years. The standard time frame used by the DoD is five years, although circumstances or specific mission requirements may require adjusting this timeline. This work plan is typically selected as the optimal work plan used to develop the PMP when the average network PCI is greater than or equal to 85. The details of developing the PMP using the optimal critical PCI work plan are described in Chapter 8 and paragraph A-9.

A-7.1 Plan Setup Tab.

This example demonstrates the steps to create a critical PCI condition stabilization work plan for an airfield network. The procedure is the same for a road and parking area network. In this example, assume shoulders are not inspected, so there is no condition data available to define M&R requirements.

- Select the **Build Selection Using Query Tool** option to filter out the shoulders, as shown in Figure A-13. If all sections in the network are inspected, select the **All Items** option on the **Plan Setup** tab.
- Set the plan start date to the first day of the next calendar year after the current PCI inspection date when the work plan is developed in conjunction with a PCI inspection. Use the first day of the calendar year after the current date when doing interim work plan updates.
- Set the plan length to five years.

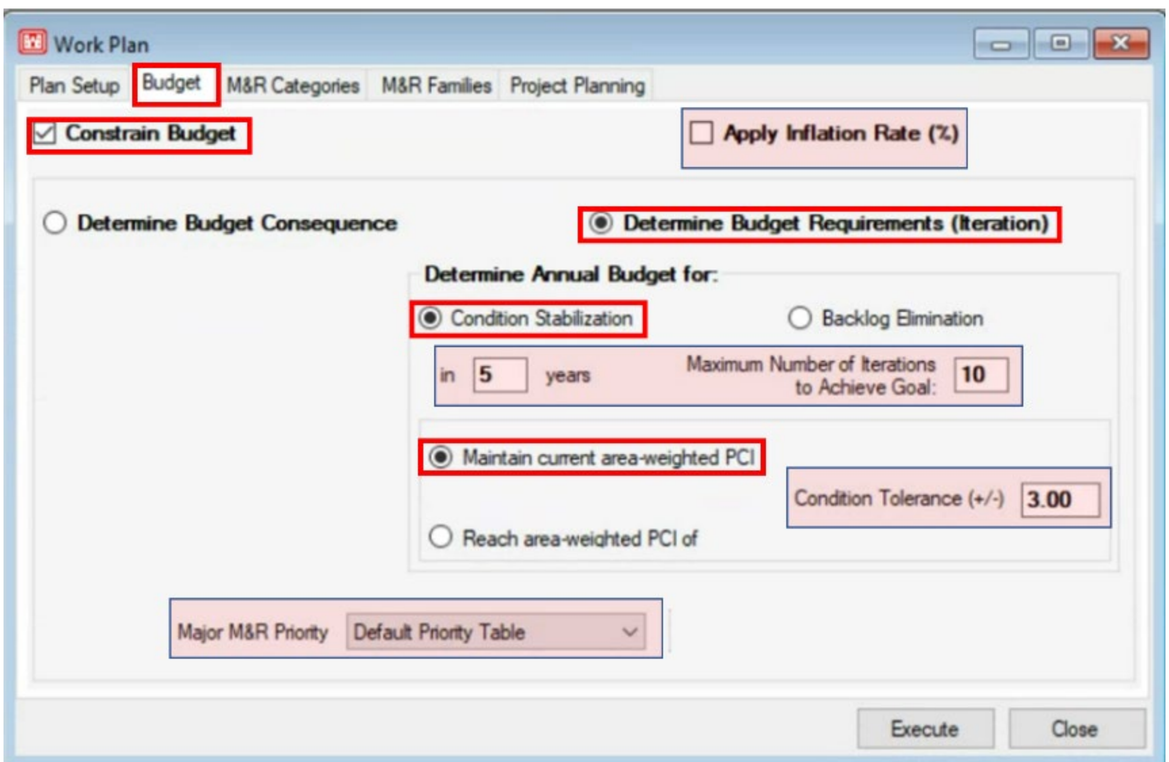
Figure A-13 Condition Stabilization Work Plan, Plan Setup Tab



A-7.2 Budget Tab.

- Check the **Constrain Budget** checkbox to develop a constrained budget, as shown in Figure A-14.
- Leave the **Apply Inflation Rate (%)** checkbox unchecked (see paragraph 7-5.2).
- Select the **Determine Budget Requirements (Iteration)** and **Condition Stabilization** options.
- Set the condition stabilization period to five years.
- Leave **Maximum Number of Iterations to Achieve Goal** set to 10. This defines the number times PAVER tries to develop a balanced budget in each of the five years.
- Select the **Maintain current area-weighted PCI** option.
- Set the **Condition Tolerance** to ±3. The tolerance can be adjusted if required.
- Use the **Default Priority Table** option in **Major M&R Priority** (see paragraph 7-5.5)

Figure A-14 Condition Stabilization Work Plan Setup Tab

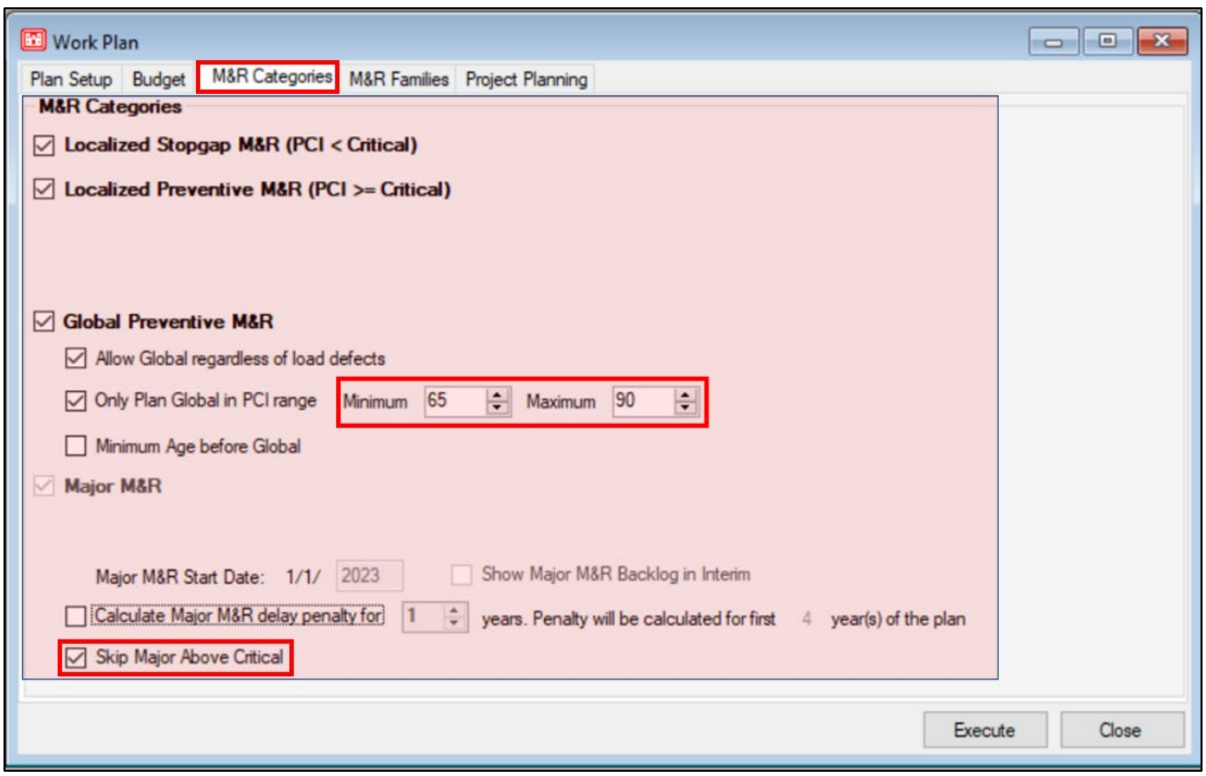


A-7.3 M&R Categories Tab.

Just as with the eliminate backlog work plan, the condition stabilization work plan identifies all M&R requirements required to achieve the goal.

- Select all M&R categories as shown in Figure A-15.
- This example applies global M&R regardless of load defects and generates global M&R requirements when the section PCI is between 65 and 90 (see paragraph 7-6.3).
- Leave the **Calculate Major M&R delay penalty** box unchecked (see paragraph 7-6.4.1).
- Check the **Skip Major M&R Above Critical** box (see paragraph 7-6.4.2).

Figure A-15 Condition Stabilization Work Plan, M&R Categories Tab

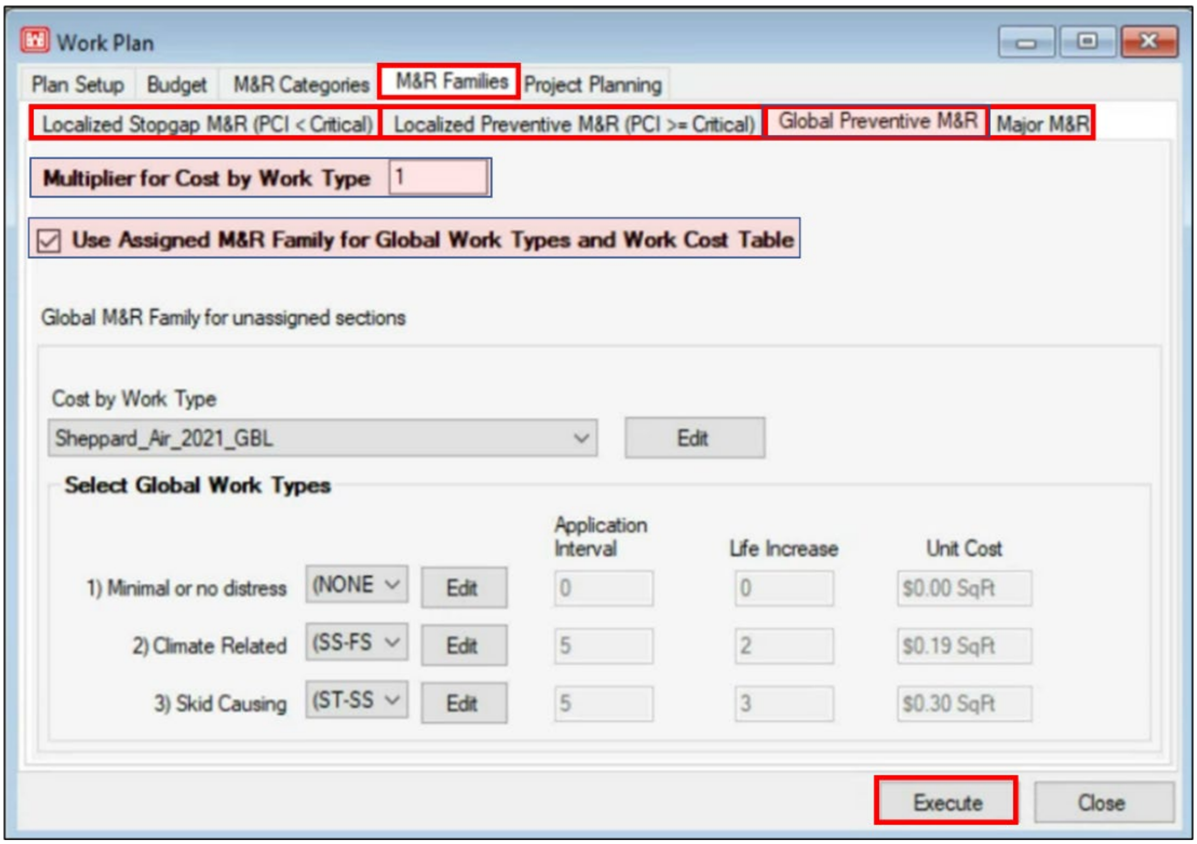


A-7.4 M&R Families Tab.

The example in Figure A-16 shows the **Global Preventive M&R** tab. Each of the tabs for the other M&R families are similar.

- Set the value in the **Multiplier for Cost by Work Type** box to 1.
- The **Use Assigned M&R Family for Global Work Types and Work Cost Table** checkbox is checked by default for all M&R types. This example assumes all sections are assigned to the appropriate M&R families.
- The **Cost by Work Type** option for unassigned sections is not used because all inspected sections are assigned to appropriate families.

Figure A-16 Condition Stabilization Work Plan, M&R Families Tab



A-7.5 Project Planning Tab.

The **Project Planning** tab is used when using PAVER to develop a PMP as described in paragraph 7-8. Examples of how to use the **Project Planning** tab are provided in paragraph A-9.

A-7.6 Execute Condition Stabilization Work Plan.

Select **Execute** in the lower right-hand corner of the form as shown in Figure A-16. Once the work plan is generated, as shown in Figure A-17, PAVER provides work plan views at the Summary (Branch) level and the Detail (Section) level as well as map views of the data. These views are pre-defined reports that provide information on condition, plan parameters, missing values, M&R requirements, and costs. Any table in any of these views can be exported to Excel using a right-click and selecting the option to export to file (*.xlsx).

- In this example, select **Funding Detail Table (all sections)**. When the table opens, right-click and select export to Excel.
- A pop-up window asks whether to include hidden columns. Respond yes.
- Open this report in Excel and unhide all of the columns.
- Use the Excel cut and insert cut functions to rearrange the columns in the table to look like the one in Figure A-18.
    - Keep **Network ID**, **Branch ID**, and **Section ID** columns (C, D, and E) in the report.
    - Either the **Date** column (F) or the **Work Year** column (I) can be used in the report to perform the sorting process outlined below.
    - Hide the **Avg. of Condition Before** column and **After** column (G and H); they can be used later in the PMP development process.
    - Move the **Branch Use** column (N), **Section Rank** column (O) and **Surface Type Current** column (P) to the right of the **Work Year** column (I).
    - Move **Work Type** (column BB) to the right of the **Surface Type Current** column.
    - Retain the **Stop Gap Funded**, **Preventive Funded**, **Global Funded**, **Major Under Critical Funded**, and **Total Funded** columns (J, L, AV, AY, and BE) in the report.
    - Delete or hide the remaining columns.
- Use the Excel sort capability to sort the report by **Work Year**, then **Branch Use**, then **Section Rank**. This procedure produces a prioritized list of requirements for each year in the plan.
- When the eliminate backlog work plan is selected as the optimal work plan, it is to develop the PMP as outlined in Chapter 8 and paragraph A-9.

Figure A-17 Condition Stabilization Work Plan Views

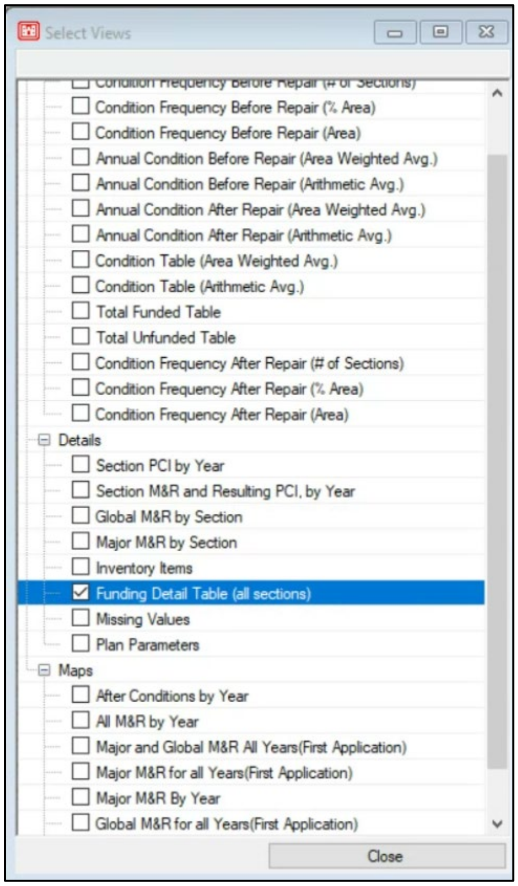


Figure A-18 Sorted Condition Stabilization Work Plan

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Surface Type Current	Work Type	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total Funded
Sheppard	RW15C33C	R06C1	2023	RUNWAY	P	AC	Major Below Critical	$0.00	$0.00	$0.00	$33,249.59	$33,249.59
Sheppard	RW15C33C	R05C1	2023	RUNWAY	P	AC	Major Below Critical	$0.00	$0.00	$0.00	$109,264.93	$109,264.93
Sheppard	RW15C33C	R07C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$29,230.76	$92,552.75	$0.00	$121,783.51
Sheppard	RW15C33C	R04A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R05C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$3,598.83	$14,238.68	$0.00	$17,837.51
Sheppard	RW15C33C	R08A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$3,288.53	$0.00	$0.00	$3,288.53
Sheppard	RW15C33C	R04A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,455.88	$0.00	$0.00	$7,455.88
Sheppard	RW15C33C	R08A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$4,932.77	$0.00	$0.00	$4,932.77
Sheppard	RW15C33C	R07C1	2023	RUNWAY	P	AC	Stopgap	$52,809.06	$0.00	$0.00	$0.00	$52,809.06
Sheppard	RW15C33C	R06C2	2023	RUNWAY	P	AC	Preventive + Global MR	$0.00	$1,349.12	$4,271.68	$0.00	$5,620.80
Sheppard	RW15L33R	R01A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$11,058.28	$0.00	$0.00	$11,058.28
Sheppard	RW15L33R	R01A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$19,413.79	$0.00	$0.00	$19,413.79
Sheppard	RW15L33R	R03A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$14,052.28	$0.00	$0.00	$14,052.28
Sheppard	RW15L33R	R02C1	2023	RUNWAY	P	AC	Preventive	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R02C2	2023	RUNWAY	P	AC	Preventive	$0.00	$2,300.37	$0.00	$0.00	$2,300.37
Sheppard	RW15L33R	R03A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$17,179.11	$0.00	$0.00	$17,179.11
Sheppard	RW15R33L	R12A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$6,726.84	$0.00	$0.00	$6,726.84
Sheppard	RW15R33L	R12A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$31,392.06	$0.00	$0.00	$31,392.06
Sheppard	RW15R33L	R13A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$3,472.86	$0.00	$0.00	$3,472.86
Sheppard	RW15R33L	R10A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$20,295.54	$0.00	$0.00	$20,295.54
Sheppard	RW15R33L	R11C2	2023	RUNWAY	P	PCC	Preventive	$0.00	$394,637.32	$0.00	$0.00	$394,637.32
Sheppard	RW15R33L	R11C1	2023	RUNWAY	P	PCC	Preventive	$0.00	$170,972.59	$0.00	$0.00	$170,972.59
Sheppard	RW15R33L	R13A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$12,708.28	$0.00	$0.00	$12,708.28
Sheppard	RW15R33L	R09A2	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,987.54	$0.00	$0.00	$7,987.54
Sheppard	RW15R33L	R10A1	2023	RUNWAY	P	PCC	Preventive	$0.00	$7,712.88	$0.00	$0.00	$7,712.88

A-8 CONSEQUENCE OF LOCALIZED DISTRESS MAINTENANCE WORK PLAN.

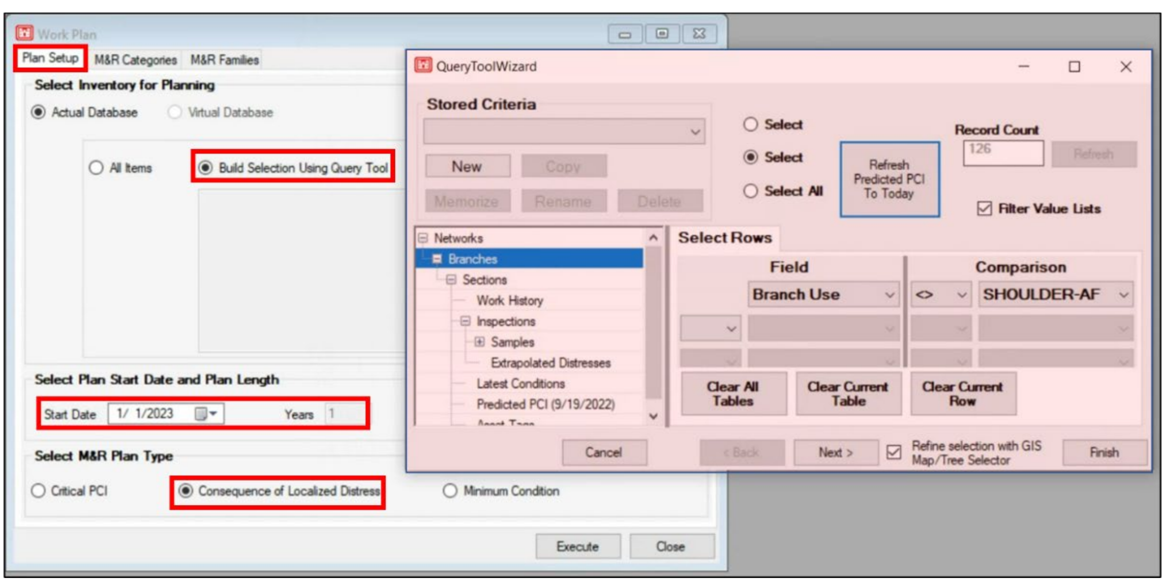
As described in paragraph 7-4, the consequence of localized distress maintenance work plan generates a list of all the localized work requirements based on the assigned distress maintenance policy, calculates the cost of each requirement based on the cost by work type tables, and computes the resulting conditions based on the consequence of maintenance policy when the distresses are repaired according to the distress maintenance policy. This work plan is used in conjunction with the optimal critical PCI work plan to develop the PMP, as described in Chapter 8 and paragraph A-9.

A-8.1 Plan Setup Tab.

This example demonstrates the steps to create a consequence of localized distress work plan for an airfield network. The procedure is the same for a road and parking area network. In this example, assume shoulders are not inspected, so there is no condition data available to define M&R requirements.

- Select the **Build Selection Using Query Tool** option to filter out the shoulders, as shown in Figure A-19. If all sections in the network were inspected, including shoulders, select the **All Items** option on the **Plan Setup** tab.
- Set the plan start date to the first day of the next calendar year after the current PCI inspection date when the work plan is developed in conjunction with a PCI inspection. Use the first day of the calendar year after the current date when doing interim work plan updates.
- The plan length is set to one year by default and cannot be changed.
- Note that the **Budget** and **Project Planning** tabs are no longer displayed.

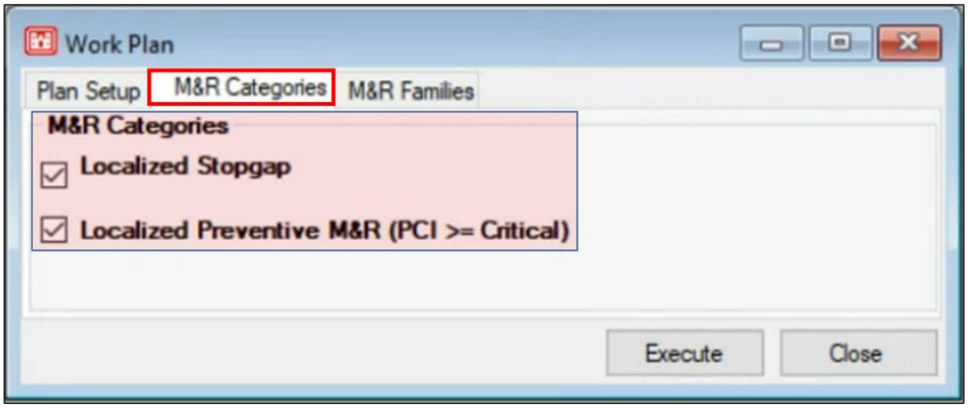
Figure A-19 Consequence of Localized M&R Work Plan, Plan Setup Tab



A-8.2 M&R Categories Tab.

The consequence of localized distress maintenance work plan just includes requirements for localized operational (stopgap) and localized preventive, as described in paragraph 7-4.

Figure A-20 Consequence of Localized M&R Work Plan, M&R Categories Tab

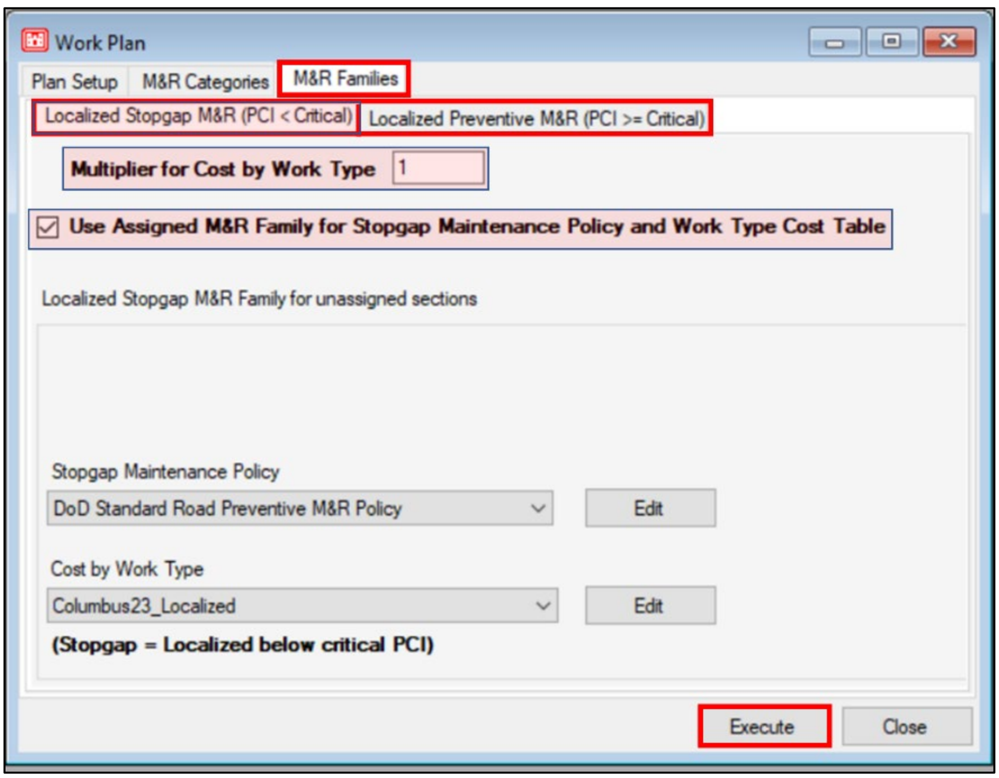


A-8.3 M&R Families Tab.

The example in Figure A-21 shows the **Localized Stopgap M&R** tab. The tab for **Localized Preventive M&R** is similar. **Note:** There are no tabs for Global or Major M&R because this work plan only considers localized.

- Set the value in the **Multiplier for Cost by Work Type** box to 1.
- The **Use Assigned M&R Family for Stopgap Maintenance Policy and Work Type Cost Table** checkbox is checked by default for all M&R types. This example assumes all sections are assigned to the appropriate M&R families.
- The **Stopgap Maintenance Policy** and **Cost by Work Type** options for unassigned sections are not used because all inspected sections are assigned to appropriate families.

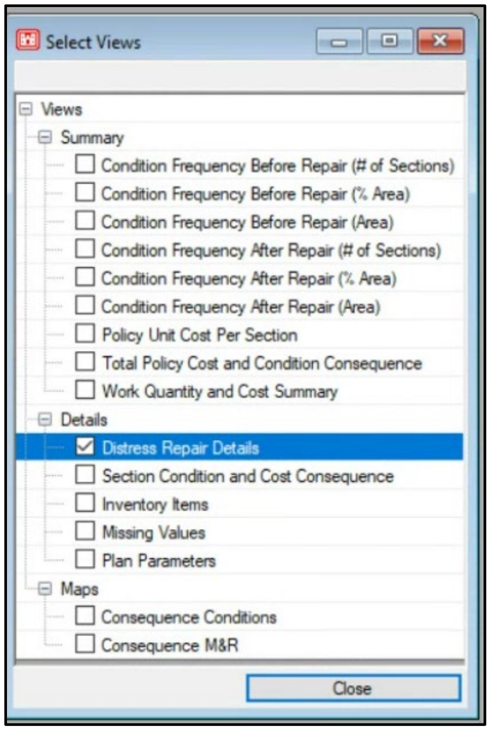
Figure A-21 Unconstrained Work Plan, M&R Families Tab



A-8.4 Execute Consequence of Localized M&R Work Plan.

Select **Execute** in the lower right-hand corner of the form as shown in Figure A-21. Once the work plan is generated, PAVER provides work plan views, as shown in Figure A-22, at the Summary (Branch) level and the Detail (Section) level as well as map views of the data. These views are pre-defined reports that provide information on condition, plan parameters, missing values, M&R requirements, and costs. Any table in any of these views can be exported to Excel using a right-click and selecting the option to export to file (*.xlsx).

Figure A-22 Condition Stabilization Work Plan Views



- In this example, select the **Distress Repair Details** view. When the table opens, right-click and select export to Excel.
- A pop-up window asks whether to include hidden columns. Respond yes.
- Open this report in Excel and unhide all of the columns.
- Use the Excel cut and insert cut functions to rearrange the columns in the table to look like the one in Figure A-23.
  - Keep **Network ID**, **Branch ID**, and **Section ID** columns (B, D, and D) in the report.
  - Move the **Branch Use** column (N) and **Section Rank** column (O) to the right of the **Section ID** column (D).
  - Move the **Age at Inspection** column (AO) and the **Condition** column (AQ) to the right of the **Section Rank** column.

- Hide the **Distress Code** column.
- Move the **Work Qty**, **Work Unit**, **Unit Cost**, and **Work Cost** columns (AV, AW, AY, and AZ) to the right of the **Work Description** column.
- Other columns may be included in the report.
- Delete or hide any unused columns.

* Use the Excel sort capability to sort the report by **Branch Use**, **Section Rank**, then **Branch ID**. This procedure produces a prioritized list of requirements for each year in the plan.
* This prioritized list augments the information in the critical PCI work plan, as outlined in Chapter 7, paragraph A-6 and paragraph A-7.

Figure A-23 Sorted Consequence of Localized Work Plan

NetworkID	BranchID	SectionID	Branch Use	Section Rank	Age at Insp	Condition	Policy	Description	Severity	Distress Unit	Work Description	Work Qty	Work Unit	Unit Cost	Work Cost
Sheppard	RW15C33C	R04A1	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	SMALL PATCH	Low	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A1	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	JT SEAL DMG	Low	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A1	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	CORNER SPALL	Low	Slabs	Crack Sealing - PCC	13.1	Ft	$3.78	$49.61
Sheppard	RW15C33C	R04A1	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	SHRINKAGE CR	N/A	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A1	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	JOINT SPALL	Low	Slabs	Crack Sealing - PCC	31.2	Ft	$3.78	$117.82
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	CORNER SPALL	Low	Slabs	Crack Sealing - PCC	8.2	Ft	$3.78	$31.00
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	JT SEAL DMG	Low	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	JOINT SPALL	Low	Slabs	Crack Sealing - PCC	34.5	Ft	$3.78	$130.22
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	LINEAR CR	Low	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	JOINT SPALL	Medium	Slabs	Patching - PCC Partial Depth	12.9	SqFt	$9.44	$121.93
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	SMALL PATCH	Low	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R04A2	RUNWAY	P	26	95.00	Sheppard_Air_2021_PRV	SHRINKAGE CR	N/A	Slabs	No Localized M & R	0.	SqFt	$0.00	$0.00
Sheppard	RW15C33C	R05C1	RUNWAY	P	16	70.00	Sheppard_Air_2021_STP	L & T CR	Low	Ft	No Localized M & R	0.		$0.00	$0.00
Sheppard	RW15C33C	R05C1	RUNWAY	P	16	70.00	Sheppard_Air_2021_STP	WEATHERING	Low	SqFt	No Localized M & R	0.		$0.00	$0.00
Sheppard	RW15C33C	R05C1	RUNWAY	P	16	70.00	Sheppard_Air_2021_STP	L & T CR	Medium	Ft	No Localized M & R	0.		$0.00	$0.00
Sheppard	RW15C33C	R05C1	RUNWAY	P	16	70.00	Sheppard_Air_2021_STP	PATCHING	Low	SqFt	No Localized M & R	0.		$0.00	$0.00
Sheppard	RW15C33C	R05C1	RUNWAY	P	16	70.00	Sheppard_Air_2021_STP	ALLIGATOR CR	Low	SqFt	No Localized M & R	0.		$0.00	$0.00
Sheppard	RW15C33C	R05C2	RUNWAY	P	16	78.00	Sheppard_Air_2021_PRV	L & T CR	Medium	Ft	Crack Sealing - AC	966.9	Ft	$1.05	$1,015.25
Sheppard	RW15C33C	R05C2	RUNWAY	P	16	78.00	Sheppard_Air_2021_PRV	L & T CR	Low	Ft	No Localized M & R	0.		$0.00	$0.00

A-9 DEVELOPING PAVEMENT MANAGEMENT PLANS.

A-9.1 Objective.

The level of detail in a pavement management plan (PMP) can range from a spreadsheet with a prioritized list of work tasks and projects in each year of the plan to a detailed document that outlines the team composition and development process, including limiting factors, assumptions, and analysis of alternatives. The objective of this UFC is to define the minimum PMP requirement, a prioritized list of work items and projects required to maintain pavements for each year in the next five calendar years.

A-9.2 Background.

A PMP is the end product of a team effort to prioritize and group pavement M&R requirements into executable work tasks and projects, as described in Chapter 8. There are different approaches to developing a PMP. This appendix uses the optimal critical PCI work plan and the consequence of localized work plan described in Chapter 7 and paragraphs A-6 and A-7 as the starting point for the process below.

1. Determine whether the eliminate backlog or condition stabilization work plan is optimal.
2. Export the optimal work plan and the consequence of localized M&R work plan to Excel, retaining all hidden columns.
3. Prioritize requirements in each work plan as described in paragraphs A-6 and A-7.
4. Add columns for the Priority, Risk-Return Category, and Method of Execution to the optimal work plan as described in this appendix and in Chapter 8.
5. Sort the optimal work plan and the consequence of localized work plan as described in this appendix and in Chapter 8 and group requirements into a prioritized list of executable work tasks and projects.
6. The prioritized list of executable work tasks and projects can serve as the PMP, but inputting the required work from the project list into PAVER provides a means of making the PMP development process easier over time.
    a. Enter the work tasks and projects into PAVER using the **Required Work** tool or **Project Planning Wizard**.
    b. Rerun the optimal work plan with the required work and repeat process, as required.
    c. For large installations, enter high-priority projects into PAVER, rerun the work plans, enter medium-priority projects, rerun work plans, etc.
7. Whether the PMP development team uses the PAVER project planning tools or not, the final result is a prioritized list of executable tasks and projects that is approved by leadership, maintained as work is completed, and updated at least annually.

When an installation has both an airfield network and a road and parking network, select an optimal critical PCI work plan for each; do not combine airfield and road and parking networks.

The examples in this appendix use a five-year eliminate backlog work plan for a road and parking network as the optimal critical PCI work plan. These examples do not attempt to address all the scenarios that might arise in developing a PMP, but rather provide guidance on the general process and addresses some common issues that might arise.

A-9.3 Initial Optimal Critical PCI Work Plan View.

The optimal critical PCI work plan used for this example is the eliminate backlog work plan for a road and parking network developed following the same procedure outlined in paragraphs A-6.1 to A-6.6. The result is the initial prioritized list of requirements shown in Figure A-24.

Figure A-24 Critical PCI Work Plan Funding Detail Table (All Sections)

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Work Type	Surface Type - Current	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDFIFTHST	05	2023	ROADWAY	P	Preventive	AC	97.54	97.83	$0.00	$124.20	$0.00	$0.00	$124.20
Keesler	RDFIFTHST	06	2023	ROADWAY	P	Preventive + Global MR	AC	79.54	83.62	$0.00	$197.48	$1,704.61	$0.00	$1,902.09
Keesler	RDFIRST	01	2023	ROADWAY	P	Major Below Critical	AC	45.14	100.00	$0.00	$0.00	$0.00	$190,283.40	$190,283.40
Keesler	RDFIRST	02	2023	ROADWAY	P	Major Below Critical	AC	51.24	100.00	$0.00	$0.00	$0.00	$39,667.24	$39,667.24
Keesler	RDFIRST	03	2023	ROADWAY	P	Major Below Critical	AC	47.44	100.00	$0.00	$0.00	$0.00	$62,236.49	$62,236.49
Keesler	RDFISHER	01	2023	ROADWAY	P	Preventive	AC	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	Preventive	AC	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDFISHER	03	2023	ROADWAY	P	Major Below Critical	AC	49.44	100.00	$0.00	$0.00	$0.00	$71,448.66	$71,448.66
Keesler	RDGENCHAPP	01	2023	ROADWAY	P	Preventive + Global MR	AC	78.84	82.92	$0.00	$722.39	$5,286.04	$0.00	$6,008.43
Keesler	RDGENCHAPP	02	2023	ROADWAY	P	Major Below Critical	AC	58.74	100.00	$0.00	$0.00	$0.00	$74,172.69	$74,172.69
Keesler	RDGENCHAPP	03	2023	ROADWAY	P	Major Below Critical	AC	52.94	100.00	$0.00	$0.00	$0.00	$96,747.59	$96,747.59
Keesler	RDHANGAR	01	2023	ROADWAY	P	Major Below Critical	AC	40.24	100.00	$0.00	$0.00	$0.00	$606,313.00	$606,313.00
Keesler	RDHSTREET	01	2023	ROADWAY	P	Major Below Critical	AC	59.74	100.00	$0.00	$0.00	$0.00	$24,277.94	$24,277.94
Keesler	RDHSTREET	02	2023	ROADWAY	P	Major Below Critical	AC	64.24	100.00	$0.00	$0.00	$0.00	$27,682.46	$27,682.46
Keesler	RDHSTREET	03	2023	ROADWAY	P	Major Below Critical	AC	38.14	100.00	$0.00	$0.00	$0.00	$105,875.24	$105,875.24
Keesler	RDHSTREET	04	2023	ROADWAY	P	Major Below Critical	AC	39.54	100.00	$0.00	$0.00	$0.00	$110,359.76	$110,359.76
Keesler	RDHSTREET	05	2023	ROADWAY	P	Major Below Critical	AC	45.04	100.00	$0.00	$0.00	$0.00	$60,890.96	$60,890.96
Keesler	RDHSTREET	06	2023	ROADWAY	P	Preventive + Global MR	AC	80.34	84.42	$0.00	$769.96	$7,663.26	$0.00	$8,433.22
Keesler	RDJSTREET	01	2023	ROADWAY	P	Major Below Critical	AC	34.84	100.00	$0.00	$0.00	$0.00	$29,773.20	$29,773.20
Keesler	RDJSTREET	02	2023	ROADWAY	P	Preventive	PCC	81.63	81.80	$0.00	$1,094.44	$0.00	$0.00	$1,094.44
Keesler	RDJSTREET	03	2023	ROADWAY	P	Preventive	AC	91.34	91.63	$0.00	$523.98	$0.00	$0.00	$523.98
Keesler	RDJSTREET	04	2023	ROADWAY	P	Preventive	AC	90.64	90.93	$0.00	$18.30	$0.00	$0.00	$18.30
Keesler	RDLARCHER	01	2023	ROADWAY	P	Preventive	AC	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	Preventive	AC	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	Preventive	AC	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	Preventive	AC	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	Preventive	AC	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	Preventive	AC	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64

A-9.4 Add Priority and Risk–Return Category Columns.

Using the prioritized requirements list in Figure A-24, modify the spreadsheet by adding columns as shown in Figure A-25.

- Add an M&R **Priority** column (paragraph 8-6.1).
- Add a **Risk-Return Category** column (paragraph 8-6.4).
- Assign a priority value to each requirement for each year of the work plan based on the branch use and section rank as described in paragraph 8-6.1 and Table 8-1.
- Sort the spreadsheet by **Work Year**, **Priority**, and **Average Condition Before**.
- Use the values in the **Priority** and **Average Condition Before** columns to define a risk - return category for each requirement in each year of the work plan, as described in paragraph 8-6.4 and Figure 8-3.

Figure A-25 Priority and Risk-Return Columns

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk-Return Category	Work Type	Surface Type Current	Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDFIFTHST	05	2023	ROADWAY	P	A	Preventive	AC	1	97.54	97.83	$0.00	$124.20	$0.00	$0.00	$124.20
Keesler	RDFIFTHST	06	2023	ROADWAY	P	A	Preventive + Global MR	AC	1	79.54	83.62	$0.00	$197.48	$1,704.61	$0.00	$1,902.09
Keesler	RDFIRST	01	2023	ROADWAY	P	C	Major Below Critical	AC	1	45.14	100.00	$0.00	$0.00	$0.00	$190,283.40	$190,283.40
Keesler	RDFIRST	02	2023	ROADWAY	P	C	Major Below Critical	AC	1	51.24	100.00	$0.00	$0.00	$0.00	$39,667.24	$39,667.24
Keesler	RDFIRST	03	2023	ROADWAY	P	C	Major Below Critical	AC	1	47.44	100.00	$0.00	$0.00	$0.00	$62,236.49	$62,236.49
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDFISHER	03	2023	ROADWAY	P	A	Major Below Critical	AC	1	49.44	100.00	$0.00	$0.00	$0.00	$71,448.66	$71,448.66
Keesler	RDGENCHAPP	01	2023	ROADWAY	P	A	Preventive + Global MR	AC	1	78.84	82.92	$0.00	$722.39	$5,286.04	$0.00	$6,008.43
Keesler	RDGENCHAPP	02	2023	ROADWAY	P	C	Major Below Critical	AC	1	58.74	100.00	$0.00	$0.00	$0.00	$74,172.69	$74,172.69
Keesler	RDGENCHAPP	03	2023	ROADWAY	P	C	Major Below Critical	AC	1	52.94	100.00	$0.00	$0.00	$0.00	$96,747.59	$96,747.59
Keesler	RDHANGAR	01	2023	ROADWAY	P	C	Major Below Critical	AC	1	40.24	100.00	$0.00	$0.00	$0.00	$606,313.00	$606,313.00
Keesler	RDHSTREET	01	2023	ROADWAY	P	C	Major Below Critical	AC	1	59.74	100.00	$0.00	$0.00	$0.00	$24,277.94	$24,277.94
Keesler	RDHSTREET	02	2023	ROADWAY	P	C	Major Below Critical	AC	1	64.24	100.00	$0.00	$0.00	$0.00	$27,682.46	$27,682.46
Keesler	RDHSTREET	03	2023	ROADWAY	P	E	Major Below Critical	AC	1	38.14	100.00	$0.00	$0.00	$0.00	$105,875.24	$105,875.24
Keesler	RDHSTREET	04	2023	ROADWAY	P	E	Major Below Critical	AC	1	39.54	100.00	$0.00	$0.00	$0.00	$110,359.76	$110,359.76
Keesler	RDHSTREET	05	2023	ROADWAY	P	C	Major Below Critical	AC	1	45.04	100.00	$0.00	$0.00	$0.00	$60,890.96	$60,890.96
Keesler	RDHSTREET	06	2023	ROADWAY	P	A	Preventive + Global MR	AC	1	80.34	84.42	$0.00	$769.96	$7,663.26	$0.00	$8,433.22
Keesler	RDJSTREET	01	2023	ROADWAY	P	E	Major Below Critical	AC	1	34.84	100.00	$0.00	$0.00	$0.00	$29,773.20	$29,773.20
Keesler	RDJSTREET	02	2023	ROADWAY	P	A	Preventive	PCC	1	81.63	81.80	$0.00	$1,094.44	$0.00	$0.00	$1,094.44
Keesler	RDJSTREET	03	2023	ROADWAY	P	A	Preventive	AC	1	91.34	91.63	$0.00	$523.98	$0.00	$0.00	$523.98
Keesler	RDJSTREET	04	2023	ROADWAY	P	A	Preventive	AC	1	90.64	90.93	$0.00	$18.30	$0.00	$0.00	$18.30
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64

A-9.5 Defining Method of Execution.

Using the requirements list in Figure A-25, modify the spreadsheet by adding a column for **Method of Execution**, as shown in Figure A-26.

- Assign a preliminary method of execution for each requirement in each year of the work plan (paragraph 8-7.2). This example assumes the following:
  - In-house work forces have the capability to do localized AC and PCC repairs but do not have the capability to do global preventive M&R.
  - There is an IDIQ contract in place with the capability to do global preventive M&R as well as localized AC and PCC repairs, but it does not have the capability to major M&R such as mill and overlay.
  - Major M&R work will be done by competitive bid or existing multiple award task order contract (MATOC).
- Review the Consequence of Localized M&R Distress Repair Details Report and consider the types and severity of distresses present when determining the method of execution.
  - The consequence of localized M&R work plan is based on the condition of the pavement at the time of the last inspection
  - In Figure A-26, the eliminate backlog work plan called for preventive M&R whereas the consequence of localized M&R work

plan example in Figure A-27 shows no localized M&R because all distresses are low severity.

- Differences like this arise because the eliminate backlog work plan anticipates the condition will deteriorate and preventive M&R will be required.

- In this example, localized preventive M&R is a good option to repair any distresses that progressed to medium severity and global M&R is a good option to address the weathering. **Note:** The work plan had projected preventive and global M&R for RDLARCHER in 2025, but could be changed to 2023 given the high priority and return on investment.

Figure A-26 Method of Execution Column

Network ID	Branch ID	Section ID	Date	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDFISHER	03	2023	ROADWAY	P	A	Major Below Critical	Contract	AC	1	49.44	100.00	$0.00	$0.00	$0.00	$71,448.66	$71,448.66
Keesler	RDGENCHAPP	01	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	78.84	82.92	$0.00	$722.39	$5,286.04	$0.00	$6,008.43
Keesler	RDGENCHAPP	02	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	58.74	100.00	$0.00	$0.00	$0.00	$74,172.69	$74,172.69
Keesler	RDGENCHAPP	03	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	52.94	100.00	$0.00	$0.00	$0.00	$96,747.59	$96,747.59
Keesler	RDHANGAR	01	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	40.24	100.00	$0.00	$0.00	$0.00	$606,313.00	$606,313.00
Keesler	RDHSTREET	01	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	59.74	100.00	$0.00	$0.00	$0.00	$24,277.94	$24,277.94
Keesler	RDHSTREET	02	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	64.24	100.00	$0.00	$0.00	$0.00	$27,682.46	$27,682.46
Keesler	RDHSTREET	03	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	38.14	100.00	$0.00	$0.00	$0.00	$105,875.24	$105,875.24
Keesler	RDHSTREET	04	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	39.54	100.00	$0.00	$0.00	$0.00	$110,359.76	$110,359.76
Keesler	RDHSTREET	05	2023	ROADWAY	P	C	Major Below Critical	Contract	AC	1	45.04	100.00	$0.00	$0.00	$0.00	$60,890.96	$60,890.96
Keesler	RDHSTREET	06	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	80.34	84.42	$0.00	$769.96	$7,663.26	$0.00	$8,433.22
Keesler	RDJSTREET	01	2023	ROADWAY	P	E	Major Below Critical	Contract	AC	1	34.84	100.00	$0.00	$0.00	$0.00	$29,773.20	$29,773.20
Keesler	RDJSTREET	02	2023	ROADWAY	P	A	Preventive	In-House	PCC	1	81.63	81.80	$0.00	$1,094.44	$0.00	$0.00	$1,094.44
Keesler	RDJSTREET	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	91.34	91.63	$0.00	$523.98	$0.00	$0.00	$523.98
Keesler	RDJSTREET	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	90.64	90.93	$0.00	$18.30	$0.00	$0.00	$18.30
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64
Keesler	RDLARCHER	07	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.24	92.53	$0.00	$71.99	$0.00	$0.00	$71.99
Keesler	RDLARCHER	08	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.44	92.73	$0.00	$277.92	$0.00	$0.00	$277.92
Keesler	RDLARCHER	09	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	92.44	92.73	$0.00	$284.11	$0.00	$0.00	$284.11

Figure A-27 Consequence of Localized M&R Example

NetworkID	BranchID	SectionID	Policy	Distress Code	Description	Severity	Distress Qty	Distress Unit	Percent Distress	Work Description
Keesler	RDLARCHER	01	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	60.5	Ft	.15	No Localized M & R
Keesler	RDLARCHER	01	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	41,183.04	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	02	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	86.06	Ft	.2	No Localized M & R
Keesler	RDLARCHER	02	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	42,084.95	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	03	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	45,568.05	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	03	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	60.76	Ft	.13	No Localized M & R
Keesler	RDLARCHER	04	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	23.98	Ft	.07	No Localized M & R
Keesler	RDLARCHER	04	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	34,249.04	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	05	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	29.13	Ft	.07	No Localized M & R
Keesler	RDLARCHER	05	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	43,677.04	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	06	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	32,510.02	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	07	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	9,073.98	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	07	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	20.01	Ft	.22	No Localized M & R
Keesler	RDLARCHER	08	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	35,955.01	SqFt	100.	No Localized M & R
Keesler	RDLARCHER	08	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	57.51	Ft	.16	No Localized M & R
Keesler	RDLARCHER	09	FY2022_AFCEC_RD&PK_PRV	10	L & T CR	Low	40.42	Ft	.11	No Localized M & R
Keesler	RDLARCHER	09	FY2022_AFCEC_RD&PK_PRV	20	WEATHERING	Low	36,755.96	SqFt	100.	No Localized M & R

A-9.6 Aggregating Requirements into Executable Tasks and Projects.

Defining the requirements for an in-house task list or a project can be accomplished using different approaches. The examples in this appendix aggregate requirements into projects by doing a series of sorts on the prioritized requirement list using the **Execution Year**, **Branch ID**, **Section ID**, **Priority**, **Risk-Return Category**, and **Method of Execution** fields to look for logical opportunities to combine requirements. The term view is used to describe the hierarchy used for each sort.

A-9.6.1 Risk Category View of M&R Requirements.

Sort the requirements for the first year of the work plan by **Risk-Return Category**, **Priority**, and **Average Condition Before**, as shown in Figure A-28. This view of the M&R requirements mirrors the hierarchy shown in Figure 8-3 and Table 8-4.

- **Note:** Set the order for **Avg Condition Before** to **Largest to Smallest**.
- Identify high-risk operational (stopgap) M&R requirements in Risk-Return Categories C and E and highlight them to indicate they are a high priority based on risk, as shown in Figure A-29.

Figure A-28 Sorting by Risk Category

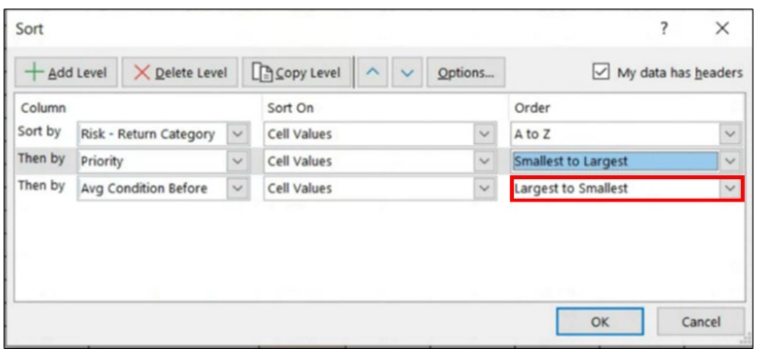


Figure A-29 Risk Category Requirements View

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDASTREET	01	2023	ROADWAY	S	C	Stopgap	In-House	AC	3	41.49	41.49	$4,347.32	$0.00	$0.00	$0.00	$4,347.32
Keesler	RDUNKNOWN3	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	27.49	27.49	$4,275.51	$0.00	$0.00	$0.00	$4,275.51
Keesler	RDGALAXY	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	12.49	12.49	$12,528.14	$0.00	$0.00	$0.00	$12,528.14
Keesler	RDFIFTHST	05	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	97.54	97.83	$0.00	$124.20	$0.00	$0.00	$124.20
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	08	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$277.92	$0.00	$0.00	$277.92
Keesler	RDLARCHER	09	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$284.11	$0.00	$0.00	$284.11
Keesler	RDLARCHER	07	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.24	92.53	$0.00	$71.99	$0.00	$0.00	$71.99
Keesler	RDJSTREET	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	91.34	91.63	$0.00	$523.98	$0.00	$0.00	$523.98
Keesler	RDJSTREET	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	90.64	90.93	$0.00	$18.30	$0.00	$0.00	$18.30
Keesler	RDUNKNOWN4	02	2023	ROADWAY	P	A	Preventive	IDIQ	AC	1	90.64	90.93	$0.00	$29.19	$0.00	$0.00	$29.19
Keesler	RDUNKNOWN3	03	2023	ROADWAY	P	A	Preventive	IDIQ	PCC	1	88.93	89.10	$0.00	$180.90	$0.00	$0.00	$180.90
Keesler	RDTHIRDST	03	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	87.74	91.81	$0.00	$579.63	$9,250.08	$0.00	$9,829.71
Keesler	RDZSTREET	02	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	85.44	89.51	$0.00	$321.65	$4,322.44	$0.00	$4,644.09
Keesler	RDZSTREET	01	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	84.34	88.41	$0.00	$705.34	$8,812.87	$0.00	$9,518.21
Keesler	RDTHIRDST	04	2023	ROADWAY	P	A	Preventive + Global MR	IDIQ	AC	1	84.14	88.22	$0.00	$250.60	$3,091.63	$0.00	$3,342.22

A-9.6.2 Adjusting Method of Execution by Branch.

Using the requirements list in Figure A-29, re-sort it to compare the method of execution for all requirements in each section for each year in the plan, as shown in Figure A-30. **Note:** The M&R priority for the branches in this example are low and work on these pavements have a low return on investment. This choice is intentional to demonstrate the same process applies to all pavements, from highest to lowest risk and return.

- Sort requirements for year one by branch and section to identify opportunities to use the same execution method (see paragraph 8-7.3) for each branch.
- Review the Consequence of Localized M&R Distress Repair Details Report and consider the types and severity of distresses present when determining changes to the method of execution
- In the example in Figure A-30, Branch PA00222 has work performed in-house and other work by IDIQ. Since the assumption is the IDIQ can handle both localized and global, update the method of execution for all to IDIQ as shown.
- Many decisions require engineering judgement. For example, Branch PA0308 in Figure A-30 has one section with execution by IDIQ and the rest in-house. Given that only one section was identified for global, postpone the global for that one section and use in-house work forces to execute all stop gap and preventive repairs for this branch.
- Repeat the process for all branches in each year of the PMP.

Figure A-30 Defining Method of Execution for a Branch

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	PA00222	01	2023	PARKING	S	D	Preventive	In-House	AC	7	92.70	92.91	$0.00	$104.21	$0.00	$0.00	$104.21
Keesler	PA00222	02	2023	PARKING	S	I	Stopgap	In-House	PCC	7	30.74	30.74	$4,235.54	$0.00	$0.00	$0.00	$4,235.54
Keesler	PA00222	03	2023	PARKING	S	D	Preventive + Global MR	IDIQ	AC	7	83.00	86.88	$0.00	$154.83	$1,782.41	$0.00	$1,937.24
Keesler	PA00223	01	2023	PARKING	S	G	Preventive	In-House	AC	7	62.60	62.80	$0.00	$3,926.17	$0.00	$0.00	$3,926.17
Keesler	PA00223	02	2023	PARKING	S	G	Preventive	In-House	AC	7	60.11	60.22	$0.00	$6,795.25	$0.00	$0.00	$6,795.25
Keesler	PA00237	01	2023	PARKING	P	B	Preventive	In-House	AC	4	91.01	91.22	$0.00	$23.74	$0.00	$0.00	$23.74
Keesler	PA00237	02	2023	PARKING	P	B	Preventive	In-House	AC	4	90.11	90.32	$0.00	$62.09	$0.00	$0.00	$62.09
Keesler	PA00237	03	2023	PARKING	P	F	Stopgap	In-House	PCC	4	47.65	47.65	$30,610.65	$0.00	$0.00	$0.00	$30,610.65
Keesler	PA00237	04	2023	PARKING	P	B	Preventive	In-House	PCC	4	83.71	84.11	$0.00	$1,458.19	$0.00	$0.00	$1,458.19
Keesler	PA00308	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	31.90	31.90	$2,961.33	$0.00	$0.00	$0.00	$2,961.33
Keesler	PA00308	03	2023	PARKING	S	G	Stopgap	In-House	AC	7	49.20	49.20	$1,903.17	$0.00	$0.00	$0.00	$1,903.17
Keesler	PA00308	05	2023	PARKING	S	G	Stopgap	In-House	AC	7	53.80	53.80	$1,634.78	$0.00	$0.00	$0.00	$1,634.78
Keesler	PA00308	06	2023	PARKING	S	G	Preventive + Global MR	IDIQ	AC	7	69.40	73.28	$0.00	$1,339.40	$2,519.62	$0.00	$3,859.02
Keesler	PA00308	07	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.10	50.10	$1,310.88	$0.00	$0.00	$0.00	$1,310.88
Keesler	PA00308	08	2023	PARKING	S	G	Preventive	In-House	AC	7	55.10	55.30	$0.00	$6,482.38	$0.00	$0.00	$6,482.38
Keesler	PA00308	09	2023	PARKING	S	G	Stopgap	In-House	AC	7	51.90	51.90	$1,468.86	$0.00	$0.00	$0.00	$1,468.86
Keesler	PA00404	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	34.60	34.60	$7,244.38	$0.00	$0.00	$0.00	$7,244.38
Keesler	PA00408	01	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.60	50.60	$758.90	$0.00	$0.00	$0.00	$758.90
Keesler	PA00408	02	2023	PARKING	S	D	Preventive	In-House	PCC	7	81.74	81.90	$0.00	$2,626.56	$0.00	$0.00	$2,626.56
Keesler	PA00412	01	2023	PARKING	S	D	Preventive	In-House	AC	7	97.90	98.10	$0.00	$15.84	$0.00	$0.00	$15.84
Keesler	PA00413	01	2023	PARKING	S	D	Preventive	In-House	PCC	7	80.94	81.10	$0.00	$249.16	$0.00	$0.00	$249.16
Keesler	PA00420	01	2023	PARKING	S	D	Preventive	In-House	AC	7	97.90	98.10	$0.00	$31.82	$0.00	$0.00	$31.82
Keesler	PA00422	01	2023	PARKING	S	G	Preventive	In-House	PCC	7	64.14	64.30	$0.00	$613.61	$0.00	$0.00	$613.61
Keesler	PA00470	01	2023	PARKING	S	D	Preventive	In-House	AC	7	91.60	91.80	$0.00	$362.74	$0.00	$0.00	$362.74

Figure A-31 Updated Method of Execution

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	PA00222	01	2023	PARKING	S	D	Preventive	IDIQ	AC	7	92.70	92.91	$0.00	$104.21	$0.00	$0.00	$104.21
Keesler	PA00222	02	2023	PARKING	S	I	Stopgap	IDIQ	PCC	7	30.74	30.74	$4,235.54	$0.00	$0.00	$0.00	$4,235.54
Keesler	PA00222	03	2023	PARKING	S	D	Preventive + Global MR	IDIQ	AC	7	83.00	86.88	$0.00	$154.83	$1,782.41	$0.00	$1,937.24
Keesler	PA00223	01	2023	PARKING	S	G	Preventive	In-House	AC	7	62.60	62.80	$0.00	$3,926.17	$0.00	$0.00	$3,926.17
Keesler	PA00223	02	2023	PARKING	S	G	Preventive	In-House	AC	7	60.11	60.22	$0.00	$6,795.25	$0.00	$0.00	$6,795.25
Keesler	PA00308	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	31.90	31.90	$2,961.33	$0.00	$0.00	$0.00	$2,961.33
Keesler	PA00308	03	2023	PARKING	S	G	Stopgap	In-House	AC	7	49.20	49.20	$1,903.17	$0.00	$0.00	$0.00	$1,903.17
Keesler	PA00308	05	2023	PARKING	S	G	Stopgap	In-House	AC	7	53.80	53.80	$1,634.78	$0.00	$0.00	$0.00	$1,634.78
Keesler	PA00308	06	2023	PARKING	S	G	Preventive + Global MR	In-House	AC	7	69.40	73.28	$0.00	$1,339.40	$2,519.62	$0.00	$3,859.02
Keesler	PA00308	07	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.10	50.10	$1,310.88	$0.00	$0.00	$0.00	$1,310.88
Keesler	PA00308	08	2023	PARKING	S	G	Preventive	In-House	AC	7	55.10	55.30	$0.00	$6,482.38	$0.00	$0.00	$6,482.38
Keesler	PA00308	09	2023	PARKING	S	G	Stopgap	In-House	AC	7	51.90	51.90	$1,468.86	$0.00	$0.00	$0.00	$1,468.86
Keesler	PA00404	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	34.60	34.60	$7,244.38	$0.00	$0.00	$0.00	$7,244.38
Keesler	PA00408	01	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.60	50.60	$758.90	$0.00	$0.00	$0.00	$758.90
Keesler	PA00408	02	2023	PARKING	S	D	Preventive	In-House	PCC	7	81.74	81.90	$0.00	$2,626.56	$0.00	$0.00	$2,626.56
Keesler	PA00412	01	2023	PARKING	S	D	Preventive	In-House	AC	7	97.90	98.10	$0.00	$15.84	$0.00	$0.00	$15.84
Keesler	PA00413	01	2023	PARKING	S	D	Preventive	In-House	PCC	7	80.94	81.10	$0.00	$249.16	$0.00	$0.00	$249.16
Keesler	PA00420	01	2023	PARKING	S	D	Preventive	In-House	AC	7	97.90	98.10	$0.00	$31.82	$0.00	$0.00	$31.82
Keesler	PA00422	01	2023	PARKING	S	G	Preventive	In-House	PCC	7	64.14	64.30	$0.00	$613.61	$0.00	$0.00	$613.61
Keesler	PA00470	01	2023	PARKING	S	D	Preventive	IDIQ	AC	7	91.60	91.80	$0.00	$362.74	$0.00	$0.00	$362.74
Keesler	PA00470	02	2023	PARKING	S	G	Preventive + Global MR	IDIQ	AC	7	66.80	70.68	$0.00	$1,384.71	$1,254.21	$0.00	$2,638.92
Keesler	PA00470	03	2023	PARKING	S	D	Preventive + Global MR	IDIQ	AC	7	83.00	86.88	$0.00	$31.11	$358.20	$0.00	$389.32
Keesler	PA00470	04	2023	PARKING	S	G	Stopgap	IDIQ	AC	7	49.20	49.20	$3,183.90	$0.00	$0.00	$0.00	$3,183.90
Keesler	PA00470	05	2023	PARKING	S	D	Preventive	IDIQ	AC	7	92.70	92.91	$0.00	$24.64	$0.00	$0.00	$24.64

A-9.6.3 Adjust Year of Execution.

Using the requirements list in Figure A-31, re-sort it to compare the year of execution for all requirements in each section for each year in the plan, as shown in Figure A-32. **Note:** The M&R priority for the branches in this example are low and work on these pavements have a low return on investment. This choice is intentional to demonstrate the same process applies to all pavements, from highest to lowest risk and return.

- Sort by branch and section and investigate opportunities to adjust the year of execution (see paragraph 8-7.3).
- In the example in Figure A-32, Major M&R is scheduled for Branch PA00308 in different years in the respective sections within the branch. It would be more cost-effective to do one M&R project for all sections in the branch.
- In this example, most sections are scheduled in 2024, so change all to 2024 and adjust the other years for each section, as required.
- Consider the types and severity of distresses present in the Consequence of Localized M&R Distress Repair Details Report to define work types and determine changes to the year of execution.
- In this example, the Consequence of Localized M&R Report indicates that there is a large quantity of medium-severity climate-related distresses, so a two-inch mill and overlay is a good repair option.
- Repeat the process for all sections in each year of the PMP.

Figure A-32 Adjust Year of Execution

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	PA00308	01	2023	PARKING	S	I	Stopgap	In-House	AC	7	31.90	31.90	$2,961.33	$0.00	$0.00	$0.00	$2,961.33
Keesler	PA00308	01	2024	PARKING	S	I	Stopgap	In-House	AC	7	30.06	30.06	$3,172.41	$0.00	$0.00	$0.00	$3,172.41
Keesler	PA00308	01	2025	PARKING	S	I	Stopgap	In-House	AC	7	28.22	28.22	$3,571.62	$0.00	$0.00	$0.00	$3,571.62
Keesler	PA00308	01	2026	PARKING	S	I	Major Below Critical	Contract	AC	7	26.38	100.00	$0.00	$0.00	$0.00	$49,565.80	$49,565.80
Keesler	PA00308	01	2027	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$16.55	$0.00	$0.00	$16.55
Keesler	PA00308	03	2023	PARKING	S	G	Stopgap	In-House	AC	7	49.20	49.20	$1,903.17	$0.00	$0.00	$0.00	$1,903.17
Keesler	PA00308	03	2024	PARKING	S	G	Stopgap	In-House	AC	7	47.36	47.36	$2,024.12	$0.00	$0.00	$0.00	$2,024.12
Keesler	PA00308	03	2025	PARKING	S	G	Major Below Critical	Contract	AC	7	45.52	100.00	$0.00	$0.00	$0.00	$36,715.34	$36,715.34
Keesler	PA00308	03	2026	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$20.43	$0.00	$0.00	$20.43
Keesler	PA00308	03	2027	PARKING	S	D	Preventive	In-House	AC	7	96.53	96.73	$0.00	$38.63	$0.00	$0.00	$38.63
Keesler	PA00308	05	2023	PARKING	S	G	Stopgap	In-House	AC	7	53.80	53.80	$1,634.78	$0.00	$0.00	$0.00	$1,634.78
Keesler	PA00308	05	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	51.96	100.00	$0.00	$0.00	$0.00	$17,225.61	$17,225.61
Keesler	PA00308	05	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$20.86	$0.00	$0.00	$20.86
Keesler	PA00308	05	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$39.55	$0.00	$0.00	$39.55
Keesler	PA00308	05	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$58.14	$0.00	$0.00	$58.14
Keesler	PA00308	06	2023	PARKING	S	G	Preventive + Global MR	In-House	AC	7	69.40	73.28	$0.00	$1,339.40	$2,519.62	$0.00	$3,859.02
Keesler	PA00308	06	2024	PARKING	S	D	Preventive	In-House	AC	7	71.44	71.64	$0.00	$898.63	$0.00	$0.00	$898.63
Keesler	PA00308	06	2025	PARKING	S	G	Preventive	In-House	AC	7	69.80	70.00	$0.00	$1,117.49	$0.00	$0.00	$1,117.49
Keesler	PA00308	06	2026	PARKING	S	G	Preventive	In-House	AC	7	68.16	68.36	$0.00	$2,027.35	$0.00	$0.00	$2,027.35
Keesler	PA00308	06	2027	PARKING	S	G	Preventive	In-House	AC	7	66.52	66.72	$0.00	$2,937.10	$0.00	$0.00	$2,937.10
Keesler	PA00308	07	2023	PARKING	S	G	Stopgap	In-House	AC	7	50.10	50.10	$1,310.88	$0.00	$0.00	$0.00	$1,310.88
Keesler	PA00308	07	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	48.26	100.00	$0.00	$0.00	$0.00	$17,470.96	$17,470.96
Keesler	PA00308	07	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$14.52	$0.00	$0.00	$14.52
Keesler	PA00308	07	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$27.53	$0.00	$0.00	$27.53
Keesler	PA00308	07	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$40.47	$0.00	$0.00	$40.47
Keesler	PA00308	08	2023	PARKING	S	G	Preventive	In-House	AC	7	55.10	55.30	$0.00	$6,482.38	$0.00	$0.00	$6,482.38
Keesler	PA00308	08	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	53.46	100.00	$0.00	$0.00	$0.00	$12,192.43	$12,192.43
Keesler	PA00308	08	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$14.77	$0.00	$0.00	$14.77
Keesler	PA00308	08	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$28.00	$0.00	$0.00	$28.00
Keesler	PA00308	08	2027	PARKING	S	D	Preventive	In-House	AC	7	94.88	95.08	$0.00	$41.15	$0.00	$0.00	$41.15
Keesler	PA00308	09	2023	PARKING	S	G	Stopgap	In-House	AC	7	51.90	51.90	$1,468.86	$0.00	$0.00	$0.00	$1,468.86
Keesler	PA00308	09	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	50.06	100.00	$0.00	$0.00	$0.00	$14,357.25	$14,357.25
Keesler	PA00308	09	2025	PARKING	S	D	Preventive	In-House	AC	7	98.16	98.36	$0.00	$17.39	$0.00	$0.00	$17.39
Keesler	PA00308	09	2026	PARKING	S	D	Preventive	In-House	AC	7	96.52	96.72	$0.00	$32.97	$0.00	$0.00	$32.97

A-9.6.4 Create In-House Work Plan.

Using the requirements list in Figure A-32, re-sort it to generate an in-house work plan, as shown in Figure A-33.

- Sort the list by **Work Year**, **Execution Method**, **M&R Priority**, **Risk-Return Category**, **Branch ID**, and **Section ID**.
- Move any sections with High risk and Low ROI to the top of the list. The remainder of the list is in M&R priority order, with the highest priority on localized and global preventive M&R.
- Review each section identified for in-house execution in the critical PCI work plan. Combine these M&R requirements in an in-house work plan. Review and update the plan at least annually.
- Use the Consequence of Localized M&R Distress Repair Details Report to determine the specific work types required for each section and use the optimal critical PCI work plan to make decisions about risk, return, and timing of repairs.
- For example, Figure A-34 shows the predominant distresses are load related and that PAVER has the section scheduled for Major M&R in 2024. Given the nature of the distresses, reconstruction is the likely M&R option. Is investing in full depth repairs in 2023 essential from a safety perspective when the pavement will be reconstructed in 2024 or should the Major M&R be moved to 2023?
- Execute any requirements that exceed in-house work capacity or capability with IDIQ or competitive bid contracts.

A-9.6.5 Create a Contract Project Plan.

Use the same procedure outlined above to create a contract project plan with a list of projects with execution method.

- Review each section identified for contract execution in the critical PCI work plan. Combine these M&R requirements in a contract project plan. Review and update the plan at least annually.
- Use the Consequence of Localized M&R Distress Repair Details Report to determine the specific work types required for each section and use the optimal critical PCI work plan to make decisions about risk, return, and timing of repairs.
- Repeat the process for all sections in each year of the PMP.

Figure A-33 In-House Work Plan

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	RDASTREET	01	2023	ROADWAY	S	C	Stopgap	In-House	AC	3	41.49	41.49	$4,347.32	$0.00	$0.00	$0.00	$4,347.32
Keesler	RDGALAXY	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	12.49	12.49	$12,528.14	$0.00	$0.00	$0.00	$12,528.14
Keesler	RDUNKNOWN3	01	2023	ROADWAY	S	E	Stopgap	In-House	AC	3	27.49	27.49	$4,275.51	$0.00	$0.00	$0.00	$4,275.51
Keesler	RDFISHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.04	95.33	$0.00	$144.90	$0.00	$0.00	$144.90
Keesler	RDFISHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	95.54	95.83	$0.00	$168.42	$0.00	$0.00	$168.42
Keesler	RDLARCHER	01	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$318.33	$0.00	$0.00	$318.33
Keesler	RDLARCHER	02	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$325.30	$0.00	$0.00	$325.30
Keesler	RDLARCHER	03	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$347.56	$0.00	$0.00	$347.56
Keesler	RDLARCHER	04	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$261.23	$0.00	$0.00	$261.23
Keesler	RDLARCHER	05	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.54	92.83	$0.00	$333.14	$0.00	$0.00	$333.14
Keesler	RDLARCHER	06	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.64	92.93	$0.00	$244.64	$0.00	$0.00	$244.64
Keesler	RDLARCHER	07	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.24	92.53	$0.00	$71.99	$0.00	$0.00	$71.99
Keesler	RDLARCHER	08	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$277.92	$0.00	$0.00	$277.92
Keesler	RDLARCHER	09	2023	ROADWAY	P	A	Preventive	In-House	AC	1	92.44	92.73	$0.00	$284.11	$0.00	$0.00	$284.11
Keesler	RD5022	01	2023	ROADWAY	S	C	Preventive	In-House	PCC	3	68.52	68.64	$0.00	$961.09	$0.00	$0.00	$961.09
Keesler	RDBAUGHMAN	01	2023	ROADWAY	S	C	Preventive	In-House	AC	3	59.59	59.76	$0.00	$2,663.40	$0.00	$0.00	$2,663.40
Keesler	RDBAUGHMAN	02	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.89	93.06	$0.00	$44.83	$0.00	$0.00	$44.83
Keesler	RDPARADELN	01	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.89	93.06	$0.00	$354.95	$0.00	$0.00	$354.95
Keesler	RDTINGLE	01	2023	ROADWAY	S	A	Preventive	In-House	AC	3	92.79	92.96	$0.00	$139.34	$0.00	$0.00	$139.34
Keesler	RDTSTREET	01	2023	ROADWAY	S	C	Preventive	In-House	AC	3	55.89	56.05	$0.00	$12,432.39	$0.00	$0.00	$12,432.39
Keesler	PA00237	01	2023	PARKING	P	B	Preventive	In-House	AC	4	91.01	91.22	$0.00	$23.74	$0.00	$0.00	$23.74
Keesler	PA00237	02	2023	PARKING	P	B	Preventive	In-House	AC	4	90.11	90.32	$0.00	$62.09	$0.00	$0.00	$62.09
Keesler	PA00237	03	2023	PARKING	P	F	Stopgap	In-House	PCC	4	47.65	47.65	$30,610.65	$0.00	$0.00	$0.00	$30,610.65
Keesler	PA00237	04	2023	PARKING	P	B	Preventive	In-House	PCC	4	83.71	84.11	$0.00	$1,458.19	$0.00	$0.00	$1,458.19

Figure A-34 In-House Work Determination

Network ID	Branch ID	Section ID	Policy	Distress Code	Description	Severity	Distress Qty	Distress Unit	Percent Distress	Work Description	Work Qty	Work Unit	Unit Cost	Work Cost
Keesler	RDGALAXY	01	FY2022_AFCEC_RD&PK_STP	1	ALLIGATOR CR	Medium	9,552.11	SqFt	97.5	No Localized M & R	0.		$0.00	$0.00
Keesler	RDGALAXY	01	FY2022_AFCEC_RD&PK_STP	20	WEATHERING	High	9,796.99	SqFt	100.	No Localized M & R	0.		$0.00	$0.00
Keesler	RDGALAXY	01	FY2022_AFCEC_RD&PK_STP	1	ALLIGATOR CR	High	244.88	SqFt	2.5	Patching - AC Deep	312.2	SqFt	$15.30	$4,772.30

Network ID	Branch ID	Section ID	Avg Of Condition Before	Avg Of Condition After	Work Year	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded
Keesler	RDGALAXY	01	12.49	12.49	2023	$12,528.14	$0.00	$0.00	$0.00
Keesler	RDGALAXY	01	10.82	100.00	2024	$0.00	$0.00	$0.00	$55,056.25
Keesler	RDGALAXY	01	98.33	98.49	2025	$0.00	$16.75	$0.00	$0.00
Keesler	RDGALAXY	01	96.82	96.98	2026	$0.00	$31.86	$0.00	$0.00
Keesler	RDGALAXY	01	95.31	95.47	2027	$0.00	$46.96	$0.00	$0.00

A-9.7 Using PAVER Required Work to Develop a PMP.

The previous sections demonstrated how to export work plans to Excel and use them to develop a PMP consisting of an in-house work plan and contract project plan. The PAVER Project Formulation Wizard or Required Projects tool can be used to identify required Global and Major M&R work and incorporate these projects into the prioritized critical PCI work plan.

A-9.7.1 Required Projects Tool.

This tool builds projects that include localized, global, or major M&R using a step-by-step process.

- Create a project.
- Define the sections in the project.
- Define the project-level work required.
- Define any section-level work required.
- Review work items.

A-9.7.2 Project Formulation Wizard.

This tool builds global and major M&R projects using a step-by-step process similar to the Required Projects tool but handles localized M&R differently and breaks out the steps in the process in a more sequential manner than the Required Projects tool.

- Create a project.
- Define the project-level work required.
- Define Pre-Application Localized M&R Policy.
- Define the sections in the project.
- Refine section selection set engineering field parameters.
- Define section selection set age and condition parameters.
- Define distress ranges.
- Review and refine sections using the map or query tool.
- Verify selected sections.
- Review work items.

A-9.7.3 Required Projects Tool Example.

The Required Projects tool example in the following sections uses the information in the modified critical PCI work plan and consequence of localized M&R work plan developed in previous sections as a starting place. Use the tool to filter down to the specific sections identified in the work plan, then use the consequence of localized M&R work plan to identify the specific work types to include in the project.

A-9.7.3.1 Selecting Sections in The Project.

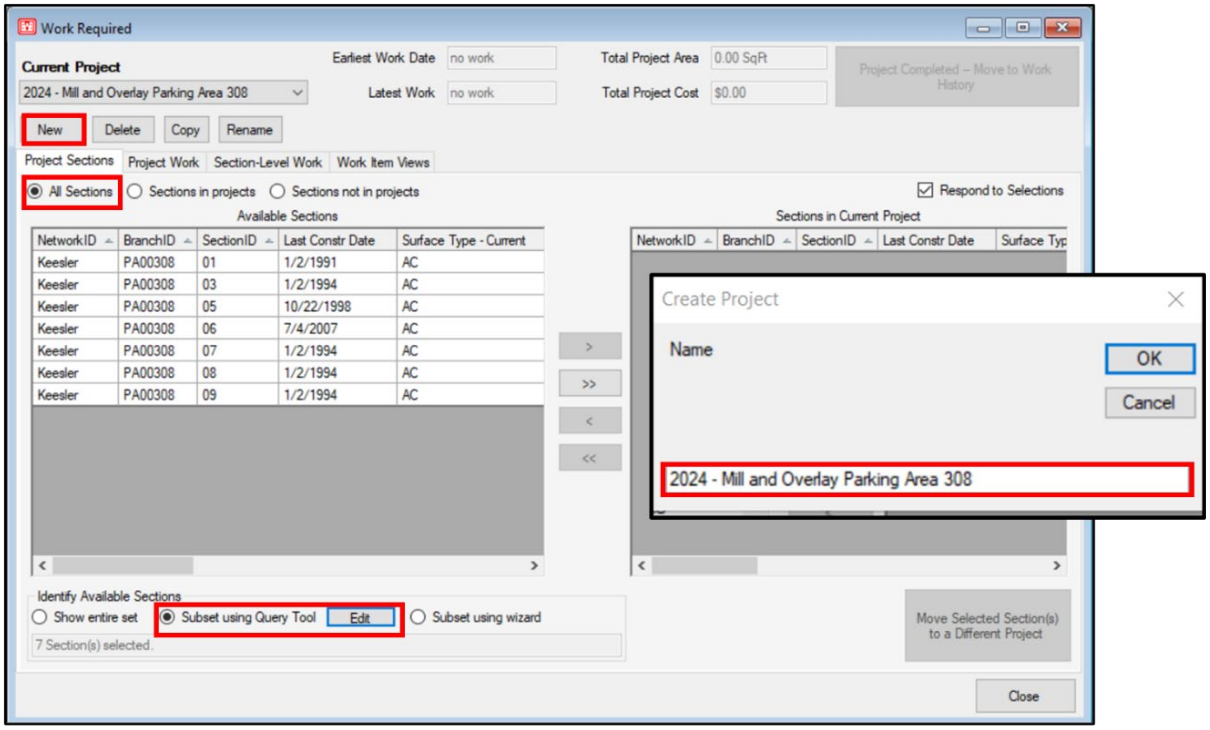
From the PAVER **Work** drop-down menu, select **Required Projects**. This opens the **Work Required** form shown in Figure A-36.

- There are several options to select sections for a project. The user can filter sections in a manner similar to the work plan sorting procedures described or select specific branches and sections based on the critical PCI work plan.
- This example demonstrates how to build a project for a specific branch. It is based on the 2024 Major M&R project in the critical PCI work plan for the Building 308 parking area from Figure A-32 and shown in Figure A-35.
- Select **New** to create a new project. Provide a descriptive name with the year of execution. For this example, use “2024 – Mill and Overlay Parking Area 308,” as shown in Figure A-36.
- Select the **All Sections** option then select **Subset using Query Tool**.
- Select **Branches** on the **Query Tool** form then select **Branch ID** from the field drop-down menu, equal to “PA00308” from the **Comparison** drop-down menu.
- This filters the list down to all sections in the PA00308 branch, as shown in the left grid in Figure A-36.
- Select the double arrows **>>** to move all sections to the **Sections in Current Project** grid on the right side of the form.
- Section 06 only requires preventive M&R and is not included in the mill and overlay project. Remove it from the **Sections in Current Project** grid by highlighting it and selecting the **<** arrow to move it back to the **Available Sections** grid.

Figure A-35 PA00308 Major M&R Project

Network ID	Branch ID	Section ID	Work Year	Branch Use	Section Rank	Risk - Return Category	Work Type	Method of Execution	Surface Type - Current	M&R Priority	Avg Condition Before	Avg Condition After	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical Funded	Total
Keesler	PA00308	01	2024	PARKING	S	I	Major Below Critical	Contract	AC	7	26.38	100.00	$0.00	$0.00	$0.00	$49,565.80	$49,565.80
Keesler	PA00308	03	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	45.52	100.00	$0.00	$0.00	$0.00	$36,715.34	$36,715.34
Keesler	PA00308	05	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	51.96	100.00	$0.00	$0.00	$0.00	$17,225.61	$17,225.61
Keesler	PA00308	07	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	48.26	100.00	$0.00	$0.00	$0.00	$17,470.96	$17,470.96
Keesler	PA00308	08	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	53.46	100.00	$0.00	$0.00	$0.00	$12,192.43	$12,192.43
Keesler	PA00308	09	2024	PARKING	S	G	Major Below Critical	Contract	AC	7	50.06	100.00	$0.00	$0.00	$0.00	$14,357.25	$14,357.25

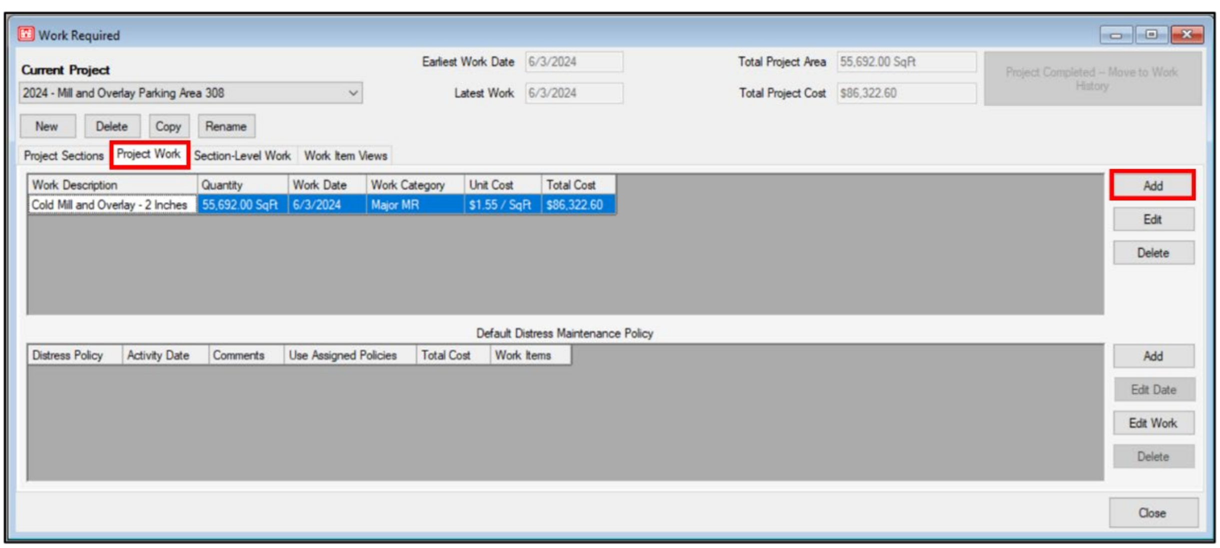
Figure A-36 Select Sections Example



A-9.7.3.2 Project Work.

After reviewing the condition and distresses in the consequence of localized work plan, a two-inch mill and overlay was selected as the best M&R option. Add this work type by selecting the **Project Work** tab, shown in Figure A-37.

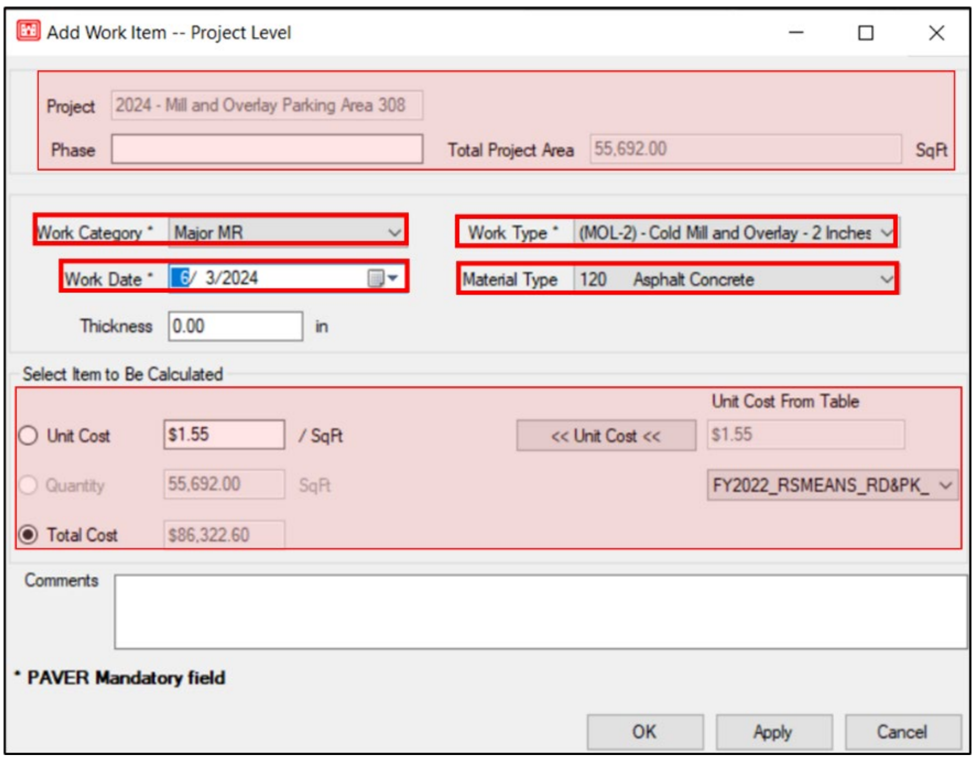
Figure A-37 Project Work Tab



- Select the **Add** button on the **Work Required** form above to open the **Add Work Item – Project Level** form shown in Figure A-38.

- The area highlighted at the top of the **Add Work Item – Project Level** form shows the **Project** name is already populated, the **Phase** field is optional, and the **Total Project Area** is populated and is the sum of the area of all sections in the project.
- Select the **Work Category** from the drop-down, then select the **Work Type**, the **Work Date** (projected date of execution), and **Material Type**.
- In this case, leave **Thickness** set to 0.00 since 2 inches of asphalt is milled and 2 inches is replaced.
- The lower portion of the form highlighted in red is for the project cost. The user can pull the unit cost from the cost by work type table for Major M&R, enter a unit cost manually, or enter the total cost of the project. In this example, the cost is coming from the FY2022_RSMEANS_RD&PK_Major cost by work type for table Major M&R.

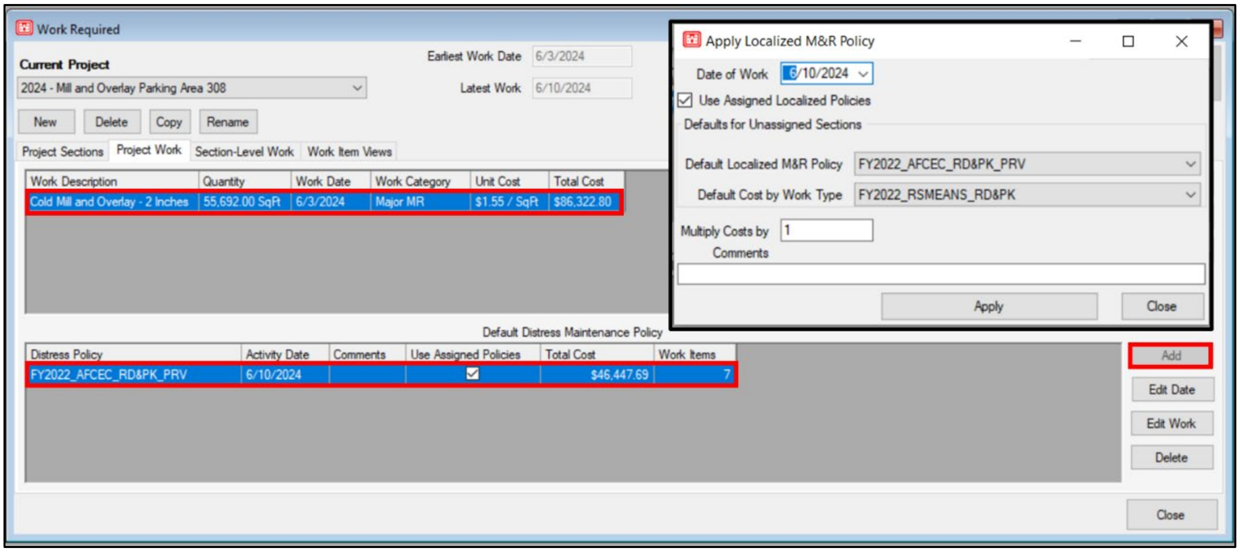
Figure A-38 Add Work Item – Project Level Form



- Select **OK** at the bottom of the **Add Work Item – Project Level** form above to close the form. The project is added to the **Project Work** tab shown in Figure A-39.
- The lower portion of the **Project Work** tab in Figure A-39 allows the user to apply localized M&R policies to the project. This is typically used when planning localized preventive or operational repair projects or when including localized work as part of a Major or global M&R project. In this case, some crack sealing and full-depth patching is appropriate after milling and prior to the overlay.

- Select **Add** to open the **Apply Localized M&R Policy** form. All sections have assigned localized M&R policies, so just select a **Date of Work** after the project start and select **Apply** to add the localized M&R work to the project, as shown in Figure A-39.

Figure A-39 Add Distress M&R Policy – Project Work Tab Cost



- **Note:** The cost of the project in Figure A-35 was higher than the estimated cost in the **Project Work** tab form in Figure A-39. The cost in Figure A-35 was based on the cost by condition tables and not associated with a specific work type. The cost in Figure A-39 was based on cost by work type. There will also be instances when the cost by condition estimates are lower than the cost by work type averages.
- Select the **Section-Level Work** tab.

A-9.7.3.3 Section-Level Work.

The **Section-Level Work** tab allows the user to review, add, edit, or delete any work item in the project on a section-by-section basis.

- The example in Figure A-40 includes Section 06. Based on the critical PCI work plan and the consequence of localized work plan, this section does not require an overlay, just crack sealing.
- Select the **Cold Mill and Overlay – 2 Inches** line item in the **Work Items for Sections** field and select **Delete**.
- Field work indicates that a patch/utility cut that was identified as low severity in the last inspection has deteriorated and will require replacement in 2024.
- Select the **Add** button to open the **Add Work Item** form and add a new work item, as shown in Figure A-41.
    - Work Category: Localized MR

- Work Date: 6/10/2024
- Thickness: 0.00 in.
- Work Type: Patching – AC Deep
- Material Type: Asphalt Concrete
- Use the unit cost from Localized Cost by Work Type table.
- Enter the quantity.
- Select **OK**.

Figure A-40 Section Work Types and Quantities

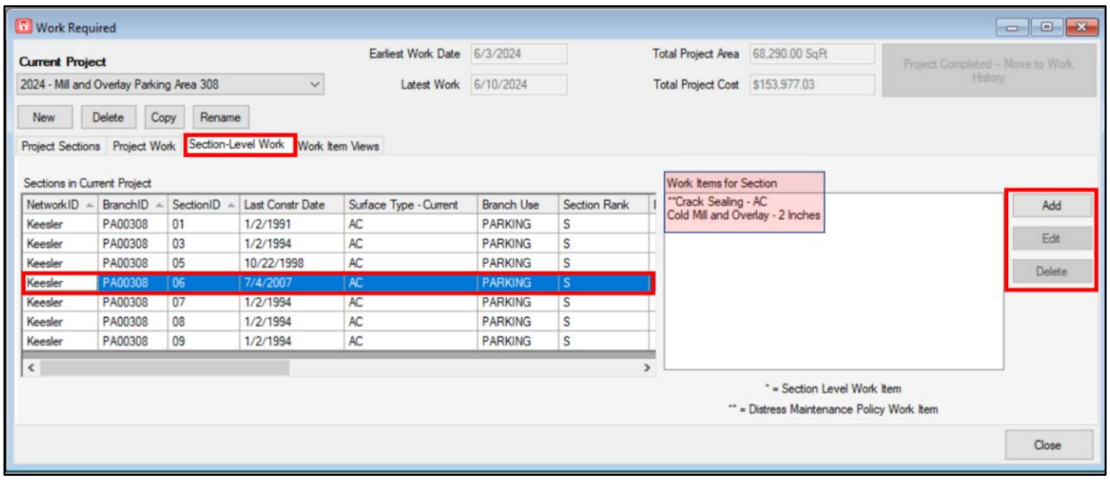
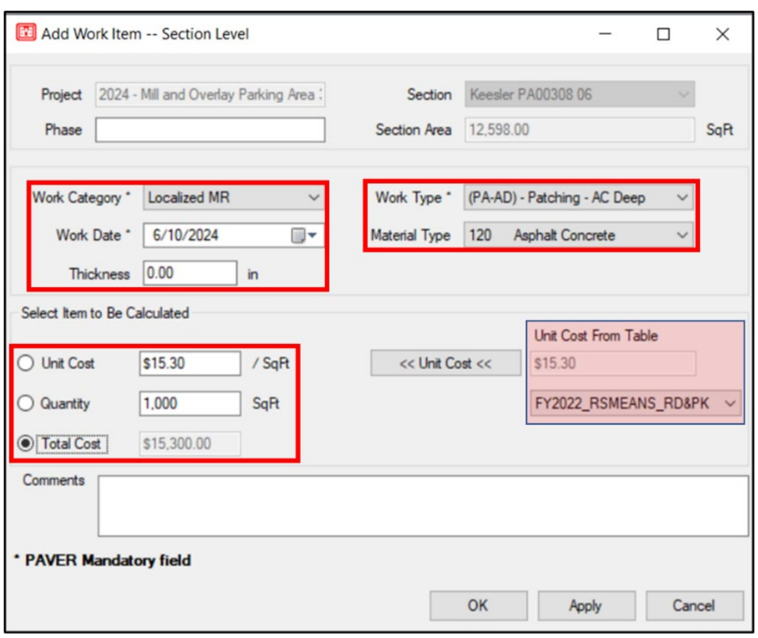


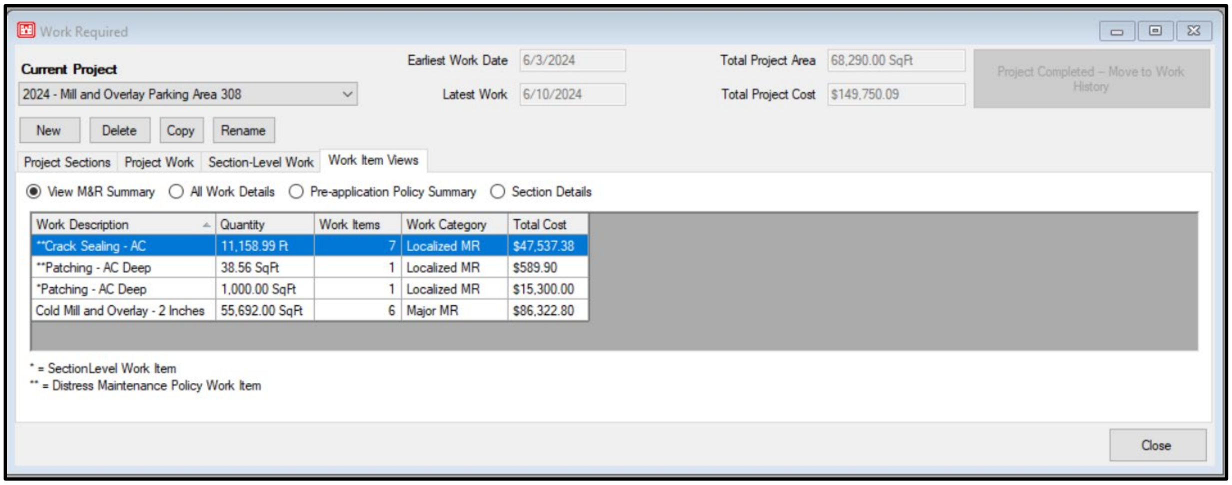
Figure A-41 Section Work Types and Quantities



A-9.7.3.4 Work Item Views.

The **Work Item Views** tab provides summary and detail-level views of the work items in the project, describing the sections included in the project, work types, quantities, and costs.

Figure A-42 View Project and Section Item Summary



A-9.7.4 Project Formulation Wizard Example.

The Required Projects Tool example in the following sections uses the information in the modified critical PCI work plan and consequence of localized M&R work plan developed in previous sections as a starting place. Use the tool to filter down to the specific sections identified in the work plan, then use the consequence of localized M&R work plan to identify the specific work types to include in the project.

A-9.7.4.1 Define Project-Level Work.

Select the **Project Formulation Wizard** icon on the tool bar. This opens the **Project Formulation Wizard** form shown in Figure A-43.

- Enter the **Project Name**. This example is a 2023 global M&R project for roads.
- Select **Add Work** to open the **Add Work Item** form shown in Figure A-44.
  - Work Category: Global MR
  - Work Date: 8/1/2023
  - Thickness: 0.50 in.
  - Work Type: Surface Treatment – Cape Seal
  - The Global M&R cost table did not have a cost for cape seals but based local costs are $0.31 per square foot.

- Select **OK** to add the work item.

Figure A-43 Global M&R Example

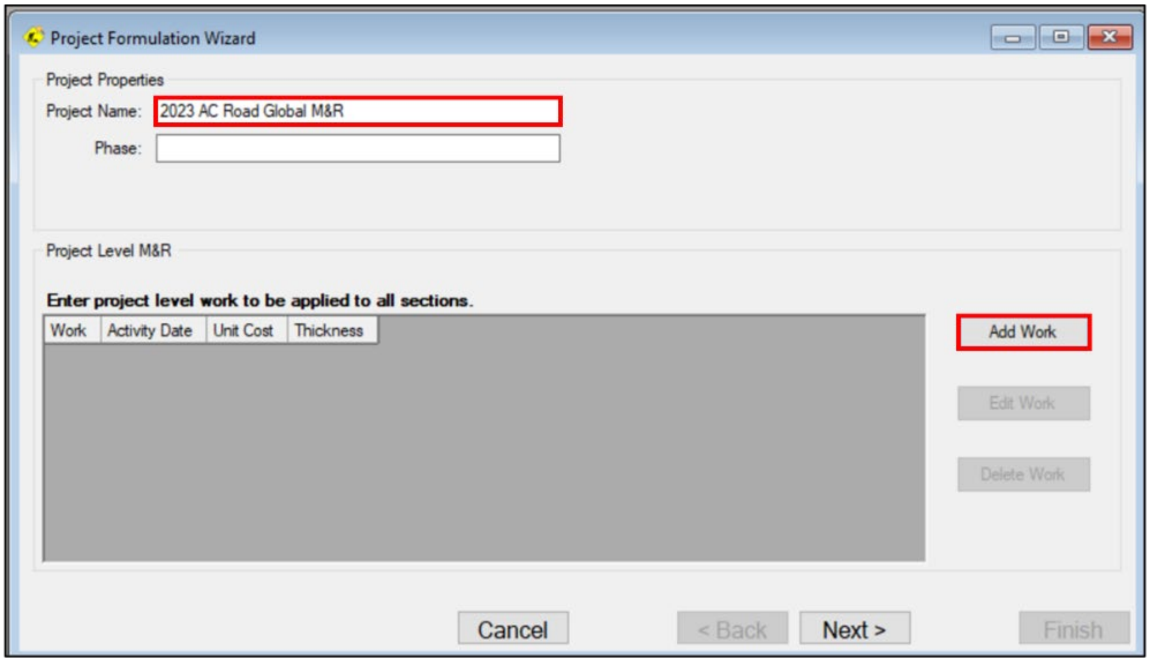
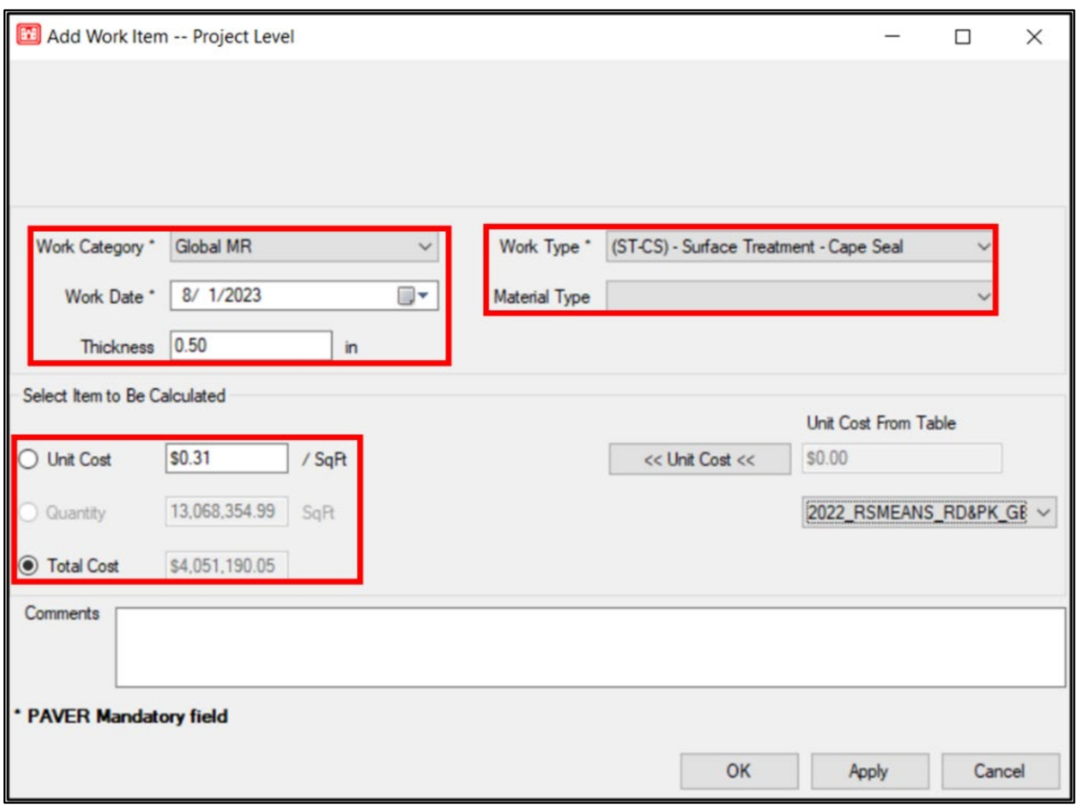


Figure A-44 Define Project-Level Work

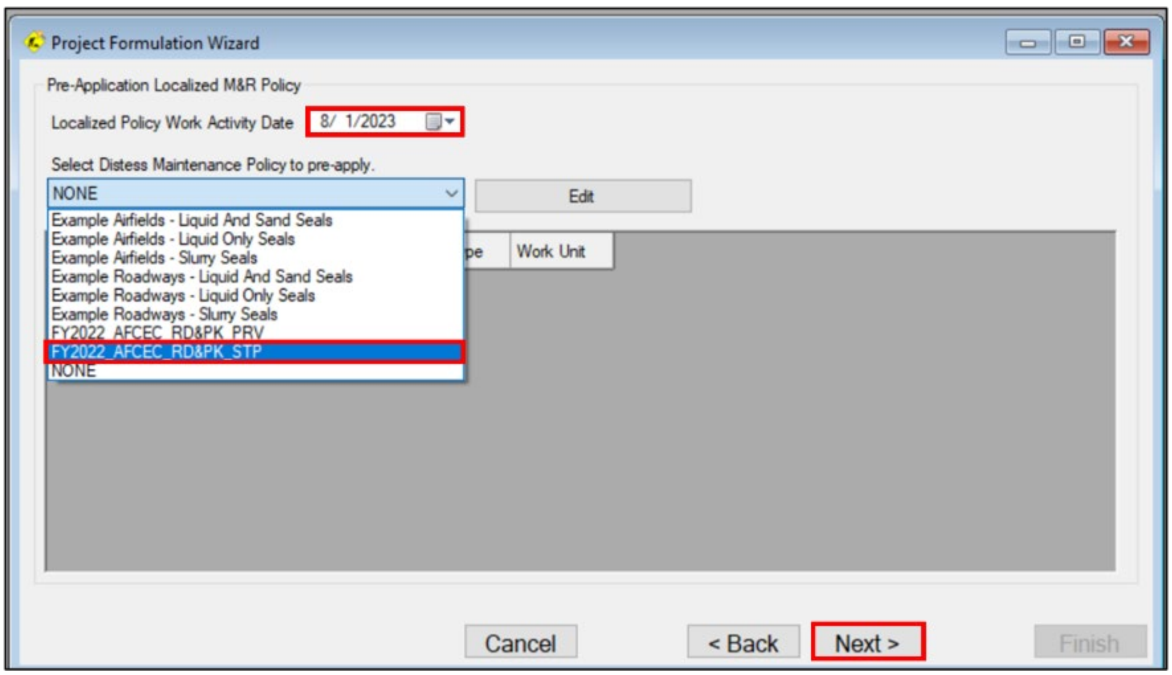


A-9.7.4.2 Pre-Application Localized M&R Policy.

Prior to applying the cape seal in this example, localized repairs are required to address some distresses.

- Select **Next >** on the **Project Formulation Wizard** form shown in Figure A-43 to open the form shown in Figure A-45.
- The **Localized Policy Work Activity Date** is the same as the project date.
- PAVER provides example policies that can be used, but for this example, select the stopgap M&R policy to repair any high-severity distresses before placing the cape seal. Review and edit the policy if required for this particular application.
- Select **Next >**.

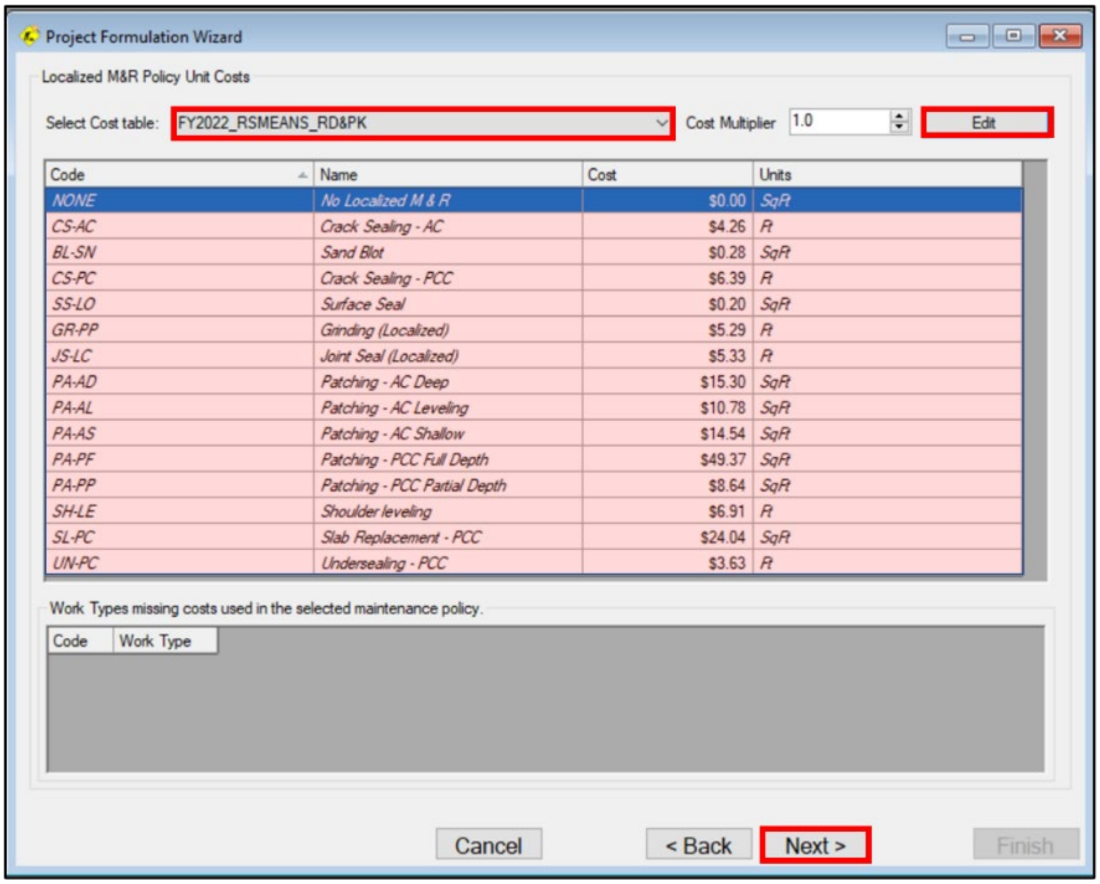
Figure A-45 Pre-Application Localized M&R Policy



A-9.7.4.3 Pre-Application Localized M&R Policy Unit Costs.

- Use the Localized M&R Policy Unit costs defined for the Localized M&R Family.
- PAVER will display any work types missing unit cost in the lower window of the form in Figure A-46. Select **Edit** to update unit costs, if required.
- Select **Next >**.

Figure A-46 Add Work Item – Project Level Form

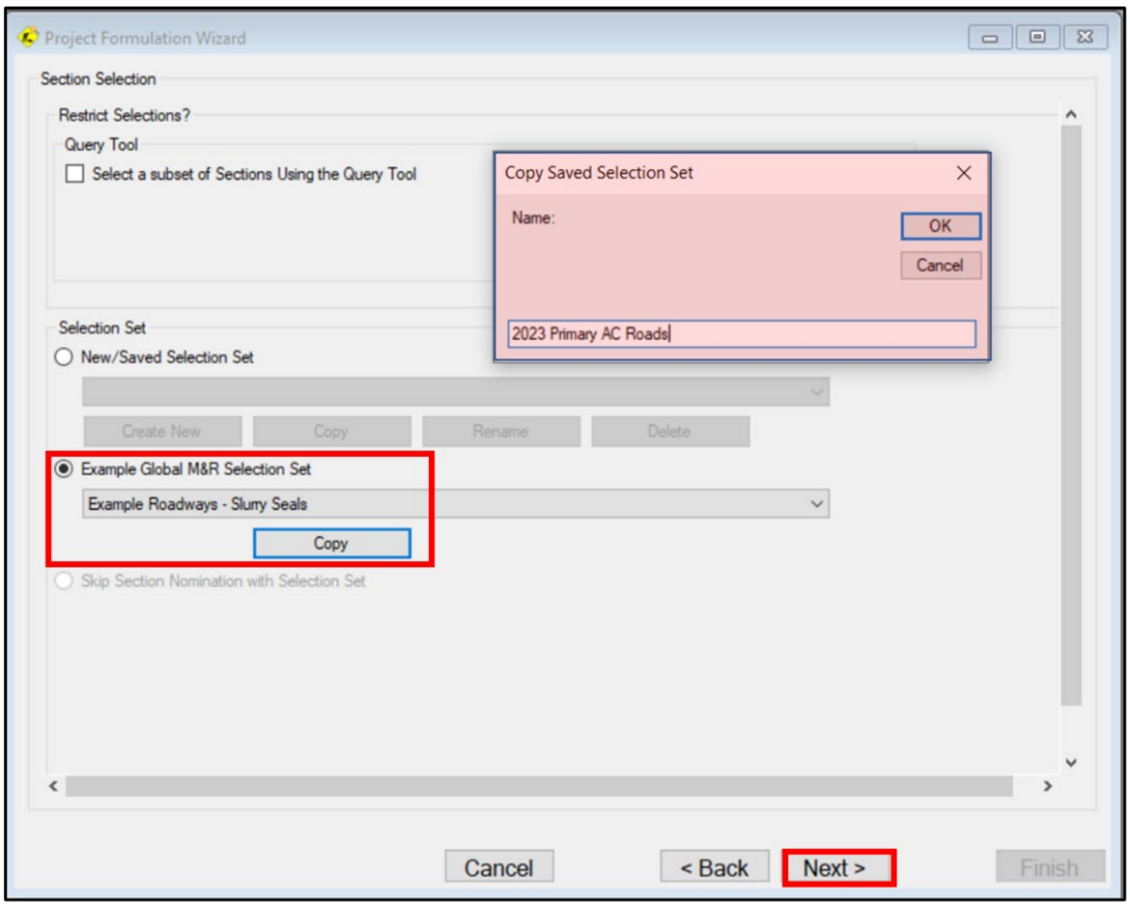


A-9.7.4.4 Define Sections in the Project.

The **Project Formulation Wizard** gives the user several options to determine the section included in a project, including the query tool used in the Required Work example, defining a new selection set, or using an example global M&R selection set to define a new selection set, which is the approach used in this example.

- Highlight the **Example Global M&R Selection Set** radio button and select **Example Roadways – Slurry Seals** from the drop-down, then select **Copy** as shown in Figure A-47.
- Give the copy of the example a new name: 2023 Primary AC Roads.
- Select **Next >**.

Figure A-47 Add Distress M&R Policy – Project Work Tab Cost

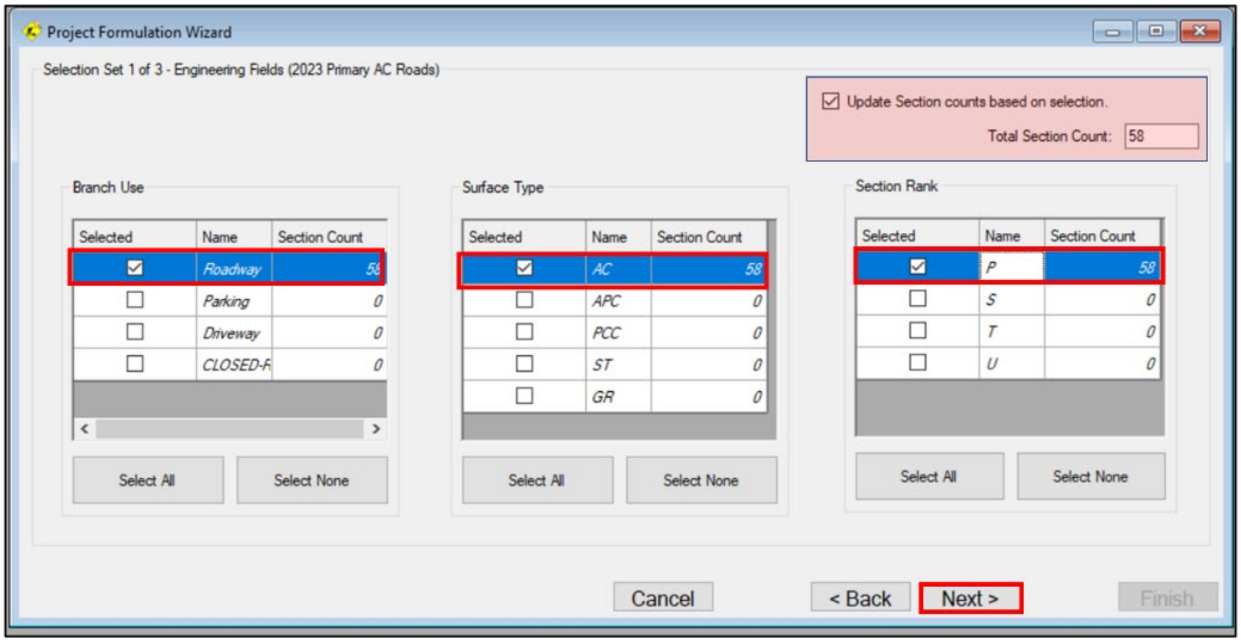


A-9.7.4.5 Selection Set - Engineering Field Parameters.

Filter the sections included in the project by checking the appropriate box for the Engineering Fields parameters, as shown in Figure A-48.

- Check the boxes for **Branch Use**: **Roadway**, **Surface Type**: **AC**, and **Section Rank**: **P**.
- The number of sections is shown in the upper-right corner of the form.
- Select **Next >**.

Figure A-48 Selection Set Engineering Field Parameters Example

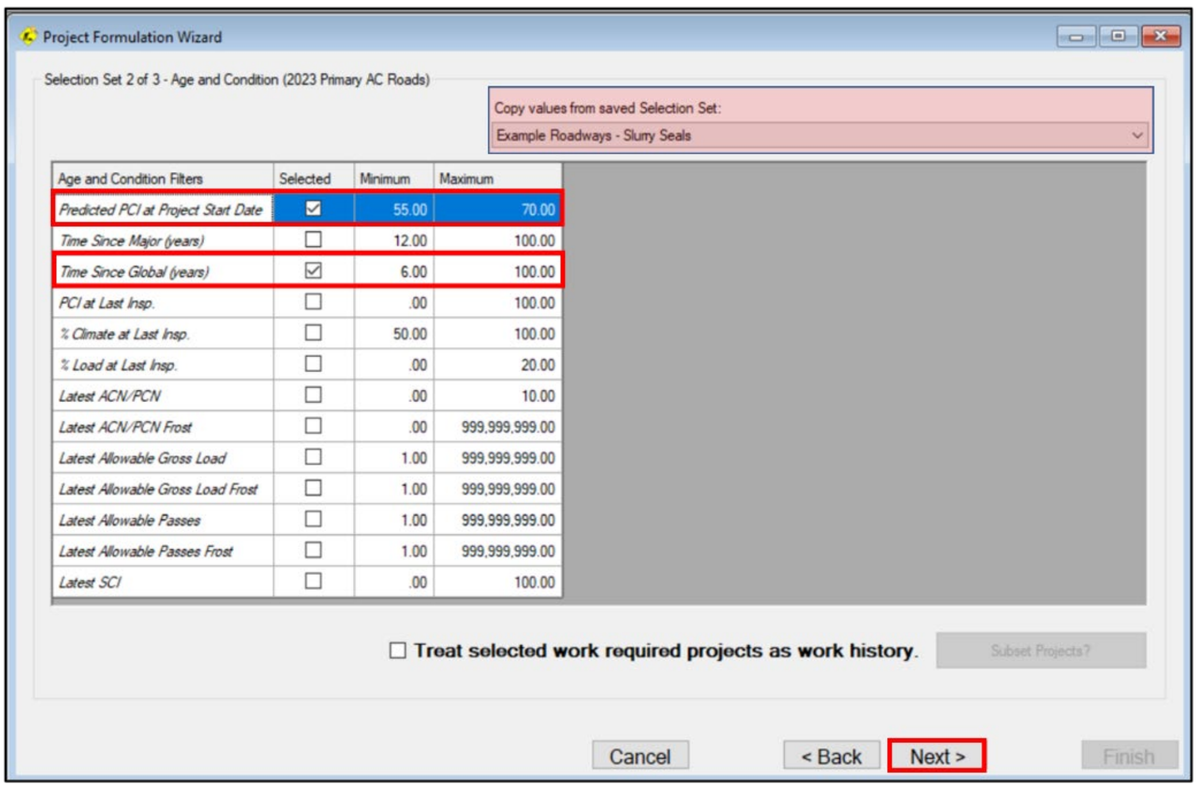


A-9.7.4.6 Selection Set – Age and Condition Parameters.

The **Selection Set - Age and Condition** parameters form opens with a standard list of parameters. The user selects the parameters for the project by checking the boxes and then setting the minimum and maximum values, as shown in Figure A-49.

- This example includes sections with a predicted PCI between 70 and 55 that have not had a global M&R application within the last six years.
- Users can save selection sets at the end of the process and reuse the parameters in future projects, as shown in the upper-right corner of the form in Figure A-49.
- Select **Next >**.

Figure A-49 Selection Set Age and Condition Parameters Example

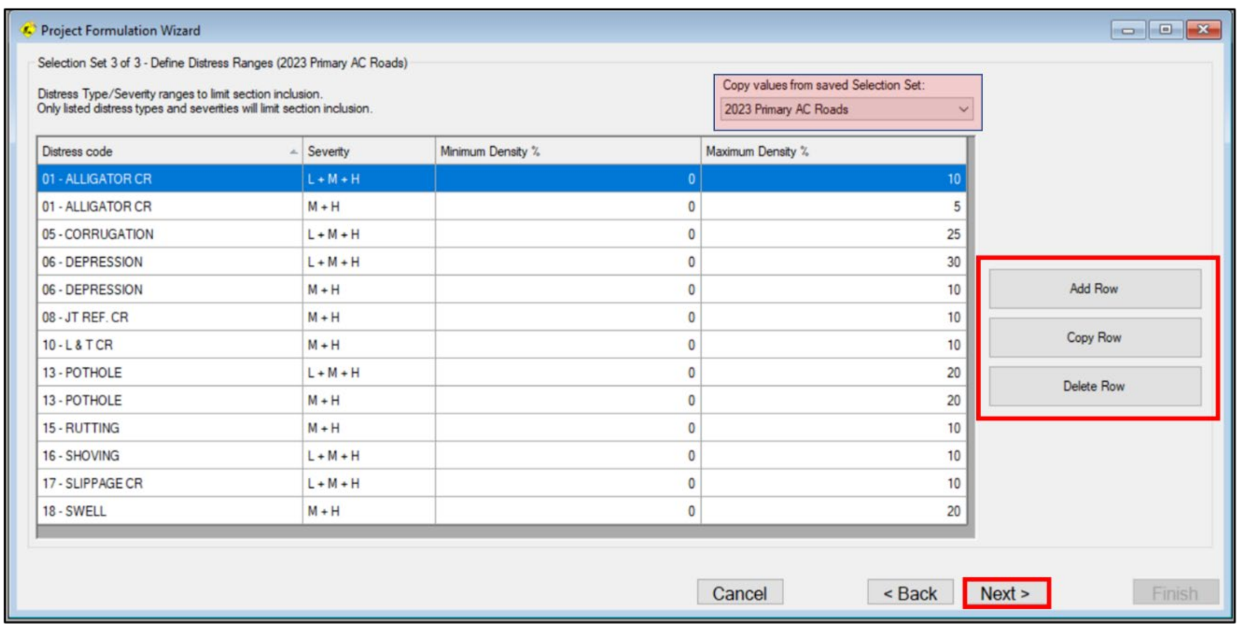


A-9.7.4.7 Selection Set – Distress Ranges.

The **Selection Set** - **Define Distress Ranges** form opens with the standard list of parameters shown in Figure A-50. The user defines the density ranges by editing the minimum and maximum density values. For example, when a section has high-severity alligator distress density above 5 percent, it would not be a good candidate for a surface treatment.

- Select **Add Row**, **Copy Row**, or **Delete Row** to tailor the parameters.
- Users can save selection sets at the end of the process and reuse the parameters in future projects, as shown in the upper-right corner of the form in Figure A-50.
- Select **Next >**.
- At the prompt to **Save Changes**, select **Yes**.

Figure A-50 View Project and Section Item Summary

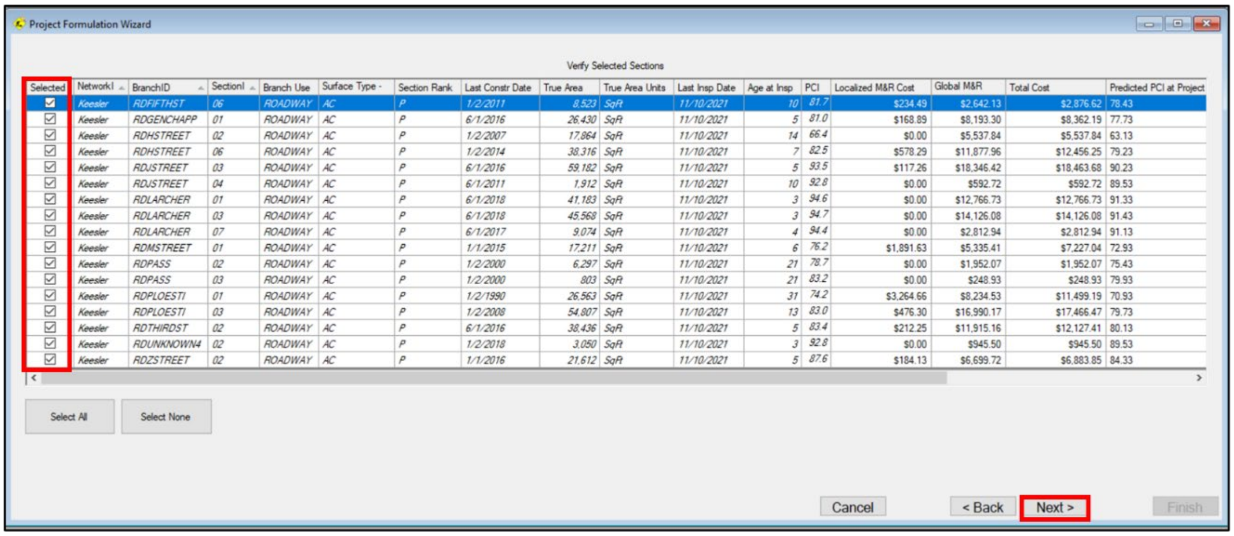


A-9.7.4.8 Review and Refine Sections in Project.

The preceding steps performed the same function, selecting sections for the project as the query tool did in the Required Projects tool example.

- PAVER generates a map view of the sections based on the selection set parameters. The user can deselect a section or add a section by clicking on it in the map.
- Select **Next >**.
- PAVER generates a list view of the sections, as shown in Figure A-51, that meet the selection set parameters. Remove sections from the project by unchecking the boxes in the left-hand column.
- Select **Next >**.

Figure A-51 Project Formulation Wizard - Verify Selected Sections



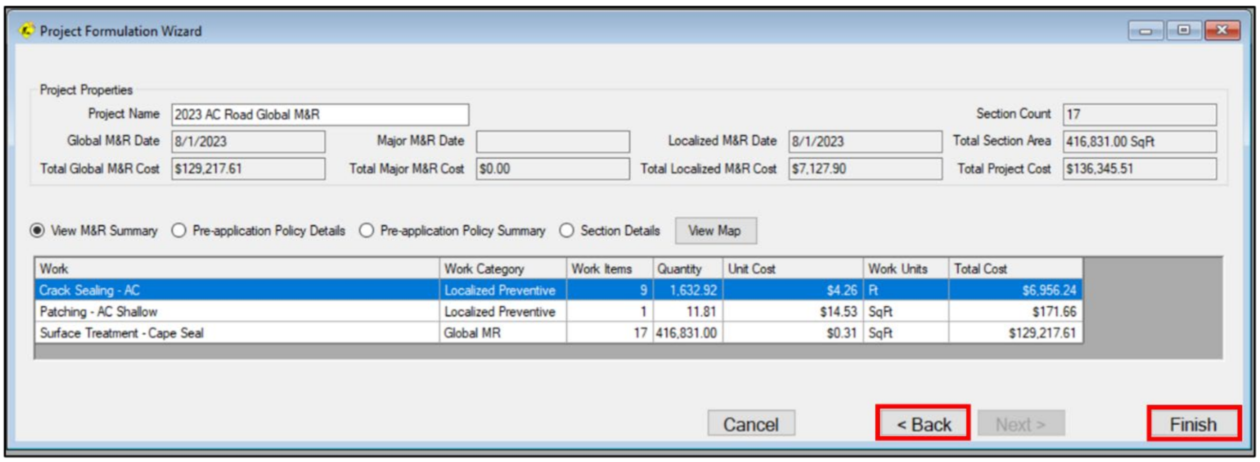
Selected	NetworkI	BranchID	SectionI	Branch Use	Surface Type	Section Rank	Last Constr Date	True Area	True Area Units	Last Insp Date	Age at Insp	PCI	Localized M&R Cost	Global M&R	Total Cost	Predicted PCI at Project
☑	Keesler	RDFIFTHST	06	ROADWAY	AC	P	1/2/2011	8,523	SqFt	11/10/2021	10	81.7	$234.49	$2,642.13	$2,876.62	78.43
☑	Keesler	RDGENCHAPP	01	ROADWAY	AC	P	6/1/2016	26,430	SqFt	11/10/2021	5	81.0	$168.89	$8,193.30	$8,362.19	77.73
☑	Keesler	RDHSTREET	02	ROADWAY	AC	P	1/2/2007	17,864	SqFt	11/10/2021	14	66.4	$0.00	$5,537.84	$5,537.84	63.13
☑	Keesler	RDHSTREET	06	ROADWAY	AC	P	1/2/2014	38,316	SqFt	11/10/2021	7	82.5	$578.29	$11,877.96	$12,456.25	79.23
☑	Keesler	RDJSTREET	03	ROADWAY	AC	P	6/1/2016	59,182	SqFt	11/10/2021	5	93.5	$117.26	$18,346.42	$18,463.68	90.23
☑	Keesler	RDJSTREET	04	ROADWAY	AC	P	6/1/2011	1,912	SqFt	11/10/2021	10	92.8	$0.00	$592.72	$592.72	89.53
☑	Keesler	RDLARCHER	01	ROADWAY	AC	P	6/1/2018	41,183	SqFt	11/10/2021	3	94.6	$0.00	$12,766.73	$12,766.73	91.33
☑	Keesler	RDLARCHER	03	ROADWAY	AC	P	6/1/2018	45,568	SqFt	11/10/2021	3	94.7	$0.00	$14,126.08	$14,126.08	91.43
☑	Keesler	RDLARCHER	07	ROADWAY	AC	P	6/1/2017	9,074	SqFt	11/10/2021	4	94.4	$0.00	$2,812.94	$2,812.94	91.13
☑	Keesler	RDMSTREET	01	ROADWAY	AC	P	1/1/2015	17,211	SqFt	11/10/2021	6	76.2	$1,891.63	$5,335.41	$7,227.04	72.93
☑	Keesler	RDPASS	02	ROADWAY	AC	P	1/2/2000	6,297	SqFt	11/10/2021	21	78.7	$0.00	$1,952.07	$1,952.07	75.43
☑	Keesler	RDPASS	03	ROADWAY	AC	P	1/2/2000	803	SqFt	11/10/2021	21	83.2	$0.00	$248.93	$248.93	79.93
☑	Keesler	RDPLOESTI	01	ROADWAY	AC	P	1/2/1990	26,563	SqFt	11/10/2021	31	74.2	$3,264.66	$8,234.53	$11,499.19	70.93
☑	Keesler	RDPLOESTI	03	ROADWAY	AC	P	1/2/2008	54,807	SqFt	11/10/2021	13	83.0	$476.30	$16,990.17	$17,466.47	79.73
☑	Keesler	RDTHIRDST	02	ROADWAY	AC	P	6/1/2016	38,436	SqFt	11/10/2021	5	83.4	$212.25	$11,915.16	$12,127.41	80.13
☑	Keesler	RDUNKNOWN4	02	ROADWAY	AC	P	1/2/2018	3,050	SqFt	11/10/2021	3	92.8	$0.00	$945.50	$945.50	89.53
☑	Keesler	RDZSTREET	02	ROADWAY	AC	P	1/1/2016	21,612	SqFt	11/10/2021	5	87.6	$184.13	$6,699.72	$6,883.85	84.33

A-9.7.4.9 Review Project Information.

The final step in the **Project Formulation Wizard** process is reviewing the project information.

- This tab provides summary and detail-level views of the work items in the project describing the sections included in the project, work types, quantities, and costs.
- Select the **< Back** button to review or revise project parameters.
- Select the **Finish** button to complete the project creation.
- The user receives a message that the required project was created.
- The user can select the button to create another project or select **Close**.

Figure A-52 Project Formulation Wizard – Project Properties

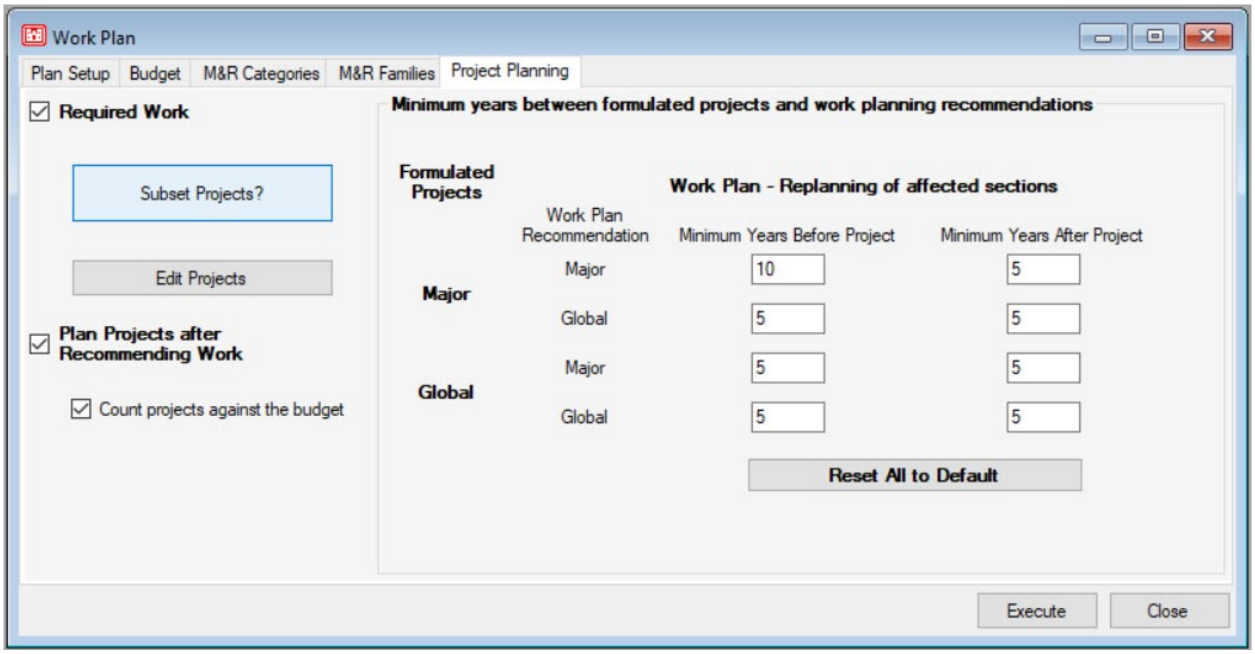


A-9.8 Project Planning.

Once the projects are generated, rerun the work plan. This can be an iterative process, run work plan, plan projects, rerun work plan, plan projects, etc.

- When rerunning the work plan, go to the **Project Planning** tab and select the checkboxes for **Required Work**, **Plan Projects after Recommending Work**, and **Count projects against the budget**, as shown in Figure A-53.
- The window for **Minimum years between formulated projects and work planning recommendations** sets the parameters PAVER uses to determine new work requirements after Major or Global M&R is performed.
- The default settings are generally acceptable but can vary based on environment. For example, the Global period is shorter for an installation that has a significant snow removal requirement.

Figure A-53 Project Planning Tab



A-9.9 Pavement Management Plan Example.

The minimum PMP is an approved list of in-house pavement M&R tasks and contract projects using the processes described in previous sections. As stated previously, the Services can augment this guidance with requirements for the specific PMP content, format, or approval process.

While the approved list of in-house pavement M&R tasks and contract projects is the core requirement, incorporating additional PMP documentation provides needed information to the approval authority and those who will implement and update the PMP.

A-9.9.3 PMP Outline.

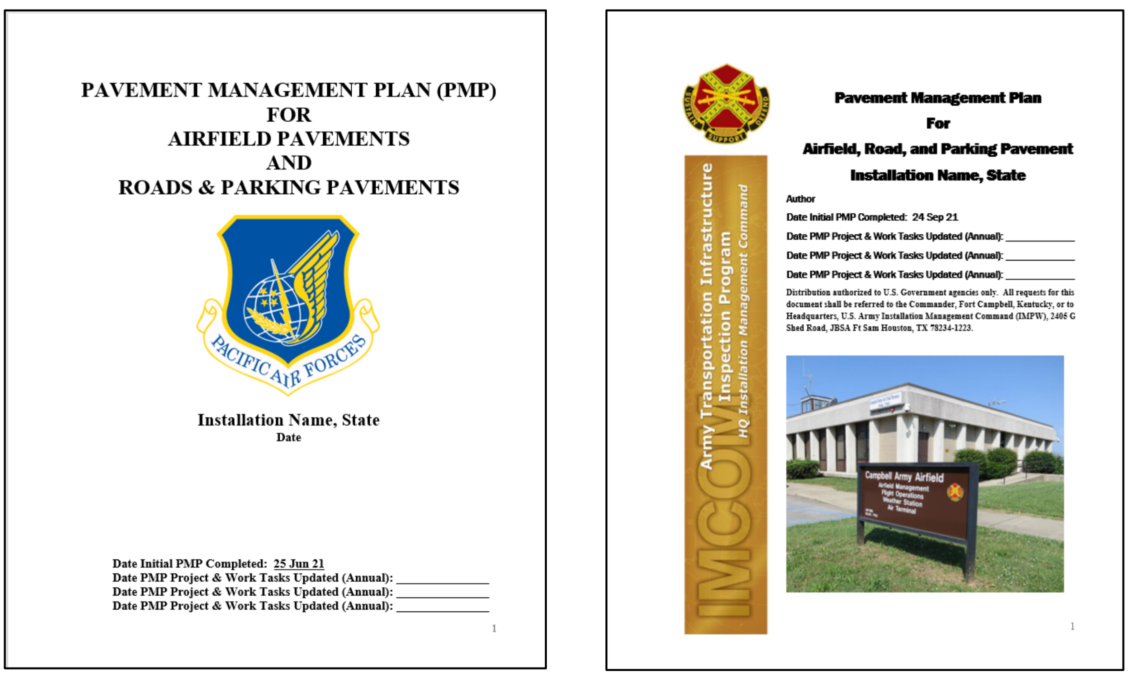
Following is a recommended PMP outline.

- Cover sheet
- Preface
- Executive Summary
- Development team members
- Development process and deliverables
- Assumptions and limiting factors
- Prioritized Work Plan for in-house execution
- Prioritized Contract Project Plan for contract execution by year

A-9.9.4 Cover Sheet.

Include the name of the installation and whether it is an airfield or roads and parking PMP. List the initial development date and the dates of all annual updates. Service policy may also require a distribution statement, as shown in the example in Figure A-54.

Figure A-54 PMP Cover Sheet Example



PAVEMENT MANAGEMENT PLAN (PMP)
FOR
AIRFIELD PAVEMENTS
AND
ROADS & PARKING PAVEMENTS

Installation Name, State
Date

Date Initial PMP Completed: 25 Jun 21
Date PMP Project & Work Tasks Updated (Annual): ____________
Date PMP Project & Work Tasks Updated (Annual): ____________
Date PMP Project & Work Tasks Updated (Annual): ____________

1

Pavement Management Plan
For
Airfield, Road, and Parking Pavement
Installation Name, State

Author
Date Initial PMP Completed: 24 Sep 21
Date PMP Project & Work Tasks Updated (Annual): ____________
Date PMP Project & Work Tasks Updated (Annual): ____________
Date PMP Project & Work Tasks Updated (Annual): ____________

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1

A-9.9.5 Preface.

The Preface is typically a single page that provides background information on the sources of pavement evaluation data, initial PMP development, and subsequent updates, as well as information on the DoD and Service guidance the PMP implements.

Figure A-55 Preface Example

> **1. PREFACE**
>
> This Pavement Management Plan (PMP) documents a [Month Year] coordinated team effort between [ERDC/Contractor, Public Works, and Airfield Management when applicable] representatives to establish an Initial PMP for the airfield pavements network and the roads and parking pavements network at [Installation Name, State]. This PMP document provides information for:
>
> - Planning and programming for pavement maintenance, repairs, and rehabilitation
> - Prioritization of pavement facilities for maintenance, repair, and rehabilitation and construction projects
> - Allocation of funds for annual maintenance and repair (M&R)
>
> Army Regulation (AR) 420-1 Army Facilities Management, Department of Army Pamphlet (DA PAM) 420-1-3 Transportation Infrastructure and Dams, UFC 3-270-08 Pavement Management, and Tri-Service Pavements Working Group (TSPWG) Manual 3-270-08.14-03 outline requirements for bases to develop pavement management plans (PMP) in support of asset management.
>
> IMCOM participated the development of an Airfield Pavement Category Intelligence Report (CIR) conducted by the Air Force. This report recommended installations develop PMPs to capitalize on efficiencies. SAF/MG approved efforts as a “go do” for the Air Force and IMCOM concurs with this recommendation for Army Installations as outlined below.

A-9.9.6 Executive Summary.

The Executive Summary outlines the purpose of the PMP and any critical issues the approval authority should be aware of. Include a summary of the annual work requirements, as shown in the example in Figure A-56. Provide a summary of the annual costs, as shown in the example in Figure A-57, and include a graphic representation of the impact of the investment in terms of condition, as shown in Figure A-58. Each of these graphics will include a brief description. The figures below are examples generated in PAVER but can also be generated using other tools.

Figure A-56 Requirements Map

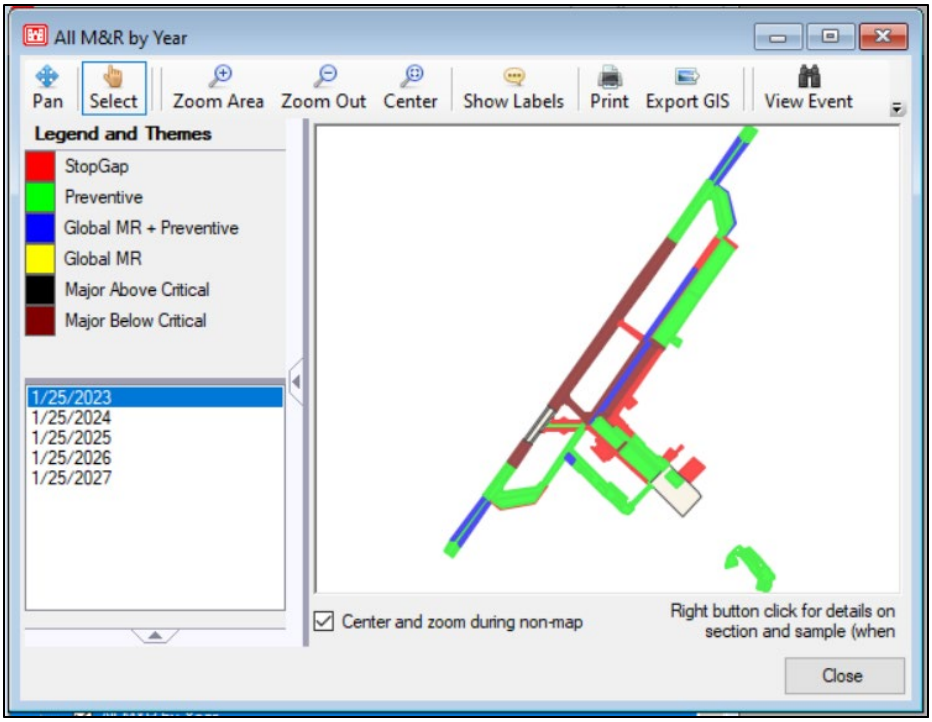
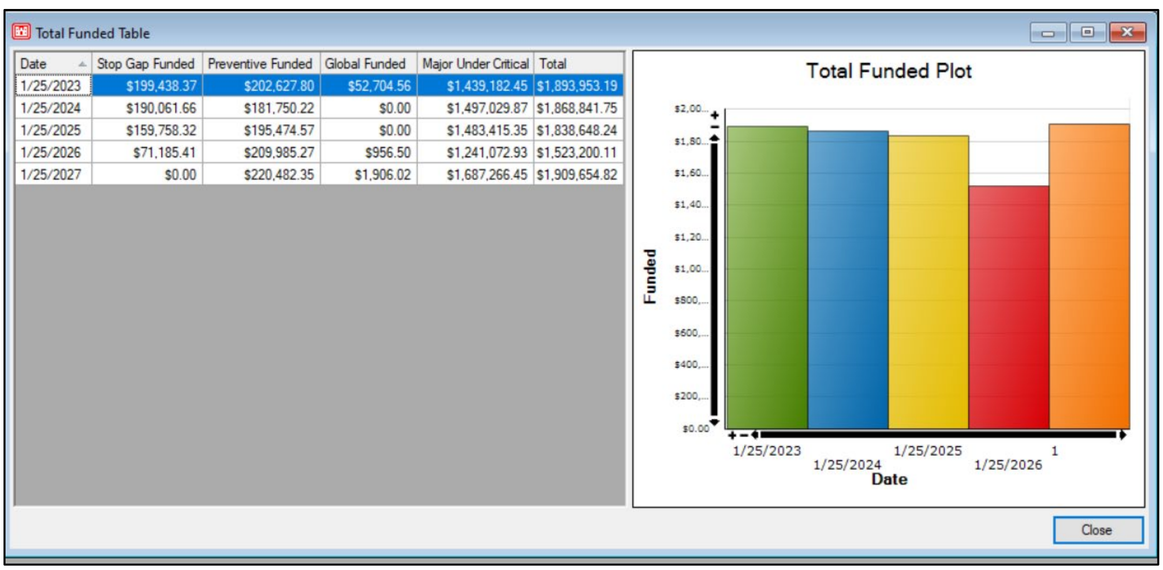
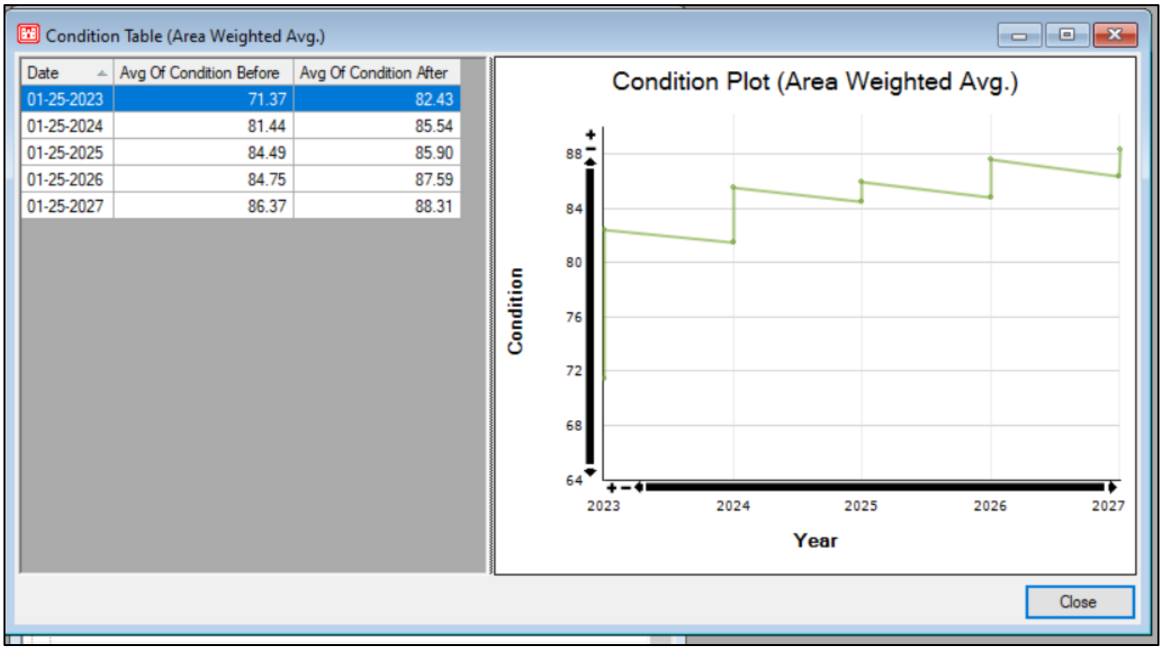


Figure A-57 Annual Funding Requirement



Date	Stop Gap Funded	Preventive Funded	Global Funded	Major Under Critical	Total
1/25/2023	$199,438.37	$202,627.80	$52,704.56	$1,439,182.45	$1,893,953.19
1/25/2024	$190,061.66	$181,750.22	$0.00	$1,497,029.87	$1,868,841.75
1/25/2025	$159,758.32	$195,474.57	$0.00	$1,483,415.35	$1,838,648.24
1/25/2026	$71,185.41	$209,985.27	$956.50	$1,241,072.93	$1,523,200.11
1/25/2027	$0.00	$220,482.35	$1,906.02	$1,687,266.45	$1,909,654.82

Figure A-58 Condition Table



Date	Avg Of Condition Before	Avg Of Condition After
01-25-2023	71.37	82.43
01-25-2024	81.44	85.54
01-25-2025	84.49	85.90
01-25-2026	84.75	87.59
01-25-2027	86.37	88.31

A-9.9.7 Development Team Members.

This is a list of the members of the development team members and their contact information. The list is updated annually when the team finalizes the PMP updates.

A-9.9.8 Development Process and Deliverables.

This section expands on the information provided in the Preface and Executive Summary and should include the following.

A-9.9.8.1 Pavement Management Objective.

Perform localized and global preventive maintenance to extend pavement life and perform Major M&R at the right time with the right repair method rather than letting the pavement deteriorate to poor or failed condition before taking any repair actions. This approach optimizes the lifecycle cost of maintaining the pavement.

A-9.9.8.2 Development Process.

Include a discussion of the following items to describe the development process.

- Generate work plans with M&R requirements using the most recent PCI inspection.
- Prioritize requirements, with an emphasis on localized and global M&R to maximize pavement life. Include a discussion of the prioritization process and other key performance indicators, e.g., FOD potential and structural index.

- Aggregate requirements into executable in-house work tasks and contract projects for each year of the PMP. Discuss project scoping and any other factors addressed when aggregating requirements, e.g., waivers, construction cycle, other projects, etc.
- Verify/validate method of execution, repair types, quantities, and costs for all M&R types, including a description of the field work performed to validate repair types and quantities.
- Finalize PMP and submit for approval.

A-9.9.9 Limiting Factors and Assumptions.

Limiting factors can include, but are not limited to, constraints on in-house capabilities, funding, operations tempo, and access to pavement surfaces. Describe any assumptions made with regard to limiting or other factors.

A-9.9.10 Prioritized In-House Execution Work Plan.

This section has the products generated from PAVER work plan spreadsheets as outlined in paragraph A-7.6 or generated using the PAVER Project Formulation Wizard as outlined in paragraph A-9.7. Embedding these products in the PMP Word document as an Excel spreadsheet is a best practice. This is especially useful on large installations when the in-house execution work plan can be quite extensive. Figure A-59 provides an example of an in-house execution work plan generated by one Service.

Figure A-59 In-House Execution Work Plan

FY	Execution Method	PMP Zone	Branch	Section	Distress	Severity	Quantity		Work Description	Work Quantity		PCI	Unit Cost	Work Cost	Pre-Work Site Visit Performed (mm/dd/y	Date Work Completed (mm/dd/y	Comment
20	IN-HOUSE	BLUE	Arm/Dearm Apron TW A	A32B	CORNER SPALL	Medium	1	Slabs	Patching - PCC Partial Depth	2	SqFt	81	$12.24	$33		08/30/20	Completed
20	IN-HOUSE	BLUE	Arm/Dearm Apron TW A	A32B	JOINT SPALL	Low	7	Slabs	Crack Sealing - PCC	11	Ft	81	$4.90	$56		08/30/20	Completed
20	IN-HOUSE	BLUE	Arm/Dearm Apron TW A	A32B	JOINT SPALL	Medium	5	Slabs	Patching - PCC Partial Depth	32	SqFt	81	$12.24	$395		08/30/20	Completed
20	IN-HOUSE	BLUE	Arm/Dearm Apron TW A	A32B	JT SEAL DMG	Medium	36	Slabs	Joint Seal (Localized)	1,228	Ft	81	$4.08	$5,016		08/30/20	Completed
20	IN-HOUSE	BLUE	Arm/Dearm Apron TW A	A32B	LINEAR CR	Medium	3	Slabs	Crack Sealing - PCC	68	Ft	81	$4.90	$331		08/30/20	Completed
21	IN-HOUSE	RED	Runway 14/32	R01A	JOINT SPALL	Low	24	Slabs	Crack Sealing - PCC	39	Ft	92	$4.90	$193			
21	IN-HOUSE	RED	Runway 14/32	R01A	JOINT SPALL	Medium	9	Slabs	Patching - PCC Partial Depth	55	SqFt	92	$12.24	$677			
21	IN-HOUSE	RED	Runway 14/32	R01A	LINEAR CR	Medium	5	Slabs	Crack Sealing - PCC	99	Ft	92	$4.90	$488			
21	IN-HOUSE	RED	Runway 14/32	R05C	JOINT SPALL	High	4	Slabs	Patching - PCC Partial Depth	33	SqFt	96	$12.24	$405			
21	IN-HOUSE	RED	Runway 14/32	R05C	JOINT SPALL	Low	90	Slabs	Crack Sealing - PCC	148	Ft	96	$4.90	$724			
21	IN-HOUSE	RED	Runway 14/32	R05C	JOINT SPALL	Medium	25	Slabs	Patching - PCC Partial Depth	158	SqFt	96	$12.24	$1,942			
21	IN-HOUSE	RED	Runway 14/32	R05C	LINEAR CR	Medium	4	Slabs	Crack Sealing - PCC	79	Ft	96	$4.90	$389			
21	IN-HOUSE	RED	Runway 14/32	R08A	CORNER BREAK	Low	2	Slabs	Crack Sealing - PCC	15	Ft	94	$4.90	$73			
21	IN-HOUSE	RED	Runway 14/32	R08A	CORNER SPALL	Low	16	Slabs	Crack Sealing - PCC	27	Ft	94	$4.90	$131			
21	IN-HOUSE	RED	Runway 14/32	R08A	JOINT SPALL	High	2	Slabs	Patching - PCC Partial Depth	15	SqFt	94	$12.24	$179			
21	IN-HOUSE	RED	Runway 14/32	R08A	JOINT SPALL	Low	13	Slabs	Crack Sealing - PCC	21	Ft	94	$4.90	$102			
21	IN-HOUSE	RED	Runway 14/32	R08A	JOINT SPALL	Medium	2	Slabs	Patching - PCC Partial Depth	12	SqFt	94	$12.24	$143			
21	IN-HOUSE	RED & BLUE	Loop Taxiway	T37A	L & T CR	Medium	449	Ft	Crack Sealing - AC	449	Ft	73	$1.37	$613			
21	IN-HOUSE	RED & BLUE	Loop Taxiway	T39A	L & T CR	Medium	28	Ft	Crack Sealing - AC	28	Ft	74	$1.37	$38			
21	IN-HOUSE	RED	Loop Taxiway	T40A	L & T CR	Medium	510	Ft	Crack Sealing - AC	510	Ft	75	$1.37	$696			

A-9.9.11 Prioritized Contract Project Plan.

This section has the products generated from PAVER work plan spreadsheets as outlined in paragraph A-7.6 or generated using the PAVER Project Formulation Wizard as outlined in paragraph A-9.7. Embedding these products in the PMP Word document as an Excel spreadsheet is a best practice.

Figure A-60 Contract Project Plan Example

Rqmt FY	Opportunity Number	Name	Execution Method	ZONE	Branch Name	Section	Rank	PCI	Work Type	AREA (SF)	Work Description	Project Cost	Program
2022			Contract	BLUE	Oscar Row Apron	A11B	P	43	AC	203,500	Structural Repair an Mill and Overlay	$708,178	EXPLAN
2022			Contract	RED	P/Q/R/S Tanker Row Apron	A06B	P	53	AC	148,915	Mill and Overlay	$265,492	EXPLAN
2022			Contract	RED	P/Q/R/S Tanker Row Apron	A04B	P	34	AC	105,239	Mill and Overlay	$1,094,488	EXPLAN
2022			Contract	RED	Loop Taxiway	T39A	P	66	AC	117,065	TBD	TBD	BCAMP
2023			Contract	RED	Taxiway A	T01A	P	63	AC	314,060	Mill and Overlay	$555,886	
2023			Contract	BLUE	Taxiway A	T28A	P	54	AC	46,572	Structural Repair an Mill and Overlay	$162,071	
2023		Twy A and Twy F North	Contract	RED	Taxiway F	T02A	P	55.8	AC	97,646	Structural Repair an Mill and Overlay	$339,807	BCAMP
2023			Contract	RED	Taxiway F	T03A	P	56.8	AC	221,177	Mill and Overlay	$391,483	
2023			Contract	RED	Taxiway F	T04A	P	65.8	AC	36,229	Mill and Overlay	$64,126	
2024			Contract	RED	Arm/Dearm Apron TW E	A31B	P	59.65	PCC	16,250	20% Slab Replacement	$96,688	EXPLAN
2024			Contract	RED	Runway 14/32	R02A	P	59.4	AC	180,272	Mill and Overlay	$319,081	
2024			Contract	RED	Runway 14/32	R03A	P	66.4	AC	156,849	Mill and Overlay	$277,623	
2024			Contract	RED	Runway 14/32	R04C	P	64.4	AC	438,172	Mill and Overlay	$775,564	
2024			Contract	RED	Runway 14/32	R06C	P	68.4	AC	1,128,398	Mill and Overlay	$1,997,264	
2024			Contract	RED	Runway 14/32	R07C	P	66.4	AC	409,912	Mill and Overlay	$725,544	
2024			Contract	RED	Runway 14/32	R09A	P	63.4	AC	211,204	Mill and Overlay	$373,831	
2024		Runway Mill and Overlay	Contract	RED	Runway 14/32	R10A	P	73.4	AC	11,700	Mill and Overlay	$20,709	BCAMP
2024			Contract	RED	Runway 14/32	R11C	P	58.4	AC	7,500	Mill and Overlay	$13,275	
2024			Contract	RED	Runway 14/32	R12C	P	50.4	AC	101,877	Mill and Overlay	$180,322	
2024			Contract	RED	Runway 14/32	R13C	P	59.4	AC	125,300	Mill and Overlay	$221,781	
2024			Contract	RED	Runway 14/32	R14A	P	68.4	AC	25,951	Mill and Overlay	$45,933	
2024			Contract	RED	Runway 14/32	R15A	P	68	AC	20,761	Mill and Overlay	$36,747	

A-10 RISK (RETURN ON INVESTMENT) ANALYSIS PROCEDURES.

This section outlines a risk analysis procedure for determining the consequence of not performing localized PM and global PM. Risk is defined as a decrease in pavement life (and thus increased M&R cost) as a result of not performing the appropriate PM at the proper time.

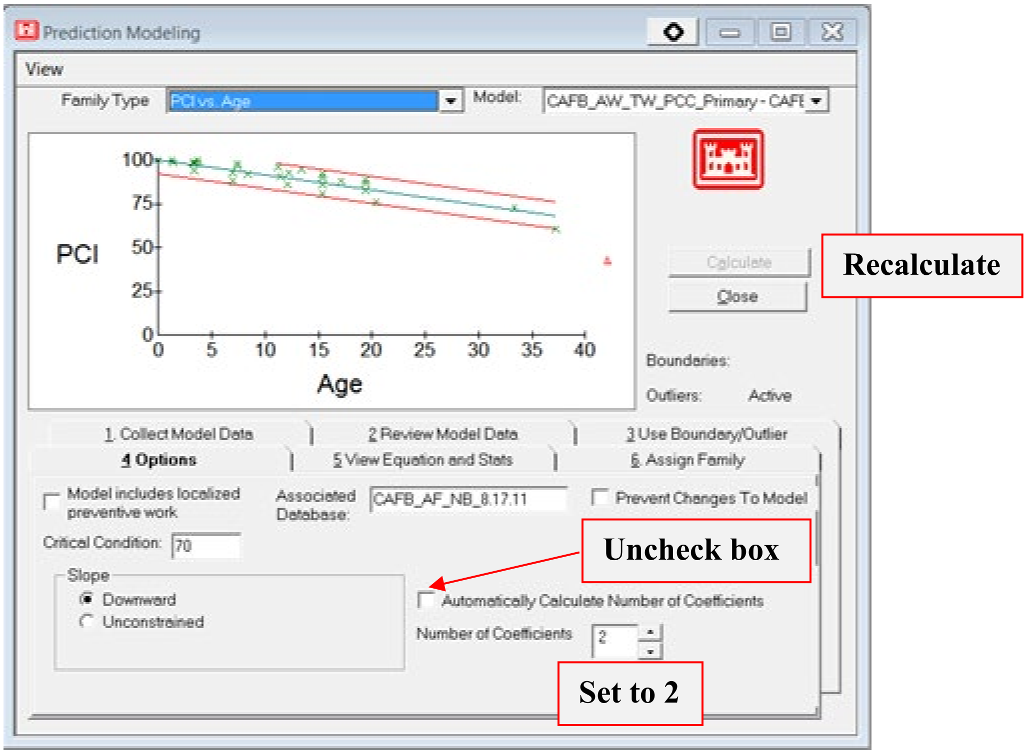
A-10.1 Risk Analysis – Localized Preventive Maintenance (PM).

A-10.1.3 Family Rate of Deterioration.

Calculate the pavement family rate of deterioration assuming localized PM has been performed in the past (R_W) and compute the rate of deterioration if localized PM is not performed (R_{WO}).

Using the steps outlined in Chapter 5 and assuming that localized PM has been performed in the past, create a family model. On tab 4, **Options**, uncheck the **Automatically Calculate Number of Coefficients** button, set the number of coefficients to 2, and press the **Calculate** button (Figure A-61). Select tab 5, **View Equation and Stats**. The second coefficient in the equation (e.g., 100 – 0.8512 X^1) is the straight-line deterioration rate (R_W = 0.85 points per year). The next step is to calculate the age (T_W) to critical PCI (PCI_C), assuming localized PM is performed.

Figure A-61 Review Model Data Tab



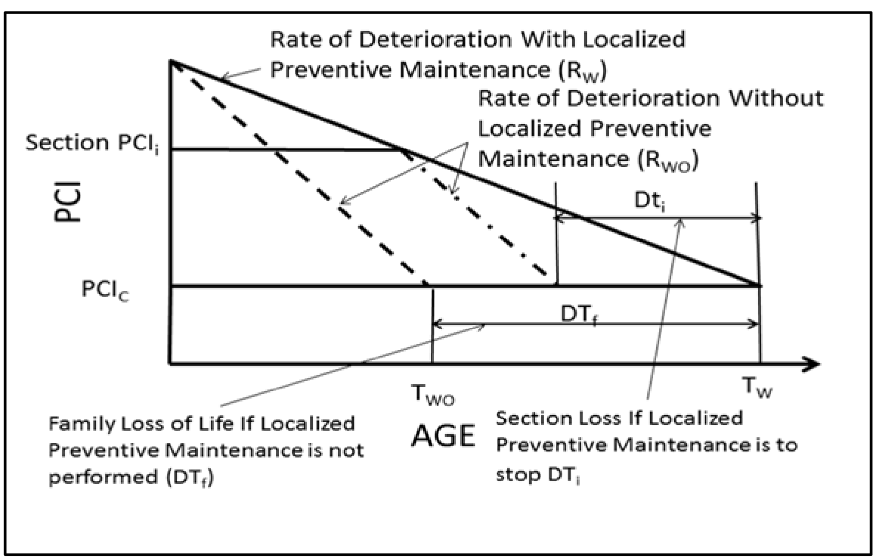
A-10.1.4 Age to Critical PCI.

The age (T_W) to critical PCI (PCI_C) is computed using the equation below.

$$T_W = (100 - PCI_C) / R_W$$

In the Figure A-62 example, assume a PCI_C = 70, T_W = (100 – 70) / 0.85 = 35.29 years.

Figure A-62 Section Deterioration



A-10.1.5 Expected Loss in Pavement Life.

Estimate the expected loss in pavement life (DT_f) caused by not performing localized PM. Loss of pavement life will depend on several factors, including pavement life with localized PM (T_w), pavement type (e.g., asphalt vs. concrete), climate, and traffic. Table A-29 provides recommended DT_f values when T_w is 20 years.

Table A-29 Recommended DTf Values

Climate	DT_{f20}, years
Dry/no freeze	5
Wet/no freeze-dry/freeze	7.5
Wet/freeze	10

The DT_f values for any other T_w can be calculated as follows:

$$DT_{fTw} = DT_{f20} * (.3691\, T_w - .0009\, {T_W}^2)/7.13$$

For example, if T_w = 35.29 years, then DT_f for dry/no freeze is calculated as:

$$5 * (.3691 * 35.29 - .0009 * (35.292))/7.13 = 8.35\, years$$

A-10.1.6 Age to Critical PCI Assuming No Localized PM.

Calculate the age to critical PCI (PCI_C), assuming localized PM is not performed (T_{WO}) using the equation below:

$$T_{WO} = T_W - DT_f$$

In the example above, assuming DT_f = 8.35 years:

$$T_{WO} = 35.29 - 8.35 = 26.94\, years$$

A-10.1.5 Rate of Deterioration Assuming No Localized PM.

Determine the pavement family rate of deterioration (R_{WO}), assuming localized PM is not performed:

$$R_{WO} = (100 - PCI_C) \,/\, T_{WO}$$

In the example above,

$$R_{WO} = (100 - 70) \,/\, 26.94 = 1.11\, PCI\ points\ per\ year$$

A-10.1.6 Expected Loss of Pavement Life with No Localized PM.

Determine the expected loss in life (DT_i) for each pavement section if localized PM is not performed:

For any pavement section (i) from the same family, DT_i can be computed if its current condition (PCI_i) is known. For this example, assume the section currently has a (PCI_i) of 85.

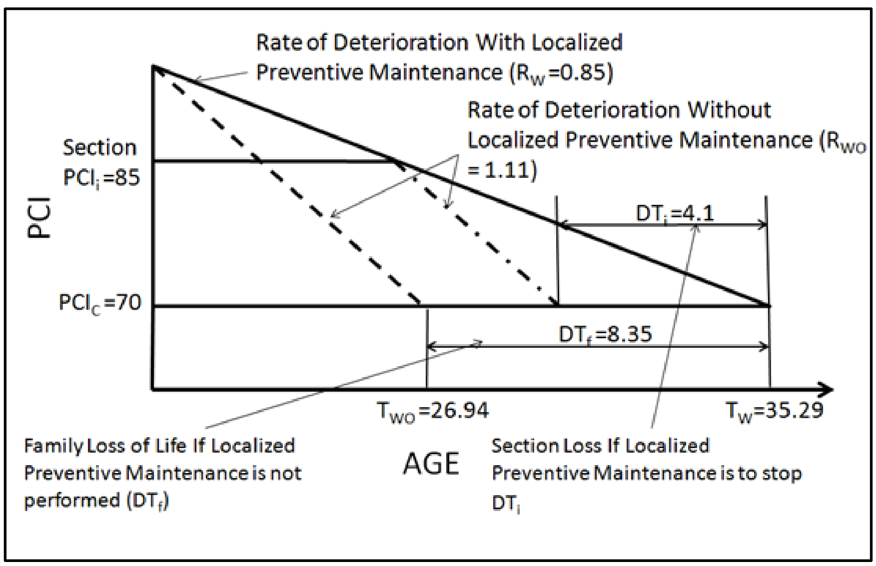
$$DT_i = (PCI_i - PCI_C) * (R_{WO} - R_W) / (R_{WO} * R_W)$$

In the above example, for a section (i) with a PCI_i = 85:

$$DT_i = (85 - 70) * (1.11 - 0.85) / (1.11 * 0.85) = 4.1\, years$$

See Figure A-63 for a depiction of the section deterioration example above.

Figure A-63 Section Deterioration Example



A-10.2 Cost of Pavement Life Loss with No Localized PM.

The procedure is based on the equivalent uniform annual cost (EUAC) economic analysis method. This method calculates the average annual cost with and without annual PM and compares the two to determine the annual cost due to loss of pavement life. The simplest form of this procedure is presented below, in which interest and inflation rates are not considered. The costs are intended to be used for comparative analysis only and not intended to represent actual project cost.

A-10.2.1 Calculate Equivalent Uniform Annual Cost (EUAC).

Determine the annual major M&R cost ($\$_{Annual\ Major\ Alt1}$) by dividing the major M&R cost at critical PCI ($\$_{Major\text{-}critical}$) by the life of the alternative T_W. $\$_{Major\ critical}$ can be estimated as one-third the cost of reconstruction for asphalt pavements and one-fourth the cost of reconstruction for concrete pavements.

In the concrete apron example above, assuming a reconstruction cost of $20.00/SF (use PACES or other estimating methods to determine estimated reconstruction costs), then $\$_{Major\text{-}critical}$ is estimated at $20/4 = $5.0/SF.

$$\$_{Annual\ Major\ Alt1} = \$5.0/35.29 = \$0.1417\ SF/Yr$$

A-10.2.2 Calculate Average Annual Cost with Localized PM.

Determine the average annual localized PM cost over the life of the alternative ($\$_{Annual\text{-}Preventive}$). This can be obtained by summing the total annual localized preventive cost over the life of the alternative (the cost will vary annually as a function of the PCI) then dividing the sum by the life (T_W). Based on unit costs in the PAVER system, this can be approximated as $0.0232/SF/YR for concrete pavements and $0.0096/SF/YR for asphalt pavements. This is a nominal average cost that can be used as constant on all analyses.

$EUAC_{Alt1}$ is determined as the sum of the $\$_{Annual\text{-}Major\text{-}Alt1}$ and $\$_{Annual\text{-}Preventive}$ costs as shown in the equation below.

$$EUAC_{Alt1} = \$_{Annual\ Major\ Alt1} + \$_{AnnualPreventive}$$

For the example above:

$$EUAC_{Alt1} = 0.1417 + 0.0232 = \$0.1649/SF/YR$$

A-10.2.3 Calculate Average Annual Cost without Localized PM.

Calculate the annual cost for the same alternative, except without a localized PM alternative ($EUAC_{Alt2}$):

Determine the annual major M&R cost ($\$_{Annual\ Major\ Alt2}$) by dividing the major M&R cost at critical PCI ($\$_{Major\ critical}$) by the life of the alternative (T_{WO}). $\$_{Major\ critical}$ can be estimated as one-third the cost of reconstruction for asphalt pavements and one-fourth the cost of reconstruction for concrete pavements.

In the example above:

$$\$_{Annual\ Major\ Alt2} = \$5.0/25.29 = \$.1977/SF/YR$$

Determine the average annual operational maintenance over the life of the alternative ($\$_{Annual\ operational}$). The annual operational maintenance actions are only measures taken to keep the pavement operationally safe. This can be obtained by summing the total annual operational cost over the life of the alternative (the cost will vary annually as a function of the PCI) then divide the sum by the life (T_{WO}). Based on unit costs in the PAVER system, this can be approximated as $0.0040/SF/YR for concrete pavements and $0.0004/SF/YR for asphalt pavements. This is a nominal average cost that can be used as constant on all analyses.

$EUAC_{Alt2}$ is determined as the sum of the $\$_{Annual\ Major\ Alt2}$ and $\$_{Annual\ Operational}$ costs as shown in the equation below.

$$EUAC_{\ Alt2} = \$_{Annual\ Major\ Alt2} + \$_{Annual\ Operational}$$

For the example above:

$$EUAC_{Alt2} = 0.1977 + 0.0040 = \$\ 0.2017/SF/YR$$

A-10.2.4 Annual Cost Due to Loss in Pavement Life.

Calculate the annual cost due to loss in pavement life ($EUAC_{LOSS}$):

$$EUAC_{LOSS} = EUAC_{Alt2} - EUAC_{Alt1}$$

For the example above:

$$EUAC_{LOSS} = 0.2017 - 0.1649 = \$\ 0.0368\ /SF/YR$$

This number is then multiplied by the losses in years from paragraph A-10.1.5, which is 4.1 years in this example, i.e., 0.0368*4.1 = $0.151/SF or approximately $1.358/SY. The section risk cost is simply the $EUAC_{LOSS}$ multiplied by the area of the section.

A-10.3 Compute Project Risk Cost.

Performing localized PM typically includes more than one pavement section. The risk for a project is simply the sum of the risk associated with every section. Set the risk cost to zero when the PCI is less than critical. The project cost is best calculated in an Excel sheet as shown in Figure A-64. The Excel sheet shown in this example was initiated in PAVER using the user-defined reports feature. The generated Excel sheet from PAVER included section area and PCI. The rest of the information in the sheet was calculated in Excel as follows.

A-10.4 Compute Risk Cost for Each Section.

Compute DT_i for each section using the equation in paragraph A-10.1.6. In the example used throughout this appendix, R_W = 0.85 and R_{WO} = 1.11

Compute the risk cost for each section as follows:

$$Section\ Risk\ Cost = DT_i * EUAC_{LOSS}$$

In this example, $EUAC_{LOSS}$ was calculated in paragraph A-10.2.4 as $0.0368/SF/YR

The project risk cost is the sum of all the section costs, which is $356,768.

Figure A-64 Project Risk Cost Table Example

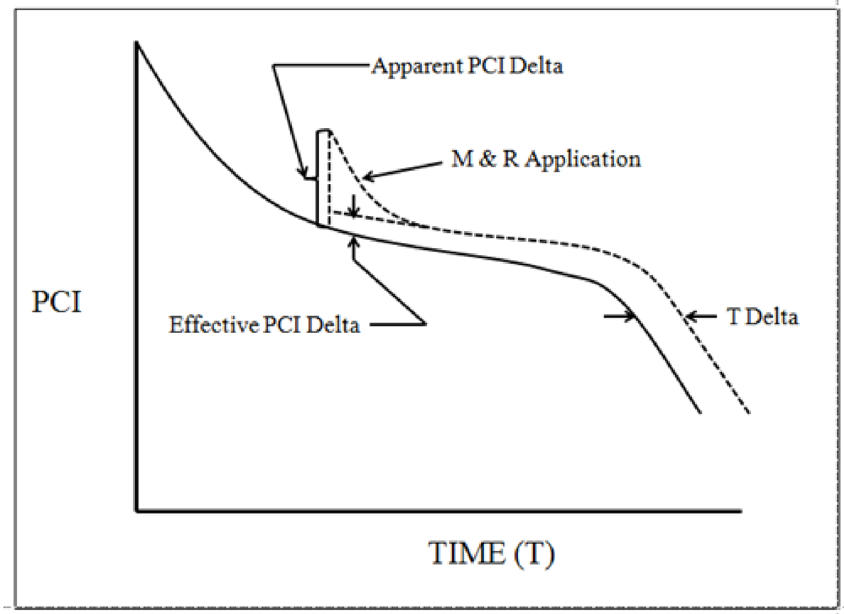
Section	Use	Rank	Surface	Area	2010 PCI	PCI Critical AFCESA	Det. Rate with SRM Rw	Pav. Life with SRM (Year) Tw	Assum. Pav. Loss Life (Year) DTf	Det. Rate without SRM Rwo	Section Loss Life (Year) Dti	Annual Preventive cost $/SF/YR	Alt1 $Annual with Major SRM Cri $/SF/YR	EUAC Alt 1 Cells: (R+S) $/SF/YR	$Annual Saftey $/SF/YR	Alt2 $Annual w/o Major SRM Cri $/SF/YR	EUAC Alt 2 Cells: (U+V) $/SF/YR	EUAC Loss Alt2- Alt1 $/SF/YR	EUACi Cells: X*Dti $/SF	Risk Cost = EUACi*Area
T32A	TAXIWAY	P	PCC	10,201	100	70	0.70	43.09	9.98	0.91	9.98	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.158	$1,607
T30A	TAXIWAY	P	PCC	103,119	100	70	0.70	43.09	9.98	0.91	9.98	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.158	$16,244
T24A	TAXIWAY	P	PCC	155,411	93	70	0.70	43.09	9.98	0.91	7.65	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.121	$18,769
T03A	TAXIWAY	S	PCC	7,565	92	70	0.70	43.09	9.98	0.91	7.32	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.116	$874
T02A	TAXIWAY	S	PCC	45,000	90	70	0.70	43.09	9.98	0.91	6.65	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.105	$4,726
T15A	TAXIWAY	S	PCC	117,307	83	70	0.70	43.09	9.98	0.91	4.33	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.068	$8,007
T20A	TAXIWAY	S	PCC	82,911	76	70	0.70	43.09	9.98	0.91	2.00	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.032	$2,612
T05A	TAXIWAY	S	PCC	65,585	72	70	0.70	43.09	9.98	0.91	0.67	$0.0232	$0.116	$0.1392	$0.004	$0.151	$0.155	$0.016	$0.011	$689
R06C	RUNWAY	P	PCC	153,750	100	70	0.58	51.98	11.75	0.75	11.75	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.104	$16,064
R07A	RUNWAY	P	PCC	129,375	100	70	0.58	51.98	11.75	0.75	11.75	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.104	$13,517
R03C	RUNWAY	P	PCC	858,351	93	70	0.58	51.98	11.75	0.75	9.01	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.080	$68,754
R01A	RUNWAY	S	PCC	30,000	90	70	0.58	51.98	11.75	0.75	7.83	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.070	$2,090
R06A	RUNWAY	S	PCC	30,000	85	70	0.58	51.98	11.75	0.75	5.87	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.052	$1,567
R04A	RUNWAY	S	PCC	45,000	80	70	0.58	51.98	11.75	0.75	3.92	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.035	$1,567
R09C	RUNWAY	P	PCC	153,750	75	70	0.58	51.98	11.75	0.75	1.96	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.017	$2,677
R10A	RUNWAY	P	PCC	170,625	70	70	0.58	51.98	11.75	0.75	0.00	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	$0.000	$0
R04A	RUNWAY	S	PCC	30,000	68	70	0.58	51.98	11.75	0.75	-0.78	$0.0232	$0.096	$0.1194	$0.004	$0.124	$0.128	$0.009	-$0.007	$0
A54B	APRON	P	PCC	130,673	100	70	0.74	40.48	9.44	0.97	9.44	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.174	$22,684
A51C	APRON	S	PCC	236,146	100	70	0.74	40.48	9.44	0.97	9.44	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.174	$40,994
A48B	APRON	S	PCC	88,800	97	70	0.74	40.48	9.44	0.97	8.50	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.156	$13,874
A05B	APRON	S	PCC	171,402	94	70	0.74	40.48	9.44	0.97	7.55	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.139	$23,804
A07B	APRON	S	PCC	95,867	93	70	0.74	40.48	9.44	0.97	7.24	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.133	$12,759
A08B	APRON	S	PCC	363,925	92	70	0.74	40.48	9.44	0.97	6.93	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.127	$46,329
A26B	APRON	S	PCC	50,940	87	70	0.74	40.48	9.44	0.97	5.35	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.098	$5,011
A05B	APRON	S	PCC	348,676	78	70	0.74	40.48	9.44	0.97	2.52	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.046	$16,141
A03B	APRON	P	PCC	887,730	73	70	0.74	40.48	9.44	0.97	0.94	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.017	$15,411
A01B	APRON	T	PCC	516,205	70	70	0.74	40.48	9.44	0.97	0.00	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	$0.000	$0
A38B	APRON	S	PCC	196,478	68	70	0.74	40.48	9.44	0.97	-0.63	$0.0232	$0.124	$0.1467	$0.004	$0.161	$0.165	$0.018	-$0.012	$0
																				$356,768

A-10.5 Risk Analysis – Global Preventive Maintenance (PM).

Typically, global PM is applied for pavements above the critical PCI at an appropriate frequency throughout the life of the pavement. Currently, global PM is limited to the application of seal coats to asphalt surfaces. In this UFC, seal coats are divided into three general applications: fog seals, rejuvenators, and slurry seals. The procedure presented below is for determining the risk for a single application. Note that in the following procedure the rate of deterioration without global PM (R_{WO_G}) is used in this analysis because the Services have not historically used global PM on airfields. If global PM has been performed in the past, use the localized preventive procedure outlined in paragraphs A-10.1 thru A-10.4.

Figure A-65 shows the general effect of applying global PM on pavement life. Pavement life is defined as the age in years from original construction or the last major M&R to the time the pavement reaches its critical PCI.

Figure A-65 Effect of Global Maintenance on PCI



A-10.5.1 Family Rate of Deterioration Without Global Preventive Maintenance (PM).

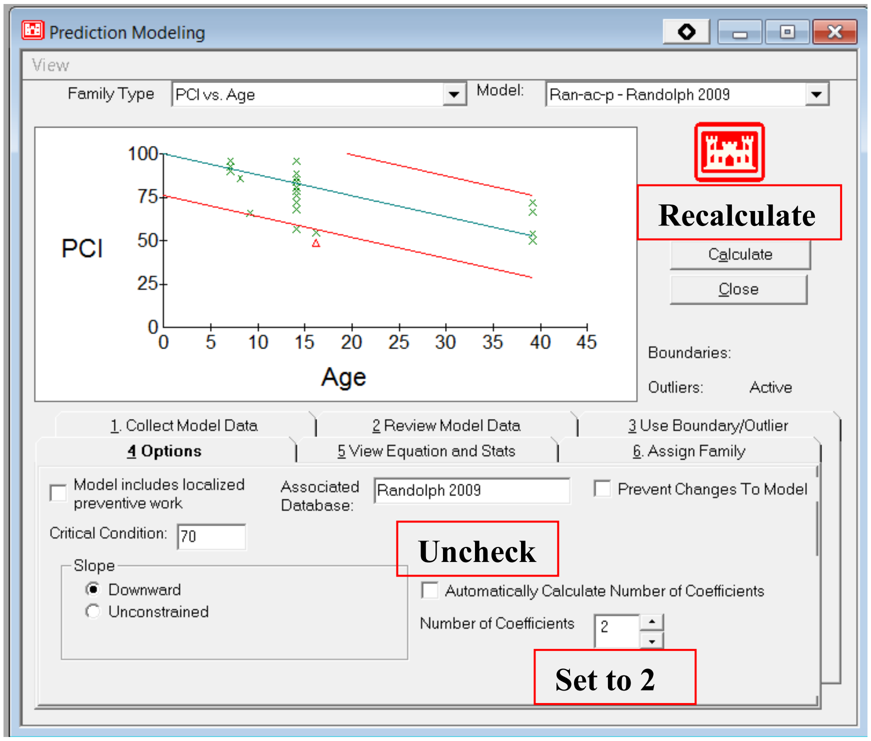
a. For each pavement section, calculate the pavement family rate of deterioration with and without performing global PM.

b. Determine the pavement family rate of deterioration (R_{WO_G}) assuming global PM has not been performed in the past.

c. Create a family curve in PAVER that includes the pavement section(s) under consideration. Figure A-66 shows an example family curve that was created for primary asphalt taxiways at an Air Force base.

d. On tab 4, **Options**, uncheck the **Automatically Calculate Number of Coefficients** button then set the number of coefficients to 2 and press the **Calculate** button as shown in Figure A-66.

Figure A-66 Effect of Global Maintenance on PCI



e. Select tab 5, **View Equation and Stats**. The second coefficient in the equation (e.g., 100 – 1.20653 X^1) is the straight-line deterioration rate (R_{wo_G} = 1.21 points per year). The next step is to calculate the age (T_{wo_G}) to critical PCI (PCI_C), assuming localized PM has not been performed.

A-10.5.2 Age to Critical PCI Without Global Preventive Maintenance (PM).

a. Calculate age to critical PCI (PCI_C), assuming global PM has not been performed (T_{wo_G}).

$$T_{wo\_G} = (100 - PCI_C) / R_{wo\_G}$$

b. In the example above, assuming a PCI_C = 70:

$$T_{wo\_G} = (100 - 70) / 1.21 = 24.8 \text{ years}$$

c. Delta T (DT) is the estimated effective increase in pavement life due to application of the global treatment. The value of DT is a function of a variety of factors, including pavement condition, climatic condition, and the type of treatment being applied. It normally ranges from two to six years, depending on treatment type. DT is less than the frequency at which the treatment is applied. For example, if a rubberized slurry seal is applied on a six-year cycle, the expected DT cannot be equal to or greater than six years. Table A-30 provides a range of recommended DT values for fog seals, rejuvenators, and slurry seals. Use the midpoint of the range unless local experience and conditions indicate other values within the range are more appropriate.

Table A-30 Recommended DTf Values

Type of Seal Coat	DT, years
Fog seal	2–3 years
Rejuvenator	3–5 years
Slurry seal	4–6 years

d. Calculate the age to critical PCI (PCI_C), assuming global PM is performed (T_{W_G}):

$$T_{W\_G} = T_{WO\_G} + DT$$

e. In the example above, assuming DT = 5 years:

$$T_{W\_G} = 24.8 + 5 = 29.8\ years$$

A-10.5.3 Estimate Cost Due to Loss in Pavement Section Life.

Performing global maintenance will increase pavement life, but a risk analysis must determine the consequences of not performing an action. This section determines the cost of not performing global maintenance (i.e., the loss in pavement life by not performing global maintenance). The procedure is based on the EUAC economic analysis method. This method calculates the average annual cost with and without global PM and compares the two to determine the annual cost due to loss of pavement life. The simplest form of this procedure is presented below, in which interest and inflation rates are not considered. The costs are intended to be used for comparative analysis only and not intended to represent actual project cost.

A-10.5.4 Calculate EUAC With Global Preventive Maintenance (PM).

a. Use the following procedure to calculate the EUAC for the global PM alternative ($EUAC_{Alt1}$).

b. Determine the annual major M&R cost ($\$_{Annual\text{-}Major\text{-}Alt1}$) by dividing the major M&R cost at critical PCI ($\$_{Major\text{-}critical}$) by the life of the alternative (T_{W_G}). $\$_{Major\text{-}critical}$ can be estimated as one-third the cost of reconstruction for asphalt pavements and one-fourth the cost of reconstruction for concrete pavements.

c. In the example above, assuming a reconstruction cost of $6.00/SF then $\$_{Major\text{-}critical}$ is estimated at $6/3 = $2.0/SF.

$$\$_{Annual\ Major\ Alt1} = \$2.0/29.8 = \$0.0671\ SF/Yr$$

d. Determine the annualized cost of the global treatment being applied ($\$_{Global}$).

$$\$_{Global} = Treatment\ unit\ cost/T_{W\_G}$$

e. For the example above, assuming the treatment unit cost is $0.30/SF:

$$\$_{Global} = \$0.30/29.8 = \$0.0100\ SF/YR$$

f. $EUAC_{Alt1}$ is determined as the sum of costs from $\$_{Major\text{-}critical}$ and $\$_{Global}$ above, as shown in the equation below:

$$EUAC_{Alt1} = \$_{Annual\ Major\ Alt1} + \$_{Global}$$

g. For the example above:

$$EUAC_{Alt1} = 0.0671 + 0.0100 = \$0.0771/SF/YR$$

A-10.5.5 Calculate EUAC Without Global Preventive Maintenance (PM).

Calculate annual cost for the same alternative, except without global PM alternative ($EUAC_{Alt2}$):

Determine the annual major M&R cost ($\$_{Annual\ Major\ Alt2}$) by dividing the major M&R cost at critical PCI ($\$_{Major\ critical}$) by the life of the alternative (T_{WO_G}). $\$_{Major\ critical}$ can be estimated as one-third the cost of reconstruction for asphalt pavements and one-fourth the cost of reconstruction for concrete pavements.

In the example above:

$$\$_{Annual\ Major\ Alt2} = \$2.0/24.8 = \$\ 0.0806\ /SF/YR$$

A-10.5.6 Calculate Annual Cost Due to Loss of Pavement Life.

Calculate the annual cost due to loss of pavement life ($EUAC_{LOSS}$):

$$EUAC_{LOSS} = EUAC_{Alt2} - EUAC_{Alt1}$$

For the example above:

$$EUAC_{LOSS} = \$0.0806 - \$0.0771 = \$\ 0.0035/SF/YR$$

This number is then multiplied by DT, which is five years in this example, i.e., 0.0035*5 = $0.0175/SF or approximately $0.1575/SY.

A-10.6 Compute Project Risk Cost.

Performing globalized PM typically includes more than one pavement section. The risk for the project is simply the sum of the risk associated with every section. Set the risk cost to zero when the PCI is less than critical. The project cost is best calculated in an Excel sheet as shown in Figure A-67. The Excel sheet in this example was initiated in PAVER using the user-defined reports feature. The generated Excel sheet from PAVER included section area and PCI. The rest of the information in the sheet was calculated in

Excel as shown above. Note that negative costs or costs shown in red/parentheses indicate these applications may not be justified based on the assumptions.

Figure A-67 Sample Table - Global

Branch	Section	Use	Rank	Surface	Area	2010 PCI	PCI Critical AFCESA	Det. Rate with SRM Rwo_G	Pav. Life without Global (Year) Two_G	Assum. Pav. Increase in Life (Year) DT	Pav. Life with Global (Year) Tw_G	Alt1 $Annual with Major SRM $/SF/YR	$Annual Global $/SF/YR	EUAC Alt 1 Cells: (M+N) $/SF/YR	Alt2 $Annual with Major SRM and w/o Global $/SF/YR	EUAC Loss Alt2- Alt1 $/SF/YR	EUACi Cells: (Q*K) $/SF	Risk Cost = EUACi*Area
TWBMAIN	T32A	TAXIWAY	P	AC	10,201	100	70	1.21	24.79	6.00	30.79	$0.065	$0.010	$0.075	$0.081	0.01	0.04	365.72
TWCMAIN	T30A	TAXIWAY	P	AC	103,119	100	70	1.21	24.79	6.00	30.79	$0.065	$0.010	$0.075	$0.081	0.01	0.04	3697.01
TWGMAIN	T05A	TAXIWAY	P	AC	155,411	93	70	1.21	24.79	6.00	30.79	$0.065	$0.010	$0.075	$0.081	0.01	0.04	5571.77
TWASOUTH	T03A	TAXIWAY	S	AC	7,565	92	70	1.21	24.79	6.00	30.79	$0.065	$0.010	$0.075	$0.081	0.01	0.04	271.22
TWBNORTH	T02A	TAXIWAY	S	AC	45,000	90	70	1.21	24.79	6.00	30.79	$0.065	$0.010	$0.075	$0.081	0.01	0.04	1613.33
TWRAMP5	T15A	TAXIWAY	S	AC	117,307	83	70	1.21	24.79	5.00	29.79	$0.067	$0.010	$0.077	$0.081	0.00	0.02	2034.30
TWPAD18	T20A	TAXIWAY	S	AC	82,911	76	70	1.21	24.79	5.00	29.79	$0.067	$0.010	$0.077	$0.081	0.00	0.02	1437.81
TWNORTH	T05A	TAXIWAY	S	AC	65,585	72	70	1.21	24.79	5.00	29.79	$0.067	$0.010	$0.077	$0.081	0.00	0.02	1137.35
TW422MAIN	T06C	TAXIWAY	P	AC	153,750	100	70	1.42	21.13	5.00	26.13	$0.077	$0.011	$0.088	$0.095	0.01	0.03	5100.13
TW422MAIN	T07A	TAXIWAY	P	AC	129,375	100	70	1.42	21.13	4.00	25.13	$0.080	$0.012	$0.092	$0.095	0.00	0.01	1620.18
TW422MAIN	T03C	TAXIWAY	P	AC	858,351	93	70	1.42	21.13	4.00	25.13	$0.080	$0.012	$0.092	$0.095	0.00	0.01	10749.27
TW624NORTH	T01A	TAXIWAY	S	AC	30,000	90	70	1.42	21.13	4.00	25.13	$0.080	$0.012	$0.092	$0.095	0.00	0.01	375.70
TW624NORTH	T06A	TAXIWAY	S	AC	30,000	85	70	1.42	21.13	3.00	24.13	$0.083	$0.012	$0.095	$0.095	(0.00)	(0.00)	(59.68)
TW624NORTH	T04A	TAXIWAY	S	AC	45,000	80	70	1.10	27.27	3.00	30.27	$0.066	$0.010	$0.076	$0.073	(0.00)	(0.01)	(356.76)
TW422MAIN	T09C	TAXIWAY	P	AC	153,750	75	70	1.10	27.27	2.00	29.27	$0.068	$0.010	$0.079	$0.073	(0.01)	(0.01)	(1610.71)
TW422MAIN	T10A	TAXIWAY	P	AC	170,625	70	70	1.10	27.27	2.00	29.27	$0.068	$0.010	$0.079	$0.073	(0.01)	(0.01)	0.00
TW624SOUTH	T04A	TAXIWAY	S	AC	30,000	68	70	1.10	27.27	2.00	29.27	$0.068	$0.010	$0.079	$0.073	(0.01)	(0.01)	0.00
																		$31,947

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APPENDIX B GLOSSARY

B-1 ACRONYMS.

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACN	Aircraft Classification Number
AMC	Air Mobility Command
ASTM	American Society for Testing and Materials
CATCODE	Category Code
CBR	California Bearing Ratio
CFME	Continuous Friction Measuring Equipment
CI	Condition Index
CIP	Common Installation Picture
CPE	Corrugated Polyethylene
DCP	Dynamic Cone Penetrometer
DoD	Department of Defense
EA	Engineering Assessment
EO	Executive Order
EUAC	Equivalent Uniform Annual Cost
FAA	Federal Aviation Administration
FAC	Facility Analysis Code
FARP	Forward Arming and Refueling Point
FCI	Facility Condition Index
FLIP	Flight Information Publications
FOD	Foreign Object Damage / Debris
FWD	Falling Weight Deflectometer
GIS	Geographic Information System

GPR	Ground-Penetrating Radar
GPS	Global Positioning System
HMA	Hot Mix Asphalt
HWD	Heavy Weight Deflectometer
ICAO	International Civil Aviation Organization
IDIQ	Indefinite Delivery / Indefinite Quantity
iNFADS	Navy Facility Assets Data Store
IRI	International Roughness Index
ISM	Impulse Stiffness Modulus
K	Modulus of Subgrade Reaction
km/h	Kilometers per Hour
LCD	Last Construction Date
m	Meter
M&R	Maintenance and Repair
mm	Millimeter
mph	Miles per Hour
O&M	Operations and Maintenance
OSD	Office of the Secretary of Defense
PCC	Portland Cement Concrete
PCI	Pavement Condition Index
PCN	Pavement Classification Number
PM	Preventive Maintenance
PMP	Pavement Management Plan
POC	Point of Contact
POL	Petroleum, Oil, Lubricants
PPD	Physical Property Data

PRV	Plant Replacement Value
ROI	Return on Investment
RPAD	Real Property Asset Database
RPSUID	Real Property Site Unique ID
RPUID	Real Property Site Unique ID
SCI	Structural Condition Index
SDDCTEA	Military Surface Deployment and Distribution Command Transportation Engineering Agency
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
SI	Structural Index
UFC	Unified Facilities Criteria
WBDG	Whole Building Design Guide

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APPENDIX C REFERENCES

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UFC 3-250-01, *Pavement Design for Roads and Parking Areas*

UFC 3-250-03, *Standard Practice Manual for Flexible Pavements*

UFC 3-250-04, *Standard Practice for Concrete Pavements*

UFC 3-250-07, *Standard Practice for Pavement Recycling*

UFC 3-250-08FA, *Standard Practice for Sealing Joints and Cracks in Rigid and Flexible Pavements*

UFC 3-260-01, *Airfield and Heliport Planning and Design*

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UFC 3-260-03, *Airfield Pavement Evaluation*

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https://nso.nato.int/nso/home/main/home

NATO STANDARD AEP-46, *ACN/PCN*

NATO STANAG 3634, *Runway Friction and Braking Conditions*

NATO Standard AATMP-13, *Runway Friction and Braking Conditions*

NATO STANAG 7131, *Aircraft Classification Number (ACN)/Pavement Classification Number (PCN)*

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AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

https://store.transportation.org/

AASHTO *Roadside Design Guide*

AASHTO *Guidelines for Geometric Design of Low-Volume Roads*

AASHTO *A Policy on Geometric Design of Highways and Streets*

AASHTO R 43, *Standard Practice for Quantifying Roughness of Pavements*

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

Aerodrome Design Manual, Part 3, Pavements, https://www.icao.int/

ASTM INTERNATIONAL

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