TSPWG 3-270-08.14-03
15 Oct 2019

TRI-SERVICE PAVEMENTS WORKING GROUP (TSPWG) MANUAL

Preventive Maintenance Plan (PMP) for Airfield Pavements

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TRI-SERVICE PAVEMENTS WORKING GROUP MANUAL (TSPWG M)

PREVENTIVE MAINTENANCE PLAN (PMP) FOR AIRFIELD PAVEMENTS

Indicate the preparing activity beside the Service responsible for preparing the document.

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	Date	Location

This TSPWG Manual supersedes ETL 14-03, dated MAY 2014.

FOREWORD

This Tri-Service Pavements Working Group Manual supplements guidance found in other Unified Facilities Criteria, Unified Facility Guide Specifications, Defense Logistics Agency Specifications, and Service specific publications. All construction outside of the United States 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 TSPWG Manual, the SOFA, the HNFA, and the BIA, as applicable. This ETL provides guidance on establishing and using a preventive maintenance plan (PMP) for airfield pavements. The information in this TSPWG Manual are referenced in technical publications found on the Whole Building Design Guide. It is not intended to take the place of service specific doctrine, technical orders (TOs), field manuals, technical manuals, handbooks, Tactic Techniques or Procedures (TTPs) or contract specifications but should be used along with these to help ensure pavements meet mission requirements.

TSPWG Manuals are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction, maintenance, repair, or operations. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of this document. Technical content of this TSPWG Manual is the responsibility of the Tri-Service Pavements Working Group (TSPWG). Defense agencies should contact the preparing activity for document interpretation. Send recommended changes with supporting rationale to the respective service TSPWG member.

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

- Whole Building Design Guide web site http://dod.wbdg.org/.

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TRI-SERVICE PAVEMENTS WORKING GROUP MANUAL (TSPWG M)
[NEW] SUMMARY SHEET

Document: TSPWG Manual 3-270-08.14-03, Preventive Maintenance Plan (PMP) for Airfield Pavements

Superseding: ETL 14-03, Preventive Maintenance Plan (PMP) for Airfield Pavements

Description: This manual provides guidance on establishing and using a preventive maintenance plan for airfield pavements.

Reasons for Document:

- To provide users with the tools need to develop a plan to sustain airfield pavements.

Impact: There is no cost impact. The following benefits should be realized.

- Supplemental information on the development of pavement maintenance plans will be available to all services.
- Maintenance and/or upgrading of this supplemental information will include inputs from all services**.**
- Implementation of this manual reduces lifecycle cost and down time of mission critical operating surfaces.

Unification Issues

None.

Note: The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Department of Defense (DOD).

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CHAPTER 1 INTRODUCTION

1-1 BACKGROUND.

Timely PM can extend pavement life, significantly reduce life-cycle cost, and decrease premature pavement failures. The full benefit of PM is not realized at installations due to inconsistent, inexact, and incomplete identification, planning, and execution of PM and a worst-first funding strategy. Improving the PM process optimizes operations at minimum cost, extends the life of airfield pavements, and assesses the risk of deferred funding. The PMP will help installations keep good pavement in good condition at minimal cost.

USAF ETL 14-3 provided guidance on the development of a PMP; however, USAF policy archived all USAF ETLs and moved relevant content to other documents. All DoD and NASA installations use PMPs to sustain Pavements. Although each organization may develop installation PMPs differently, most use key performance indicators. Most use Pavement Condition Index (PCI), foreign object damage (FOD) potential rating, friction, and structural capability, as key performance indicators. The targets for these key performance indicators define risk factors. Use these risk factors, in combination with knowledge of the mission requirements, to manage assets and activities to minimize the life-cycle cost and risk to the mission.

1-2 PURPOSE AND SCOPE.

This manual provides guidance on establishing and using a preventive maintenance plan (PMP) for airfield pavements. This manual provides continued access to the guidance in ETL 14-3 despite the Archiving of all USAF ETLs. The PMP provides the Installation pavement engineer with the necessary tools to establish a prioritized maintenance program based on condition and risk that will be defendable when advocating for funding at local or higher levels.

1-3 APPLICABILITY.

All DOD organizations and contractors responsible for planning, design, construction, sustainment, restoration, maintenance, operation, or repair of airfield pavements.

1-4 GENERAL BUILDING REQUIREMENTS.

Comply with UFC 1-200-01, *DoD Building Code (General Building Requirements)*. 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.

1-5 REFERENCES.

Appendix A 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.

1-6 GLOSSARY.

Appendix C contains acronyms, abbreviations, and terms.

CHAPTER 2 TOOLS FOR DEVELOPING THE AIRFIELD PMP

2-1 INTRODUCTION.

Appendix B contains guidance for the development of an installation level PMP for airfield pavements.

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APPENDIX A REFERENCES

AIR FORCE

AFI 32-1041, AIRFIELD PAVEMENT EVALUATION PROGRAM, HTTP://WWW.E-PUBLISHING.AF.MIL/

ASTM INTERNATIONAL

ASTM D5340, Airfield Pavement Condition Survey Procedures

FEDERAL AVIATION ADMINISTRATION (FAA)

FAA Advisory Circular (AC) 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces,

http://www.faa.gov/documentlibrary/media/advisory_circular/150-5320-12c/150_5320_12c.pdf

UNIFIED FACILITIES CRITERIA

http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

UFC 3-260-03, Airfield Pavement Evaluation

UFC 3-260-16FA, Design: Airfield Pavement Condition Survey Procedures

UFC 3-270-01 O&M MANUAL: ASPHALT AND CONCRETE PAVEMENT MAINTENANCE AND REPAIR

UFC 3-270-08, PAVEMENT MAINTENANCE MANAGEMENT

TRI-SERVICE PAVEMENTS WORKING GROUP MANUAL

TSPWG M 3-260-03.02-19, AIRFIELD PAVEMENT EVALUATION STANDARDS AND PROCEDURES

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APPENDIX B BEST PRACTICES

B-1 ARCHIVED USAF ETL 14-3.

A copy of the archived USAF ETL 14-3 Preventive Maintenance Plan (PMP) for Airfield Pavements is appended In the following pages.

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
TYNDALL AIR FORCE BASE FLORIDA

18 AUGUST 2014

FROM: AFCEC/DD
139 Barnes Drive, Suite 1
Tyndall AFB, FL 32403-5319

SUBJECT: **Engineering Technical Letter (ETL) 14-3: Preventive Maintenance Plan (PMP) for Airfield Pavements**

1. Purpose. This ETL provides guidance on establishing and using a preventive maintenance plan (PMP) for airfield pavements. The PMP provides the base pavement engineer with the necessary tools to establish a prioritized maintenance program based on condition and risk that will be defendable when advocating for funding at local or higher levels.

2. Application: All Department of Defense (DOD) organizations and contractors responsible for planning, design, construction, sustainment, restoration, maintenance, operation, or repair of airfield pavements.

2.1. Authority: Air Force policy directive (AFPD) 32-10, *Air Force Installations and Facilities*

2.2. Coordination: Major command (MAJCOM) pavement engineers

2.3. Effective Date: Immediately

2.4. Intended Users:

- Base pavement engineers
- Contractors performing design, construction, sustainment, restoration, maintenance, operation, or repair of airfield pavements, infrastructure, facilities, or equipment on airfields funded, managed, operated, maintained, or serviced by the Air Force or DOD
- Other organizations responsible for airfield maintenance

3. References.

3.1. DOD:

- Unified Facilities Criteria (UFC) 3-260-03, *Airfield Pavement Evaluation*, http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4
- UFC 3-260-16FA, *Design: Airfield Pavement Condition Survey Procedures*, http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

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3.2. Air Force:

- AFPD 32-10, *Air Force Installations and Facilities*, http://www.e-publishing.af.mil/
- Air Force instruction (AFI) 32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*, http://www.e-publishing.af.mil/
- AFI 32-1041, *Airfield Pavement Evaluation Program*, http://www.e-publishing.af.mil/
- ETL 02-19, *Airfield Pavement Evaluation Standards and Procedures*, http://www.wbdg.org/ccb/browse_cat.php?o=33&c=125
- ETL 11-26, *Using Asphalt Surface Treatments as Preventive Maintenance on Asphalt Airfield Pavements*, http://www.wbdg.org/ccb/browse_cat.php?o=33&c=125

3.3. ASTM International:

- ASTM D5340, *Airfield Pavement Condition Survey Procedures*

3.4. Federal Aviation Administration (FAA):

- FAA Advisory Circular (AC) 150/5320-12, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*, http://www.faa.gov/documentlibrary/media/advisory_circular/150-5320-12c/150_5320_12c.pdf

4. Acronyms.

AC - asphalt concrete
AFCEC - Air Force Civil Engineer Support Agency
AFI - Air Force instruction
AFPD - Air Force policy directive
AMP - Activity Management Plan
DOD - Department of Defense
ETL - Engineering Technical Letter
EUAC - equivalent uniform annual cost
FOD - foreign object damage
Ft - foot
ft^2 - square feet
LoS - levels of service
M&R - maintenance and repair
MAJCOM - major command
PACES - Parametric Cost Engineering System
PAVER - pavements management software
PCC - Portland cement concrete
PCI - pavement condition index
PM - preventive maintenance
PMP - preventive maintenance plan
SF - square foot
SF/Yr - square feet per year

sq ft	- square foot
SY	- square yard
UFC	- Unified Facilities Criteria

5. Definitions.

5.1. *Critical PCI*. The PCI value of a section at which the rate of deterioration significantly increases and return on investment of PM decreases. Critical PCI (or breakdown point) will depend on the pavement type, pavement use, and traffic level, and is unique for each base. Until the PAVER software is configured to calculate the critical PCI, the policy PCI of 70 will be the default critical PCI for primary pavements and 55 for secondary and tertiary pavements. In the future, PAVER will develop critical PCIs for runways, taxiways, aprons, overruns, shoulders, asphalt concrete (AC), and portland cement concrete (PCC) pavements.

5.2. *Global Preventive Maintenance (PM)*. Global PM is used to retard or slow pavement deterioration. Generally, global PM is effective at the beginning of pavement life and/or when climate-caused distresses have not started or, in some cases, the severity is low or medium. Global PM, like localized PM, may be performed in response to the appearance or progression of distress, but is more commonly performed on a recurring schedule (i.e., at set time intervals) without regard for the distresses present.

5.3. *Localized Preventive Maintenance (PM)*. Localized PM consists of maintenance actions performed on pavement at the location of individual distresses to slow down the rate of pavement deterioration. It differs from global PM in that it typically is not applied to pavement outside of the location of the distress, whereas global PM is applied to areas of the pavement that may not be distressed.

5.4. *Operational Maintenance*. Operational maintenance is also referred to as safety maintenance, stop-gap maintenance, and breakdown maintenance. Operational maintenance is performed to mitigate distresses on pavements that are below the critical PCI to keep them operationally safe for use.

5.5. *Pavement Condition Index (PCI)*. PCI is a numerical indicator between 0 and 100 that reflects the surface condition of the pavement.

5.6. *Policy PCI*. A project should be programmed before the pavement reaches these conditions:

- Sections with a PCI greater than or equal to 71 generally require minor maintenance and repair (M&R)
- Sections with a PCI of 56 to 70 generally require major and/or minor M&R
- Sections with a PCI of 41 to 55 generally require major and minor M&R or reconstruction
- Sections with a PCI of 26 to 40 generally require major repair or reconstruction
- Sections with a PCI less than or equal to 25 generally require reconstruction

5.7. *Preventive Maintenance (PM).* PM is a program of activities that preserves the investment in pavements, reduces the rate of degradation due to specific distresses, extends pavement life, enhances pavement performance, and reduces mission impact. PM includes localized PM and global PM. Both are performed on pavements that are above the critical PCI and are intended to maintain good pavements in good condition at minimal cost.

5.8. *Preventive Maintenance Plan (PMP).*

5.8.1. PMP is a plan for sustainment funds, i.e., a document that informs base leadership:

- When maintenance is needed
- What maintenance activities are to be performed
- How the work is to be accomplished
- What is the cost for the work and what is the risk if the work is not accomplished

5.8.2. As a minimum, the PMP should include a prioritized list of projects by contract and in-house with location, quantity, estimated cost, and the risk associated with not performing the work.

5.9. *Primary Pavements.* 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 used by aircraft on a daily basis or frequently used transient taxiways and parking areas are considered primary pavements.

5.10. *Rate of Pavement Deterioration.* This is the rate at which a specific pavement at a specific location deteriorates over time. This rate is dependent on climatic conditions, pavement use, and traffic level.

5.11. *Secondary Pavements.* 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 used to test aircraft arresting gear). In general, any pavements that are not in daily use by aircraft are secondary pavements.

5.12. *Tertiary Pavements.* 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 for takeoff 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.

5.13. *Unused Pavements.* Unused pavements include any pavements that are inactive, abandoned, or scheduled for demolition.

6. Background. Timely PM can extend pavement life, significantly reduce life-cycle cost, and decrease premature pavement failures. However, the full benefit of PM is not fully realized at most Air Force bases, partially due to inconsistent, inexact, and incomplete identification, planning, and execution of PM and a worst-first funding strategy. Improving the PM process will help optimize operations at minimum cost, extend the life of the airfield pavements, and provide commanders with a risk assessment for deferred funding. The PMP will help bases keep good pavement in good condition at minimal cost.

7. Levels of Service (LoS).

7.1. The levels of service (LoS) for airfields is to provide pavements that support the Air Force mission by balancing risk to operations with resource constraints. The goal is to ensure that the airfield pavements are managed in the most effective, efficient, and sustainable way; to ensure that this mission-critical infrastructure is maintained in a state and condition, and is managed in such a manner, so as to minimize the potential for it to adversely impact flight and space operations and readiness at any time; to minimize deferred maintenance of assets that are critical to the mission; and to reduce the amount of deferred maintenance of other assets. LoS criteria are evolving and remain subject to revision. Consult the current Air Force Transportation Network Activity Management Plan (AMP) and Airfield Pavements AMP for the latest revisions.

7.2. The four key performance indicators are PCI, foreign object damage (FOD) potential rating, friction, and structural capability. The targets for these four key performance indicators are used to define risk factors. These risk factors, in combination with knowledge of the mission requirements, are used to manage assets and activities to minimize the life-cycle cost and risk to the mission. Key performance indicator (KPI) criteria are evolving and remain subject to revision. Consult the current Air Force Transportation Network AMP for the latest revisions.

8. Tools for Developing the Airfield PMP. There are several existing programs or reports that can help base personnel develop the airfield PMP. These include the PAVER Pavement Management Program, condition survey report, structural pavement evaluation report, runway friction characteristics evaluation report, and Parametric Cost Engineering System (PACES). PAVER will continue to be the standard pavement management program used by the Air Force and will be modified to include the criteria in this ETL. The condition survey, structural evaluation, and friction characteristics reports are discussed in AFI 32-1041, *Airfield Pavement Evaluation Program*.

8.1. PAVER Pavement Management Program.

8.1.1. Background. DOD and numerous other agencies use PAVER, a computerized pavement maintenance system, to manage both airfield and road pavements. Basic inputs are type, density, and severity of distress and policies for M&R. Procedures for determining these inputs are contained in ASTM D5340, *Airfield Pavement Condition Survey Procedures*. PAVER is based on the concept that timely and appropriate M&R procedures and techniques provide the best pavements at least life-cycle cost, as depicted in Figure 1.

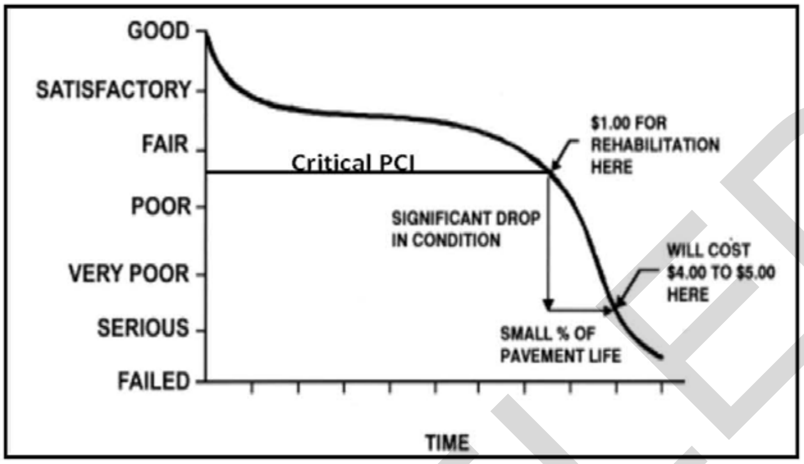

Figure 1. Pavement Life Cycle

8.1.2. PAVER Capabilities.

8.1.2.1. Pavement Condition: Computes the PCI for each section and branch. PCI is a numerical rating (on a scale of 0 to 100) determined by a visual pavement survey based on procedures in ASTM D5340. The standard PCI scale and the simplified PCI scale used in the structural evaluation reports are shown in Figure 2.

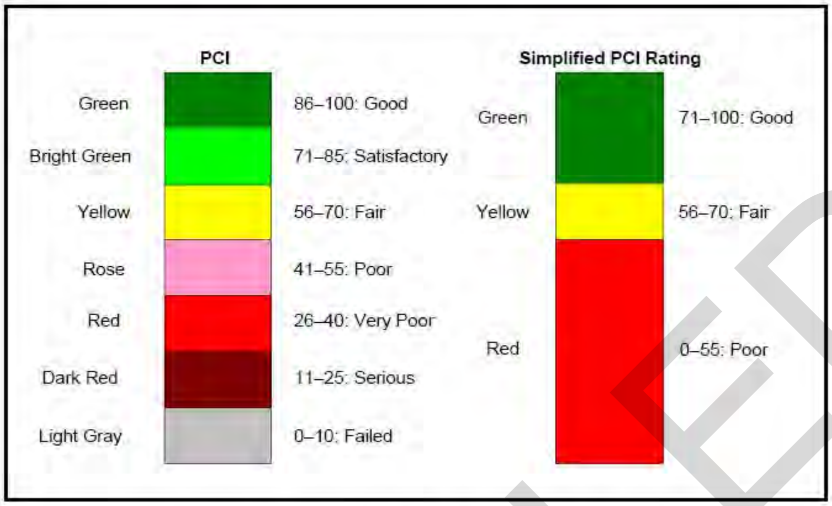

Figure 2. Standard and Simplified PCI Scale

8.1.2.2. Deterioration Rates: Predicts future condition of pavements based on a set of family curves developed specifically for the base, as depicted in Figure 3. The middle green curve represents the rate of deterioration; the outside red curves represent outlier boundaries. The red lines that form the envelope of the prediction curve represent 1.96 Sigma on each side of the prediction curve. This equates to 95 percent of the data points being within the envelope.

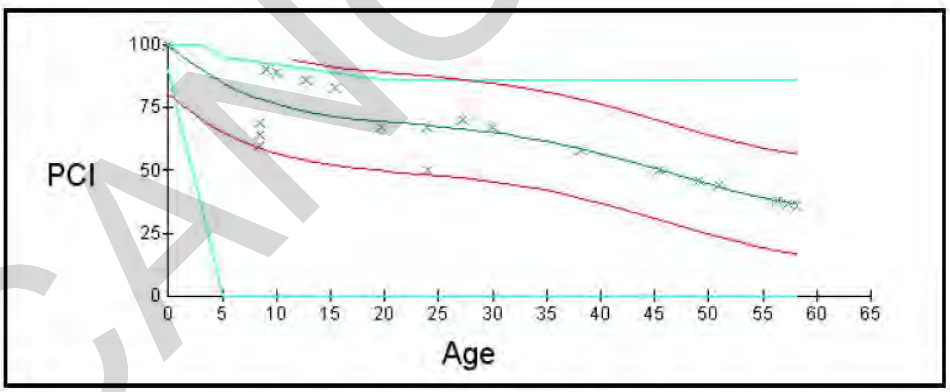

Figure 3. Typical Family Curve

8.1.2.3. Work Plans: Develops work plans to maintain and repair each section. Work plans are based on the type and severity of distress, appropriate repair procedure, and generally follow the guidance in this ETL.

8.1.2.4. Develop Budgets: PAVER currently develops budget requirements for several standard scenarios. PAVER will be modified to incorporate recommendations in this ETL.

8.2. Pavement Condition Index Survey Report. This is the primary report the base should use to develop the pavement PMP. AFCEC manages the Air Force pavement condition survey program and provides an on-call service for accomplishing condition surveys by contract. Condition surveys are required every five years. The survey is a visual assessment and uses standard procedures as detailed in ASTM D5340 for airfield pavements. Results of the survey, data analysis, and recommendations are documented in the Pavement Condition Index Survey Report.

8.2.1. Airfield Pavement Maps. These maps are segmented into unique pavement areas based on use, surface type, construction history, pavement structure cross-section, functional use and traffic area, and pavement condition. These unique areas are designated as branches and sections and defined in AFI 32-1041.

8.2.2. PAVER PMPs. PAVER PMPs develop M&R work plans based on budget scenarios and cost-by-condition M&R policies (i.e., M&R business rules) for localized stopgap M&R (safety M&R), localized preventive M/R (when PCI is above the policy PCI), and major M&R (when PCI is at or below the policy PCI). The work plans consist of project costs over seven years. Generally, the PM requirements are contained in the localized preventive M&R projects. For example, to develop a single joint seal project to replace sealant in more than one section, the base will have to extract the joint seal requirements from each section and combine them to form a single project. A new PAVER report is being developed to help define the work requirements for projects; in the interim, PM requirements may be extracted and managed on a spreadsheet.

8.3. Structural Pavement Evaluation Report. The purpose of a structural pavement evaluation is to determine the capability of the airfield to support aircraft. Structural evaluations are generally performed every seven to ten years by AFCEC's Pavement Evaluation Team. The AFCEC Pavement Evaluation Team performs detailed testing using non-destructive equipment or an automated or manual dynamic cone penetrometer. The airfield pavement is segmented into branches and sections in accordance with AFI 32-1041 so sections and branches should correspond with those in the condition survey report. The findings of the field testing and inspection are analyzed and documented in the pavement evaluation report. Structural deficiencies and load-related problems are discussed and recommendations for M&R are included.

8.4. Runway Friction Characteristics Evaluation Report. This report, prepared by AFCEC, analyzes and documents the test results using criteria and procedures outlined in AFI 32-1041 and FAA AC 150/5320-12, *Measurement, Construction, and*

Maintenance of Skid-Resistant Airport Pavement Surfaces. The report recommends M&R options to correct deficiencies in friction characteristics.

8.5. Parametric Cost Engineering System (PACES). PACES is a parametric cost-estimating system used primarily for developing programming or budgetary cost estimates in support of the military construction (MILCON) program. It is produced by AECOM and used extensively by the Air Force, Navy, and Army. The PACES system uses parametric methodology adjusting cost models for estimating project costs. The cost models are based on generic engineering solutions for building and site work projects, technologies, and processes. The generic engineering solutions are derived from historical project information, government laboratories, construction management agencies, vendors, contractors, and engineering analyses. When the user creates an estimate in PACES they can tailor the generic engineering solutions to reflect specific quantities of work and information is priced using current cost data. Costs are automatically adjusted for the project location and markups and escalation are automatically applied. PACES is not a design program but can be used to estimate the cost to construct new or reconstruct existing airfield pavements. The program will estimate a theoretical cross-section (e.g., surface, base, subbase) for rigid and flexible pavements, or a variety of overlays. It can estimate the required thickness of each layer in the pavement structure or thickness of the layers can be assigned. Quantities of materials are computed for each layer.

8.6. Other Reports. Other reports such as Airfield Operations Certification Inspection (AOCI) reports and Airfield Operations Board (AOB) minutes, signed by a responsible base official, also provide additional information that should be used to develop an airfield PMP.

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

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

9.2. Team Composition. The assessment team should consist of experienced personnel from airfield operations and civil engineering. At a minimum, civil engineering should be represented by the pavements engineer and a person from the pavement and equipment shop.

9.3. Procedure. The assessment process is a three-part procedure that involves gathering requirements from the various tools, visually assessing the pavements to validate known requirements and identify new requirements, and developing project scopes and costs for airfield pavements. The requirements and projects applicable to PM will be extracted for the PMP.

9.3.1. Gathering Requirements from Various Tools. Review the latest airfield pavement condition index survey report. This report is the primary source document for developing the PMP. Review the condition of each section, including type, severity, and quantity of each distress. Review the recommended M&R for the various budget scenarios and determine which requirements need M&R solutions. Divide it into two sets of requirements: PM and major M&R. (In the future, PAVER will provide the two sets of requirements; currently, it may have to be done manually on a spreadsheet [see Figure 4]). Review existing documents from other tools in paragraph 8 for additional requirements. Review the history of each feature and any completed maintenance.

					Linear Crack Quantities (LF)/Cost					Joint Seal Quantities (LF)/Cost					Total Section Cost
Pavement	Branch	Section	PCI	Area (SF)	High Linear Cr	Med Linear Cr	Unit Cost	Total Cost	Cost/SF	High Joint Seal	Med Joint Seal	Unit Cost	Total Cost	Cost/SF	
Apron	East Apron	A02B	70	1,212,596		10	$1.94	$19	$0.0000		10	$3.77	$38	$0.0000	$57
Apron	Hangar Access Apron	A15B	82	6,475			$1.94	$0	$0.0000			$3.77	$0	$0.0000	$0
Apron	Hangar Access Apron	A16B5	93	3,600	25	75	$1.94	$194	$0.0539	200	400	$3.77	$2,262	$0.6283	$2,456
Apron	Northwest Apron	A08B2	88	14,400	50	50	$1.94	$194	$0.0135	400	200	$3.77	$2,262	$0.1571	$2,456
Apron	Power Check Pad	A12B	98	63,140	25	75	$1.94	$194	$0.0031	200	400	$3.77	$2,262	$0.0358	$2,456
Apron	South Apron	A05B1	80	1,155,150	18,000	36,500	$1.94	$105,730	$0.0915	13,500	41,000	$3.77	$205,465	$0.1779	$311,195
Apron	South Apron	A05B2	93	111,500	1,500	3,500	$1.94	$9,700	$0.0870	1,300	4,000	$3.77	$19,981	$0.1792	$29,681
Apron	South Apron	A05B3	83	282,750	4,400	9,000	$1.94	$25,996	$0.0919	3,300	10,000	$3.77	$50,141	$0.1773	$76,137
Apron	South Apron	A05B4	100	15,750	300	600	$1.94	$1,746	$0.1109	200	500	$3.77	$2,639	$0.1676	$4,385
Apron	South Apron	A13B	97	522,000	8,000	16,500	$1.94	$47,530	$0.0911	6,100	18,500	$3.77	$92,742	$0.1777	$140,272
Apron	South Apron	A14B1	97	132,000	2,000	4,000	$1.94	$11,640	$0.0882	1,500	4,500	$3.77	$22,620	$0.1714	$34,260
Apron	South Apron	A14B2	99	41,250	650	1,300	$1.94	$3,783	$0.0917	500	1,500	$3.77	$7,540	$0.1828	$11,323
Apron	Southeast Apron	A03B	86	512,720		22	$1.94	$43	$0.0001			$3.77	$0	$0.0000	$43
Apron	Southwest Apron	A09B1	69	463,036		50	$1.94	$97	$0.0002			$3.77	$0	$0.0000	$97
Apron	Southwest Apron	A09B2	82	14,830			$1.94	$0	$0.0000		27	$3.77	$102	$0.0069	$102
Apron	TW A1 Apron	A01B1	70	38,925		38	$1.94	$74	$0.0019			$3.77	$0	$0.0000	$74
Apron	TW A1 Apron	A01B2	93	11,856	200	558	$1.94	$1,471	$0.1240	500	1,634	$3.77	$8,045	$0.6786	$9,516
	TOTALS				35,150	72,278		$208,410		27,700	82,671		$416,099		$624,509
	Cost by high distress							$68,191					$104,429		$172,620
	Cost by medium distress							$140,219					$311,670		$451,889

Figure 4. Distress Quantities/Cost Estimate – Total by Pavement Type

9.3.2. Perform Visual Assessment of Airfield Pavements.

9.3.2.1. The objective is for the base assessment team to validate and identify requirements, determine cost-effective engineering solutions, and organize the requirements into manageable/executable projects to be accomplished in-house or by contract. Included in this assessment are the condition of pavement markings (e.g., faded, thickness, chipping), rubber deposit buildup (e.g., friction issue, obscured markings), surface drainage (e.g., ponding, reverse drainage to pavements), and subsurface drainage (edge drainage systems). Some factors for developing the projects include type of distress, recommended maintenance procedure, location, and quantity. Visual assessments should be done by walking the candidate sections. The assessment team should assess the pavements at least once per year.

9.3.2.2. Sometimes the pavement condition index survey data may be outdated, the rate of deterioration is faster than anticipated, or the base has reason to question the validity of the data. A cursory PCI survey, similar to the cursory PCI performed by the AFCEC Pavement Evaluation Team, may be helpful. Generally, the cursory PCI survey procedure follows the procedures outlined in ASTM D5340 or ETL 02-19, *Airfield Pavement Evaluation Standards and Procedures*; however, engineering judgment is used to determine the number of sample units to survey. Typically, fewer sample units will be surveyed. Forms and tables to assist in conducting a cursory PCI survey are in Attachment 1. These include:

- Cursory PCI survey procedures
- PCI survey sheets for AC and PCC pavements (show rubber buildup, etc., in notes)
- Density/deduct worksheets for AC and PCC
- Corrected deduct value curves for AC and PCC
- Corrected deduct value tables for AC and PCC

10. Preventive Maintenance Plan (PMP). Applying PM at the correct time is often cited as a key to cost-effectively extending pavement serviceability. If a PM action is applied too early, funds are expended on pavements that do not require treatment or do not demonstrate sufficient benefit to justify the costs. If a PM action is applied too late, pavements have deteriorated to the point that the treatment is ineffective or does not add sufficient life to justify the cost. The best time to apply PM is before the pavement reaches the critical PCI. This is the optimum condition to minimize risk to the mission and life-cycle cost, as noted in the low airfield risk factor (see AFI 32-1041, Chapter 9). PM is intended to maintain pavements in good condition, not upgrade them to good condition. For example, joint and crack sealing performed as a PM action limits water infiltration into the underlying base, subbase, or subgrade, which can lead to freeze-thaw-related damage, saturation, or other weakening effects that accelerate deterioration or premature failure. Sealing also prevents incompressible debris from entering and accumulating in joints and cracks and restricting normal opening and closing in response to temperature and moisture changes. The restrictions create high stresses that can cause spalling and FOD. Once the critical PCI is reached for a pavement section, operational maintenance actions (or breakdown maintenance) should only be taken to keep the pavement operationally safe. An example would be an urgent repair of a spall with a high-severity FOD potential. At that point in the pavement's life major rehabilitation should be programmed for the pavement. The charts in Figures 5 and 6 reflect historical Air Force maintenance cost data compared to PCI to illustrate the critical PCI concept. For an adequately designed and constructed pavement there is a fairly consistent pattern to distress development and to the sequence of treatments intended to address the distresses at various points in the deterioration cycle. In this process, the current and historical conditions of the airfield pavement are first established through condition surveys and the assessment process, as noted above. A preliminary list of projects that best address the deficiencies of the existing pavement is then developed. The candidate treatments are evaluated according to their ability to satisfy performance needs and the economic and construction constraints of the PM action. A final list of projects is generated and these projects are analyzed for risk, service life, cost-effectiveness, and other considerations to arrive at a prioritized list to maintain the pavement. Two important considerations in the identification of PM actions are the rate of deterioration and the time lapse from when a PM action is planned to when it is executed. Pavements showing abnormally high reductions in condition are likely being affected by structural weakness or design/construction/material deficiencies that could greatly limit the effectiveness of a PM action to extend pavement life. If three years or more have elapsed from the time a

PM action was planned, the condition of the pavement may have changed enough to warrant a re-assessment of the PM action.

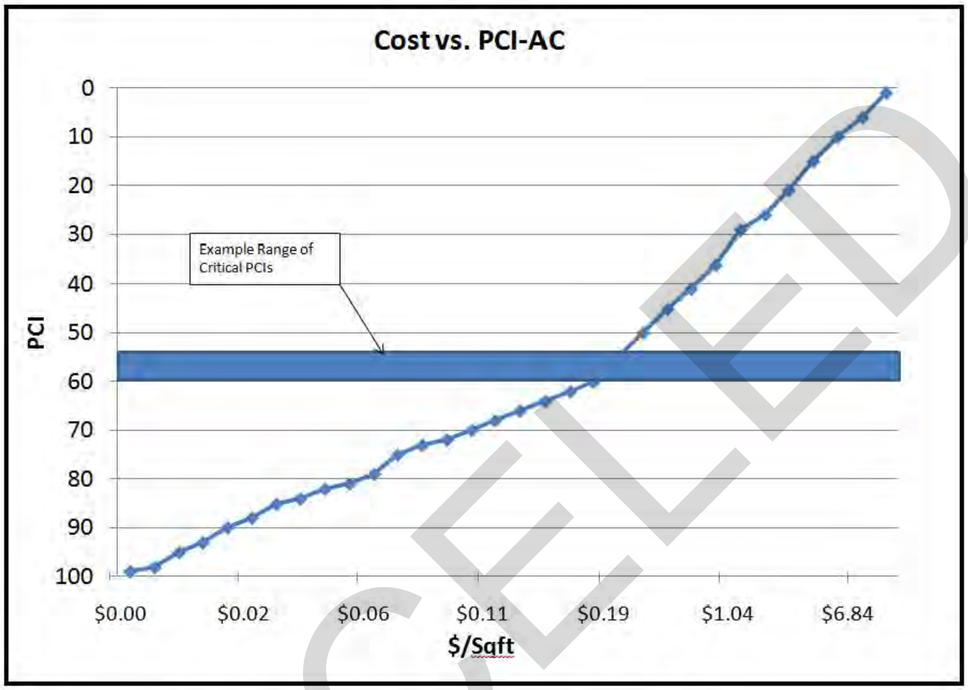

Figure 5. AC Airfield Pavements - Cost vs. PCI

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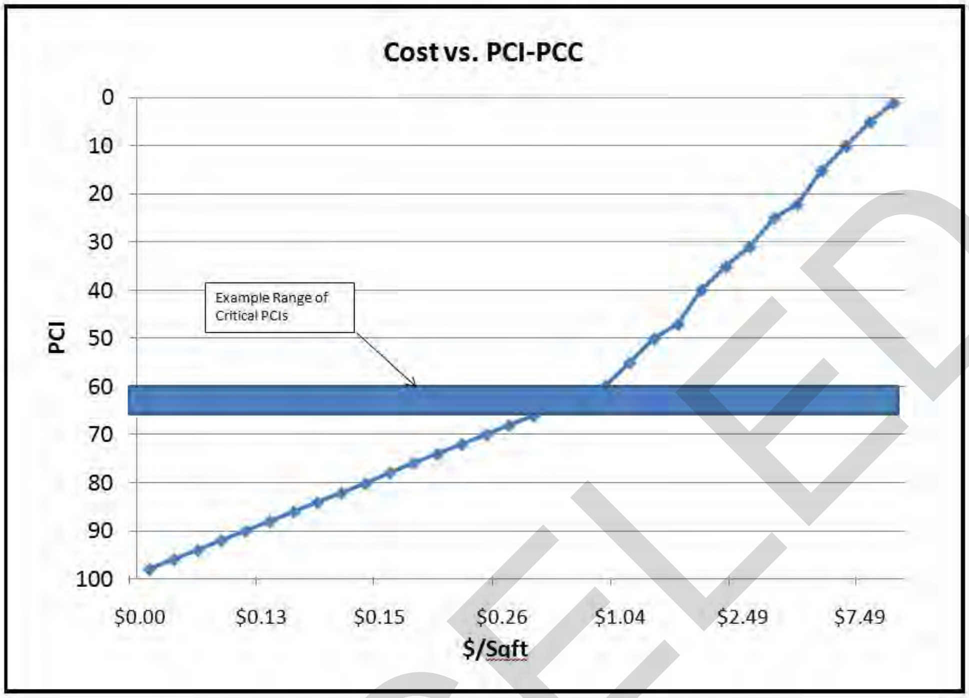

Figure 6. PCC Airfield Pavements – Cost vs. PCI

10.1. Preferred Maintenance Actions.

10.1.1. Localized Maintenance. Since pavement maintenance actions address pavement deficiencies to varying degrees and no one pavement maintenance action is best suited for all conditions, a guideline is needed that matches pavement maintenance action capabilities with existing deficiencies. The Air Force has developed recommended localized M&R actions used to mitigate distresses and preserve airfield pavements above the critical PCI, as indicated in Tables 1 and 2. These PM actions also consider the severity and extent of each observed distress. For example, using the PCI pavement distress evaluation terminology, the occurrence of joint seal damage in PCC pavements at medium or high severity triggers the need for joint sealing. It should be noted that the PM actions are for planning purposes; a detailed engineering analysis is required for project development, which may include other PM options.

Table 1. Localized Maintenance Actions for AC Pavement

Distress	Description	Distress Severity	Recommended PM	Work Unit
41	Alligator Cr	High	Patching - AC Deep	SqFt
41	Alligator Cr	Medium	Patching - AC Deep	SqFt
41	Alligator Cr	Low	Surface Crack Seal	SqFt
42	Bleeding	N/A	Do Nothing	
43	Block Cr	High	Patching - AC Shallow	SqFt
43	Block Cr	Medium	Crack Sealing - AC	Ft
43	Block Cr	Low	Do Nothing	
44	Corrugation	High	Patching - AC Shallow	SqFt
44	Corrugation	Medium	Grinding/Milling	SqFt
44	Corrugation	Low	Do Nothing	
45	Depression	High	Patching - AC Deep	SqFt
45	Depression	Medium	Patching - AC Deep	SqFt
45	Depression	Low	Do Nothing	SqFt
46	Jet Blast	N/A	Do Nothing	
47	Jt Ref. Cr	High	Crack Sealing - AC	Ft
47	Jt Ref. Cr	Medium	Crack Sealing - AC	Ft
47	Jt Ref. Cr	Low	Do Nothing	
48	L & T Cr	High	Crack Sealing - AC	Ft
48	L & T Cr	Medium	Crack Sealing - AC	Ft
48	L & T Cr	Low	Do Nothing	
49	Oil Spillage	N/A	Patching - AC Shallow	SqFt
50	Patching	High	Patching - AC Deep	SqFt
50	Patching	Medium	Patching - AC Deep	SqFt
50	Patching	Low	Do Nothing	
51	Polished Agg	N/A	Do Nothing	
52	Raveling	High	Patching - AC Shallow	SqFt
52	Raveling	Medium	Do Nothing	
53	Rutting	High	Patching - AC Deep	SqFt
53	Rutting	Medium	Patching - AC Deep	SqFt
53	Rutting	Low	Do Nothing	
54	Shoving	High	Patching - AC Deep	SqFt
54	Shoving	Medium	Grinding/Milling	SqFt
54	Shoving	Low	Do Nothing	
55	Slippage Cr	N/A	Patching - AC Shallow	SqFt
56	Swelling	High	Patching - AC Deep	SqFt

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Distress	Description	Distress Severity	Recommended PM	Work Unit
56	Swelling	Medium	Patching - AC Deep	SqFt
56	Swelling	Low	Do Nothing	
57	Weathering	High	Patching - AC Shallow	SqFt
57	Weathering	Medium	Do Nothing	
57	Weathering	Low	Do Nothing	
Notes: *Patching - AC Shallow* refers to replacing the deteriorated area of the pavement surface *Patching - AC Deep* refers to replacing the deteriorated area of the surface, base, and subbase(s)				

Table 2. Localized Maintenance Actions for PCC Pavements

Distress	Description	Distress Severity	Recommended PM	Work Unit
61	Blow-Up	High	Slab Replacement	SqFt
61	Blow-Up	Medium	Patching - PCC Full Depth	SqFt
61	Blow-Up	Low	Patching - PCC Partial Depth	SqFt
62	Corner Break	High	Patching - PCC Full Depth	SqFt
62	Corner Break	Medium	Patching - PCC Full Depth	SqFt
62	Corner Break	Low	Crack Sealing - PCC	Ft
63	Linear Cr	High	Patching - PCC Partial Depth	SqFt
63	Linear Cr	Medium	Crack Sealing - PCC	Ft
63	Linear Cr	Low	Do Nothing	
64	Durabil. Cr	High	Slab Replacement	SqFt
64	Durabil. Cr	Medium	Patching - PCC Full Depth	SqFt
64	Durabil. Cr	Low	Do Nothing	
65	Jt Seal Dmg	High	Replace Joint Seal	Ft
65	Jt Seal Dmg	Medium	Replace Joint Seal	Ft
65	Jt Seal Dmg	Low	Do Nothing	
66	Small Patch	High	Patching - PCC Partial Depth	SqFt
66	Small Patch	Medium	Patching - PCC Partial Depth	SqFt
66	Small Patch	Low	Do Nothing	
67	Large Patch	High	Patching - PCC Full Depth	SqFt
67	Large Patch	Medium	Patching - PCC Partial Depth	SqFt
67	Large Patch	Low	Do Nothing	
68	Popouts	N/A	Do Nothing	
69	Pumping	N/A	Underseal and Replace Joint Seal	Ft

Distress	Description	Distress Severity	Recommended PM	Work Unit
70	Scaling	High	Slab Replacement - PCC	SqFt
70	Scaling	Medium	Patching - PCC Partial Depth	SqFt
70	Scaling	Low	Do Nothing	
71	Faulting	High	Grinding	SqFt
71	Faulting	Medium	Grinding	SqFt
71	Faulting	Low	Do Nothing	
72	Shat. Slab	High	Slab Replacement - PCC	SqFt
72	Shat. Slab	Medium	Slab Replacement - PCC	SqFt
72	Shat. Slab	Low	Crack Sealing - PCC	Ft
73	Shrinkage Cr	N/A	Do Nothing	
74	Joint Spall	High	Patching - PCC Partial Depth	SqFt
74	Joint Spall	Medium	Patching - PCC Partial Depth	SqFt
74	Joint Spall	Low	Crack Sealing - PCC	Ft
75	Corner Spall	High	Patching - PCC Partial Depth	SqFt
75	Corner Spall	Medium	Patching - PCC Partial Depth	SqFt
75	Corner Spall	Low	Crack Sealing - PCC	Ft
76	ASR	High	Slab Replacement - PCC	SqFt
76	ASR	Medium	Patching - PCC Partial Depth	SqFt
76	ASR	Low	Do Nothing	

10.1.2. Global PM. Global PM is used to retard or delay large-scale pavement deterioration. Currently, global PM for the Air Force is limited to applying surface treatments to asphalt surfaces. (See ETL 11-26, *Using Asphalt Surface Treatments as Preventive Maintenance on Asphalt Airfield Pavements*, for applicability and uses for surface treatments.) For this ETL, surface treatments are divided into two general applications: fog seals/rejuvenators and slurry seals/microsurfacing. When determining the frequency of global PM, the pavement's condition should serve as the primary determining factor. Generally, global PM is effective at the beginning of pavement life and/or when the distress severity is low. When used correctly, global PM prolongs pavement service life but the increase is difficult to quantify because of the need for repeated treatments on a routine cycle. Global PM, however, should still be considered as a routine PM alternative to extend pavement service life.

10.2. Project Planning. The exact extent of maintenance work is determined at the project level. Since PAVER uses standard Air Force maintenance actions that match the distresses with M&R treatments, it should provide the framework for establishing projects. It is important to remember that PAVER establishes quantities from the samples used in the survey. For example, the existence of the eleven corner breaks was estimated by sampling (and not by an actual field count) and should be verified by a detailed survey on the project level during the visual assessment or a follow-up

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project definition visual assessment. The selection of sections for maintenance actions should not be done using a "worst condition first" approach, but by selecting sections where a maintenance action would be most cost-effective over the life of the pavement. It should be cautioned again that to apply maintenance treatments to low distress levels may cause the pricing of the PM to be beyond affordability. As a general guideline, low distresses should be monitored and included in the pavement management plan, medium distresses should be programmed to be executed within the next two years, and high distresses should be an immediate action. Projects can be developed either by airfield area (e.g., all PM for runway) or by distress (e.g., replace joint seals on the runway and aprons). At this point, engineering judgment is required to develop projects considering several other factors. These factors include the time of year planned for the action, ongoing airfield operations (mission impact), availability of work force (contract/in-house), environmental considerations, and economic or financial constraints. For example, a PCC apron section has joint seal damage that equates to 15 percent of the total linear feet of joints having a high-distress density and 40 percent of the total linear feet of the joints having a medium-distress density. Rather than replacing only the damaged joint sealant, it would be more cost-effective and practical to replace all the joint sealant in the section; consequently, the project would be developed accordingly. The key is to develop projects that are executable within the physical and financial constraints at the location on the airfield. Creating large/high-cost projects requiring Air Force/MAJCOM-level approval defeats the intent of a PMP.

10.3. Project Delivery. As part of the PMP, projects should be identified with the intended method of delivery of the maintenance treatments either by contract or in-house. There is not a preferred option for either in-house or contract. Project delivery should be based on scope, complexity, timing, and local historical preferences. It would not be unusual for the PMP to include projects for both in-house and contract accomplishment. There is a time factor that should be included in both options that should be reflected in the PMP. For in-house accomplishment, time should be allowed for the project to be worked into the schedule and for delivery of materials. For contract, accomplishment time should be allowed for the procurement action or negotiations.

10.4. Risk Analysis. A key component of the PMP is the risk analysis that calculates the loss of service life and cost of deferred rehabilitation. The methodology in Attachment 2 shows the impact of deferring maintenance and establishes a starting point for project prioritization. If the PCI for a section is below the critical PCI, a risk analysis for that section does not need to be performed; at that stage only undertake maintenance actions needed to keep the pavement operational.

10.5. Priorities. Prioritizing projects requires balancing the cost, mission impact, and risks to create a sustainable airfield over time. While pavement condition is a factor, PM projects should not typically be prioritized by a "worst condition first" approach. Ideally, projects should be prioritized based on life-cycle cost, with the goal of keeping the good pavements good at a minimal cost. For example, the pavement with the highest PCI may be the top priority because of the gain in service life for the minimal cost invested. The results of the risk analysis should be the starting point for project prioritization. Consideration should then be given to use of pavement (primary, secondary, tertiary), mission impact, and other factors unique to the location. A prioritization procedure example is shown in Table 3. A detailed example analysis is included in Attachment 3, Tab G.

Table 3. Prioritization Procedure Example

1 Project	2 Cost	3 Risk Years	4 Risk Years Score	5 Cost Risk	6 Cost Risk Score	7 Mission Impact	8 Mission Impact Score	9 Use	10 Use Score	11 Location	12 Location Score	13 Total Score
						1	100					
						2	95					
						3	90					
						4	85					
						5	80					

Column 1—Name of Project	e.g., "Joint Seal Runway"
Column 2—Cost	Estimated cost to complete the project
Column 3—Risk Years	Computed using Attachment 2, Risk Analysis Procedures
Column 4—Risk Years Score	Rank order by either years of life gained from completion of the PM project or years of life lost by not completing the PM project (be consistent). The largest years are given 100 points and reduced by 5 points down the list
Column 5—Cost Risk	Computed using Attachment 2, Risk Analysis Procedures
Column 6—Cost Risk Score	Rank order by largest cost in pavement life, with the highest cost given 100 points and reduced by 5 points down the list
Column 7—Mission Impact	Rank order to mission impact if pavement sections are closed
Column 8—Mission Impact Score	Priority #1 = 100 points; remainder reduced by 5 points down the list
Column 9—Use	Runway, taxiway, apron, overrun and shoulder
Column 10—Use Score	Runway = 80 points ,taxiway= 50 points, apron = 30 points, overrun and shoulder = 10 points
Column 11—Location	Primary, secondary, tertiary
Column 12—Location Score	Primary = 50 points, secondary = 25 points, tertiary= 10 points
Column 13—Total Score	Sum of columns 4,6,8,10 and 12

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10.6. Format. The PMP should address each topic in this ETL, to include, as a minimum, tools used; plan, timing and results of inspections; and explanation of procedures to develop a finalized project list. The PMP should be updated annually. An example PMP is shown in Attachment 3.

11. Approval. The annual PMP should be approved by the base civil engineer and should be available for review by the MAJCOM. All projects (completed and programmed) should be entered in the current Air Force data system and identified in the AMP process.

12. Point of Contact. Recommendations for improvements to this ETL are encouraged and should be furnished to the Pavements Engineer, AFCEC/COSC, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32408-5319, DSN 523-6439, commercial (850) 283-6439, e-mail AFCEC.RBC@tyndall.af.mil.

ANTHONY A. HIGDON, Colonel, USAF
Deputy Director

4 Atchs
1. Cursory PCI Forms
2. Risk Analysis Procedures
3. Example Preventive Maintenance Plan
4. Distribution List

CURSORY PCI FORMS

Atch 1
(1 of 9)

Flexible Pavement
Pavement Condition Index
Data Sheets

Airfield Pavement Evaluation

Cursory PCI Survey
Performing the PCI

- Step 1 Divide the Airfield into Sections
- Step 2 Subdivide Each Section into Sample Units
- Step 3 Inspect Randomly Selected Sample Units
- Step 4 Determine Deduct Values for All Distresses
- Step 5 Compute Total Deduct Value for Sample
- Step 6 Determine Max Corrected Deduct Value
- Step 7 Compute PCI for Each Sample
- Step 8 Compute PCI for Entire Section

Standard Sample Sizes
(Must adjust densities if other than standard sizes)

ACC: 5,000 Contiguous Square Feet
(± 2,000 ft² if section is not evenly divided by 5,000)

For Cursory Evaluations
Number of Samples to Survey

If section is size of 1 to 5 Samples, survey 1 sample unit
If section is size of 6 to 10 Samples, survey 2 sample units
If section is size of 11 to 15 Samples, survey 3 sample units
If section is size of 16 to 40 Samples, survey 4 sample units
If section is greater than size of 40 Samples, survey 10% of the sample units
Average the PCIs of all samples surveyed in a given section to determine the overall section PCI

Atch 1
(2 of 9)

Flexible Pavement PCI

Section # and Sample #:

Description:

No.	Distress	Severity	Criteria	TOTAL	% DENSITY	DEDUCT VALUE
41	ALLIGATOR CRACKING (SF)	L	Fine parallel cracks, light FOD			
		M	Well defined pattern, some FOD			
		H	Well defined and spalled, some moving			
42	BLEEDING (SF)	N/A	only skid problem			
43	BLOCK CRACKING (SF) 1'x1' to 10'x10'	L	< 1/4", no FOD, light spall			
		M	> 1/4", some FOD, moderate spall			
		H	> 1/4", definite FOD, severe spall			
44	CORRUGATION (SF) Affect on Ride Quality	L	< 1/4" max, < 1/2" 5ft span			
		M	> 1/4" to 1/2" max, < 1/2" to 1" 5ft span			
		H	> 1/2" an any, > 1" 5ft span			
45	DEPRESSION (SF) Affect on Ride Quality and Hydroplaning Potential	L	1/8" to 1/2" max, 1/2" to 1" 5ft span			
		M	1/2" to 1" max, 1" to 2" 5ft span			
		H	> 1" max, >2" 5ft span			
46	JET BLAST (SF)	ANY				
47	JOINT REFLECTIVE CRACKING (LF)	L	< 1/4", no FOD, light spall			
		M	> 1/4", some FOD, moderate spall			
		H	> 1/4", definite FOD, severe spall			
48	LONGITUDINAL TRANSVERSE CRACKING (LF)	L	< 1/4", no FOD, light spall			
		M	> 1/4", some FOD, moderate spall			
		H	> 1/4", definite FOD, severe spall			
49	OIL SPILLAGE (SF)	ANY				
50	PATCHING UTILITY CUT (SF)	L	Good condition, little or no FOD			
		M	Deteriorated condition, some FOD			
		H	Badly deteriorated condition, high FOD			
51	POLISHED AGG (SF)	ANY	Do not count with bleeding			
52	RAVELING (SF) Dislodging of Coarse Particles	L	[illegible]			
		M	[illegible]			
		H	[illegible]			
53	RUTTING (SF)	L	1/4" to 1/2" mean depth			
		M	1/2" to 1" mean depth			
		H	> 1" mean depth			
54	SHOVING OF FLEX PAVEMENT BY PCC SLABS (SF)	L	< 3/4" height difference, no breakup			
		M	3/4" to 1-1/2" height difference, moderate breakup			
		H	> 1-1/2" height difference, severe breakup			
55	SLIPPAGE CRACK (SF)	ANY				
56	SWELL (SF) Ride quality at normal aircraft speed	L	< 3/4" height difference			
		M	3/4" to 1-1/2" height difference			
		H	> 1-1/2" height difference			
57	WEATHERING (SF) Wearing away of asphalt binder and fine aggregate	L	[illegible]			
		M	[illegible]			
		H	[illegible]			
			Q =	TOTAL		
			CORRECTED DEDUCT VALUES			
			PCI			

PCI	GOOD	SAT	FAIR	POOR	VERY POOR	SERIOUS	FAILED
	100 - 86	85 - 71	70 - 56	55 - 41	40 - 26	25 - 11	10 - 0

Flexible Pavement PCI

Notes

Rubber Buildup:

Drainage:

Cracks:

Raveling:

Rutting:

Patches:

Other:

Inspection Date: ____________

Inspected By: ____________

Atch 1
(3 of 9)

Flexible Pavement Distress Deduct Values

No.	DISTRESS DENSITY %	Sev.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100
41	ALLIGATOR CRACKING (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
42	BLEEDING (SF)	ANY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
43	BLOCK CRACKING (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	CORRUGATION (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
45	DEPRESSION (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
46	JET BLAST EROSION (SF)	ANY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
47	JOINT REFLECTIVE CRACKING (LF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
48	LONGITUDINAL AND TRANSVERSE CRACKING (LF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
49	OIL SPILLAGE (SF)	ANY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50	PATCHING AND UTILITY CUT (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
51	POLISHED AGGREGATE (SF)	ANY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
52	RAVELING (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
53	RUTTING (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
54	SHOVING OF FLEX PAVEMENT BY PCC SLABS (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
55	SLIPPAGE CRACKING (SF)	ANY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
56	SWELL (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
57	WEATHERING (SF)	L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	DISTRESS DENSITY %		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100

Flexible Pavement Corrected Deduct Value Chart

Total Deduct Values (TDV)	q = 1	2	3	4	5	6
1	1					
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					
9	9					
10	10					
11	11	4				
12	12	5				
13	13	6				
14	14	6				
15	15	7				
16	16	8				
17	17	9	5			
18	18	9	5			
19	19	10	6			
20	20	11	7			
21	21	11	8			
22	22	12	8			
23	23	13	9			
24	24	14	10			
25	25	14	10	5		
26	26	15	11	6		
27	27	16	12	7		
28	28	17	13	7		
29	29	17	13	8		
30	30	18	14	9		
31	31	19	15	9		
32	32	19	16	10		
33	33	20	16	11		
34	34	21	17	12		
35	35	22	18	12		
36	36	22	18	13		
37	37	23	19	14		
38	38	24	20	15		
39	39	25	21	15		
40	40	25	22	16		
41	41	26	22	17		
42	42	27	23	18		
43	43	28	24	18		
44	44	28	24	19		
45	45	29	25	20		
46	46	30	26	20		
47	47	31	27	21		
48	48	31	27	22		
49	49	32	28	22		
50	50	33	29	23		
51	51	34	30	24		
52	52	35	31	25		
53	53	35	31	25		
54	54	36	32	26		
55	55	37	33	27		
56	56	38	34	27		
57	57	38	35	28		
58	58	39	36	28		
59	59	40	36	29		
60	60	41	37	30		

Total Deduct Values (TDV)	q = 1	2	3	4	5	6
61	61	41	37	31		
62	62	42	38	31		
63	63	43	38	32		
64	64	44	39	32		
65	65	44	40	33		
66	66	45	41	34		
67	67	46	41	34		
68	68	47	42	35		
69	69	47	43	35		
70	70	48	43	36		
71	71	49	44	37		
72	72	50	45	38		
73	73	51	46	38		
74	74	52	46	39		
75	75	52	47	39		
76	76	53	48	40		
77	77	54	48	41		
78	78	55	49	41		
79	79	55	50	42		
80	80	56	51	42		
81	81	57	51	43		
82	82	57	52	43		
83	83	58	53	44		
84	84	59	54	44		
85	85	60	54	45		
86	86	60	55	46		
87	87	61	55	46		
88	88	62	56	47		
89	89	62	56	47		
90	90	63	57	48		
91	91	64	57	48		
92	92	64	58	49		
93	93	65	59	49		
94	94	66	59	50		
95	95	66	60	50		
96	96	67	60	51	51	51
97	97	68	61	51	51	51
98	98	68	61	52	52	52
99	99	69	62	52	52	52
100	100	69	63	53	53	53
101		70	63	53	53	53
102		71	64	54	53	53
103		71	64	54	54	54
104		72	65	55	54	54
105		73	65	55	54	54
106		73	66	56	55	55
107		74	66	56	55	55
108		74	67	57	56	56
109		75	67	57	56	56
110		76	68	58	57	56
111		76	68	58	57	57
112		77	69	59	58	57
113		78	69	59	58	58
114		78	70	60	59	58
115		79	70	60	59	58
116		79	71	61	60	59
117		80	72	61	60	59
118		81	72	62	61	60
119		81	73	62	61	60
120		82	73	63	62	61

Total Deduct Values (TDV)	q = 1	2	3	4	5	6
121		82	74	63	62	61
122		83	74	64	62	61
123		83	75	64	63	62
124		84	75	64	63	62
125		84	76	65	63	62
126		85	76	65	64	63
127		86	77	66	64	63
128		86	77	66	65	63
129		87	78	67	65	64
130		87	78	67	66	64
131		88	78	68	66	64
132		89	79	68	66	65
133		90	80	68	67	65
134		90	80	69	67	65
135		91	81	69	67	66
136		91	81	70	68	66
137		92	81	70	68	66
138		92	82	71	69	67
139		92	82	71	69	67
140		93	83	72	70	67
141		93	83	72	70	68
142		93	84	73	71	68
143		93	84	73	71	68
144		94	85	73	71	69
145		94	85	74	72	69
146		95	85	74	72	70
147		95	86	74	72	70
148		96	86	75	73	70
149		96	87	75	73	71
150		97	87	76	74	71
151		97	88	76	74	71
152		97	88	76	74	71
153		98	88	77	75	72
154		98	89	77	75	72
155		99	89	77	75	72
156		99	90	78	76	73
157		100	90	78	76	73
158		100	90	78	76	73
159		101	91	79	77	74
160		101	91	79	77	74
161		102	92	80	77	74
162		102	92	80	78	74
163		103	93	81	78	75
164		103	93	81	78	75
165		103	93	81	78	75
166		104	94	82	79	75
167		104	94	82	79	76
168		104	94	82	79	76
169		105	95	83	79	76
170		105	95	83	80	76
171			95	83	80	77
172			96	83	80	77
173			96	83	80	77
174			97	84	80	77
175			97	84	81	78
176			97	84	81	78
177			98	85	81	78
178			98	85	82	78
179			98	85	82	78
180			98	85	82	79

q = Number of distresses with deduct values greater than 5

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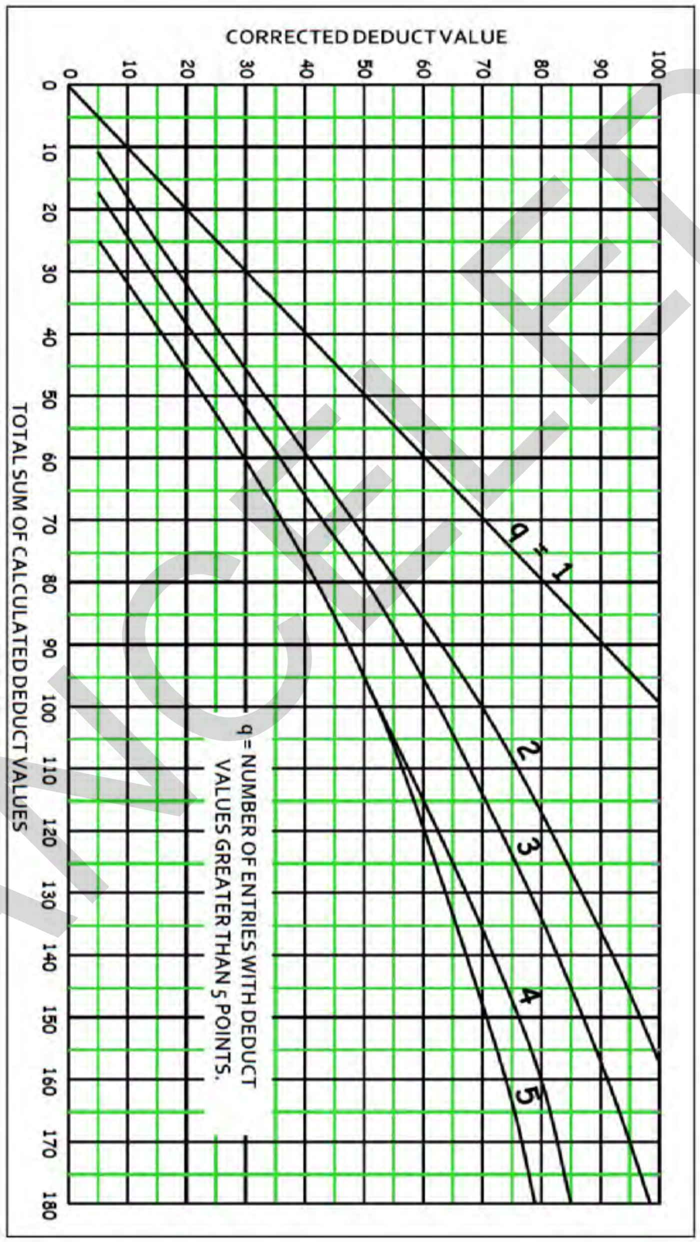

Corrected Deduct Values for Flexible (AC) Pavements

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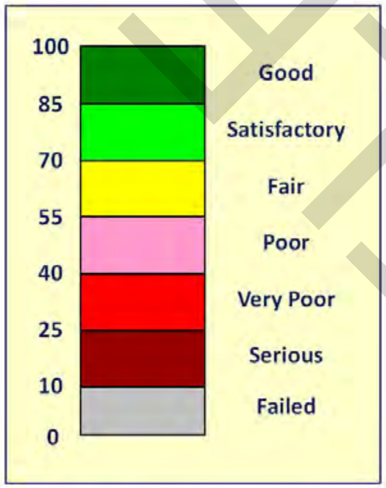
Rigid Pavement

Pavement Condition Index Data Sheets



Airfield Pavement Evaluation

Cursory PCI Survey

Performing the PCI

- Step 1 Divide the Airfield into Sections
- Step 2 Subdivide Each Section into Sample Units
- Step 3 Inspect Randomly Selected Sample Units
- Step 4 Determine Deduct Values for All Distresses
- Step 5 Compute Total Deduct Value for Sample
- Step 6 Determine Max Corrected Deduct Value
- Step 7 Compute PCI for Each Sample
- Step 8 Compute PCI for Entire Section

Standard Sample Sizes

(Must adjust densities if other than standard sizes)

PCC: 20 Contiguous Slabs

(± 8 slabs if total number of slabs in section is not evenly divided by 20)

Exception: If slabs are longer than 25 feet, then they should be subdivided into slabs less than or equal to 25 feet in length. The imaginary joints are assumed to be in perfect condition.

For Cursory Evaluations Number of Samples to Survey

If section is size of 1 to 5 Samples, survey 1 sample unit
If section is size of 6 to 10 Samples, survey 2 sample units
If section is size of 11 to 15 Samples, survey 3 sample units
If section is size of 16 to 40 Samples, survey 4 sample units
If section is greater than size of 40 Samples, survey 10% of the sample units
Average the PCIs of all samples surveyed in a given section to determine the overall section PCI

Atch 1
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Rigid Pavement PCI

Section # and Sample #:				TOTAL	% DENSITY	DEDUCT VALUE
Description:						
61	BLOW-UP	L	Slight roughness			
		M	Significant roughness			
		H	Pavement inoperative			
62	CORNER BREAK	L	< 1/8", no to minor spalling			
		M	1/8" to 1", moderate spalling			
		H	> 1", severe spalling			
63	CRACKS LONG/TRANS/DIAG breaks slab into 2 or 3 pieces	L	< 1/8", no to minor spalling			
		M	1/8" to 1", moderate spalling			
		H	> 1", severe spalling			
64	DURABILITY "D" CRACKING if "D" don't record scaling	L	Limited area, little or no FOD			
		M	Considerable area of some FOD			
		H	Considerable area with FOD			
65	JOINT SEAL DAMAGE	L	Generally good condition, minor damage			
		M	Generally fair condition, replace 2 yrs			
		H	Generally poor condition, replace immediately			
66	SMALL PATCH (<5 SF) count highest severity once if more than 1 patch	L	Little or no deterioration			
		M	Deteriorated, moderate spalling			
		H	Deteriorated, needs replacement			
67	LARGE PATCH (>5 SF) count highest severity once if more than 1 patch	L	Little or no deterioration			
		M	Deteriorated, moderate spalling			
		H	Deteriorated, needs replacement			
68	POPOUTS >3/SY overall	N/A				
69	PUMPING count all slab	ANY				
70	SCALING count highest severity on slab	L	Minimal particle loss, no FOD			
		M	Some FOD potential			
		H	High FOD potential			
71 *	SETTLEMENT FAULTING	L	< 1/4" hwy/bay, 1/8" to 1/2" apron			
		M	1/4" to 1/2" hwy/bay, 1/2" to 1" apron			
		H	> 1/2" hwy/bay, > 1" apron			
72	SHATTERED SLAB INTERSECTING CRACKS Do not count other distresses if medium or high severity	L	4 or 5 pieces, low severity cracks			
		M	4 or 5 pieces, medium severity cracks			
		H	4 or 5 pieces, high severity cracks			
73	SHRINKAGE CRACK	ANY				
74	JOINT SPALLING	L	Low or Med severity cracks, little FOD			
		M	Low or Med severity cracks, some FOD			
		H	High severity cracks, high FOD			
75	CORNER SPALLING within approx 2 ft of corner	L	1 or 2 pieces, little or no FOD			
		M	2 or more pieces, some FOD			
		H	2 or more pieces, high FOD			
76	ASR No other distresses recorded if High Severity ASR	L	Little to no FOD or movement			
		M	Some FOD or movement			
		H	Missing fragments, slab integrity degraded			
* count fault btw 2 slabs as 1			Q =	TOTAL		
			CORRECTED DEDUCT VALUES			
			PCI			

PCI	GOOD	SAT	FAIR	POOR	VERY POOR	SERIOUS	FAILED
	100 - 86	85 - 71	70 - 56	55 - 41	40 - 26	25 - 11	10 - 0

Rigid Pavement PCI

Notes

Rubber Buildup:

Drainage:

Joint Seals:

Cracks:

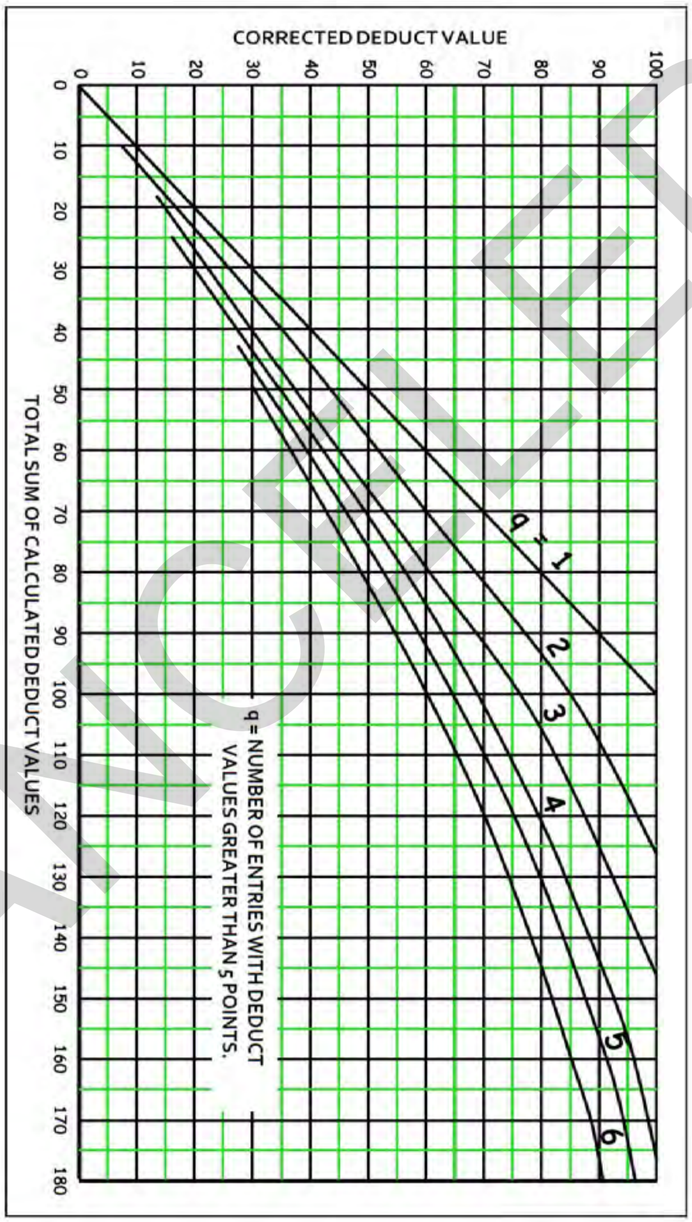
Spalls:

Patches:

Other:

Inspection Date: ____________________

Inspected By: ____________________



Corrected Deduct Values for Rigid (PCC) Pavements

Atch 1
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Rigid Pavement Distress Deduct Values

DISTRESS DENSITY %	61 BLOW-UP L	61 M	61 H	62 CORNER BREAK L	62 M	62 H	63 LONG / TRANS / DIAG CRACKS L	63 M	63 H	64 DURABILITY "D" CRACKING L	64 M	64 H	65 JOINT SEAL DAMAGE L	65 M	65 H	66 SMALL PATCH (<5 SF) L	66 M	66 H	67 LARGE PATCH (>5 SF) L	67 M	67 H	68 POPOUTS >3/SY N/A	69 PUMPING ANY	70 MAP CRACKING SCALING L	70 M	70 H	71 SETTLEMENT OR FAULTING L	71 M	71 H	72 INTERSECTING CRACK SHATTERED SLAB L	72 M	72 H	73 SHRINKAGE CRACK ANY	74 JOINT SPALLING L	74 M	74 H	75 CORNER SPALLING L	75 M	75 H	76 ASR L	76 M	76 H	DISTRESS DENSITY %
5	14	32	100	4	8	13	5	11	15	3	10	18	2	7	12	1	3	7	3	12	19	4	5	2	5	18	4	8	15	10	20	30	2	2	4	13	2	4	5	5	14	24	5
10	22	43	100	8	15	23	9	19	26	6	16	29				1	6	11	6	16	29	7	10	2	10	30	8	14	26	17	27	40	2	3	7	21	4	7	10	8	23	38	10
15	27	46	100	12	20	30	11	23	33	8	21	35				2	8	14	8	21	36	10	14	2	14	37	12	19	33	22	33	46	3	5	11	25	6	10	13	11	28	46	15
20	34	54	100	15	24	36	13	28	39	10	25	41				3	10	17	10	24	42	12	18	3	17	42	14	24	30	26	39	52	3	6	13	20	7	12	16	12	32	51	20
25	39	56	100	18	28	41	15	32	46	12	27	47				4	12	20	12	28	47	14	23	3	21	47	17	27	44	30	43	56	4	7	16	32	8	14	18	13	35	56	25
30	44	64	100	21	32	46	17	35	50	13	30	52				5	13	22	14	30	52	15	26	3	23	52	20	30	40	33	47	61	4	8	18	34	10	16	23	14	37	59	30
35	49	69	100	23	35	50	18	37	54	14	32	56				5	14	24	15	32	56	17	29	3	26	56	22	33	53	35	51	65	5	9	21	36	11	17	25	15	38	63	35
40	54	75	100	25	39	54	19	40	58	15	35	60				6	15	27	16	34	60	18	32	4	28	60	24	35	57	37	54	70	6	10	23	38	12	18	27	16	40	66	40
45	59	81	100	27	42	58	20	43	63	16	37	64				7	16	28	17	36	63	19	35	4	30	63	25	37	61	40	57	73	7	11	24	41	13	20	30	17	42	69	45
50	65	86	100	29	45	62	20	45	66	17	38	67				8	17	30	18	37	67	20	38	4	31	66	27	40	64	42	61	77	7	11	26	42	14	21	32	18	43	72	50
55	70	91	100	31	48	66	20	47	68	18	40	70				8	18	32	19	40	70	21	41	5	32	68	28	43	67	44	63	81	8	12	27	44	14	22	34	19	44	74	55
60	75	96	100	33	51	69	21	49	71	19	42	73				9	18	33	20	42	73	22	43	5	33	70	30	44	71	46	66	84	9	12	29	45	15	23	36	19	45	76	60
65	81	100	100	35	54	72	21	50	73	20	43	76				9	20	35	20	43	75	22	45	5	34	72	32	46	74	47	68	87	10	13	31	46	16	24	37	20	46	78	65
70	86	100	100	37	56	76	22	52	76	20	44	78				9	20	36	21	44	78	22	47	5	36	73	33	48	76	49	71	89	11	13	33	47	16	24	39	21	47	79	70
75	91	100	100	38	59	79	22	53	77	21	45	81				9	21	37	21	45	80	22	48	5	36	74	34	50	78	51	73	93	12	13	33	48	17	25	41	22	48	80	75
80	96	100	100	39	62	82	22	54	79	21	46	83				10	22	38	21	46	83	22	50	6	37	76	34	52	82	53	75	96	12	14	34	49	17	26	43	22	48	81	80
85	100	100	100	40	65	84	22	55	81	22	47	84				10	22	39	22	47	84	22	51	6	37	77	35	53	83	54	77	97	13	14	35	50	18	26	44	22	48	81	85
90	100	100	100	41	67	87	22	56	82	22	48	86				10	22	40	22	48	86	22	52	6	38	78	36	54	86	56	79	100	13	14	36	51	19	27	45	22	49	81	90
95	100	100	100	41	70	89	22	57	83	22	49	87				10	22	41	22	48	87	22	52	7	38	80	37	55	87	58	82	100	14	14	36	51	19	28	46	22	49	82	95
100	100	100	100	42	73	91	22	58	84	22	50	86				10	22	41	22	49	88	22	52	7	39	81	37	56	90	57	83	100	14	14	38	52	19	28	46	22	50	82	100

Rigid Pavement Corrected Deduct Value Chart

q = Number of distresses with deduct values greater than 5

Total Deduct Value (TDV)	1	2	3	4	5	6	7	8
1	1							
2	2							
3	3							
4	4							
5	5							
6	6							
7	7							
8	8							
9	9							
10	10	7						
11	11	8						
12	12	9						
13	13	10						
14	14	11						
15	15	12						
16	16	13						
17	17	14						
18	18	14	14					
19	19	15	14					
20	20	16	15					
21	21	17	15					
22	22	18	16					
23	23	19	17					
24	24	20	18					
25	25	20	18	16				
26	26	21	19	17				
27	27	22	20	18				
28	28	23	21	18				
29	29	24	21	19				
30	30	25	22	20				
31	31	25	22	21				
32	32	26	23	21				
33	33	27	24	22				
34	34	28	25	23				
35	35	29	25	24				
36	36	30	26	24				
37	37	31	27	25				
38	38	31	28	26				
39	39	32	29	26				
40	40	33	30	27				
41	41	34	30	28				
42	42	35	31	29				
43	43	36	32	30	29	28		
44	44	37	32	30	29	28		
45	45	38	33	31	30	29		
46	46	39	34	32	31	30		
47	47	40	35	33	32	31		
48	48	40	36	33	32	31		
49	49	41	36	34	33	32	31	30
50	50	42	37	35	34	33	32	31
51	51	43	38	35	34	33	32	31
52	52	44	38	36	35	34	33	32
53	53	45	39	37	36	35	33	32
54	54	46	40	37	36	35	34	33
55	55	46	41	38	37	36	35	34
56	56	47	42	39	38	37	36	34
57	57	48	43	40	39	37	36	35
58	58	49	43	40	39	38	37	35
59	59	50	44	41	40	39	38	36
60	60	51	45	42	41	40	39	37
61	61	52	46	43	42	40	40	37
62	62	53	47	43	42	41	40	38
63	63	54	47	44	43	42	41	39
64	64	55	48	45	43	42	41	39
65	65	55	49	46	44	43	42	40
66	66	56	50	46	45	44	42	40
67	67	57	51	47	46	44	43	41
68	68	58	51	48	46	45	43	42
69	69	59	52	48	47	46	44	42
70	70	60	53	49	47	46	44	43
71	71	61	54	50	48	47	45	43
72	72	62	55	50	48	47	46	44
73	73	63	56	51	49	48	47	45
74	74	64	56	51	50	49	47	45
75	75	64	57	52	51	49	48	46
76	76	65	58	53	52	50	48	46
77	77	66	58	54	52	51	49	47
78	78	67	59	55	53	51	49	47
79	79	68	60	56	54	52	50	48
80	80	69	61	56	55	53	51	49
81	81	70	62	57	55	53	51	49
82	82	70	63	58	56	54	52	50
83	83	71	64	58	57	55	53	51
84	84	72	65	59	57	55	53	51
85	85	73	65	60	58	56	54	52
86	86	74	65	60	58	56	54	52
87	87	74	66	61	59	57	55	53
88	88	75	67	62	60	57	55	53
89	89	76	68	62	60	58	56	54
90	90	77	69	63	61	59	57	55
91	91	78	69	63	61	59	57	55
92	92	79	70	63	62	60	58	56
93	93	79	71	64	62	60	58	56
94	94	80	71	65	63	61	59	57
95	95	81	72	66	64	62	59	57
96	96	82	73	66	64	62	60	58
97	97	83	74	67	65	63	60	58
98	98	83	74	68	65	63	61	59
99	99	84	75	68	66	64	61	59
100	100	85	76	69	67	65	62	60
101		85	76	69	67	65	62	60
102		86	77	70	68	65	63	61
103		87	78	70	68	66	63	61
104		87	78	71	69	67	64	62
105		88	79	72	69	67	64	62
106		89	80	72	70	68	65	63
107		89	80	73	70	68	66	63
108		90	81	73	71	68	66	64
109		91	82	74	71	69	67	64
110		91	83	74	72	70	68	65
111		92	83	75	72	70	68	65
112		93	84	75	73	71	69	66
113		93	84	76	73	71	69	66
114		94	85	76	74	72	70	67
115		94	85	77	74	72	70	67
116		95	86	77	75	73	71	68
117		95	86	78	75	73	71	68
118		96	87	78	76	74	72	69
119		96	87	79	76	74	72	69
120		97	88	79	77	75	73	70
121		97	88	80	77	75	73	70
122		98	89	80	78	76	73	71
123		98	90	81	78	76	74	71
124		99	90	81	79	77	74	71
125		99	91	82	79	77	75	72
126		100	91	82	80	78	75	72
127			92	82	80	78	76	73
128			92	83	81	78	76	73
129			93	83	81	79	77	74
130			93	84	82	80	77	74
131			94	84	82	80	77	74
132			94	85	83	80	78	75
133			95	85	83	81	78	75
134			95	86	84	81	78	76
135			96	86	84	82	79	76
136			96	86	84	82	79	76
137			96	87	85	83	80	77
138			97	87	85	83	80	77
139			97	88	85	83	81	78
140			98	88	86	84	81	78
141			98	88	86	84	82	78
142			98	89	87	85	82	79
143			98	89	87	85	82	79
144			99	90	87	85	82	79
145			99	90	88	86	83	80
146			99	91	88	86	83	80
147			100	91	89	87	84	81
148				91	89	87	84	81
149				92	89	87	84	81
150				92	90	88	85	82
151				92	90	88	85	82
152				93	91	88	85	82
153				93	91	89	86	83
154				94	92	89	86	83
155				94	92	90	87	83
156				94	92	90	87	84
157				95	93	90	87	84
158				95	93	91	88	84
159				95	93	91	88	85
160				96	94	91	88	85
161				96	94	92	89	85
162				96	94	92	89	86
163				96	94	92	89	86
164				97	95	93	90	87
165				97	95	93	90	87
166				97	95	93	90	87
167				97	95	93	90	87
168				98	96	94	91	88
169				98	96	94	91	88
170				98	97	94	91	88
171				99	97	95	92	89
172				99	97	95	92	89
173				99	97	95	92	89
174				99	97	95	92	89
175				99	98	96	93	89
176				100	98	96	93	90
177					98	96	93	90
178					98	96	93	90
179					99	97	94	90
180					99	97	95	91

Atch 1
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RISK ANALYSIS PROCEDURES

This attachment 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.

I. Risk Analysis – Localized PM.

A. Calculate the pavement family rate of deterioration with and without performing localized PM:

1. Determine the pavement family rate of deterioration (R_w), assuming localized PM is performed as in the past:

   a. Create a family curve in PAVER that includes the pavement Section(s) under consideration. Figure A2.1 shows an example family curve that was created for primary concrete taxiways located at an Air Force base.

   b. In Tab #4 (Options) unclick the "Automatically Calculate Number of Coefficients" button (Figure A2.1) then set the number of coefficients to 2 and press the "Calculate" button (Figure A2.2).

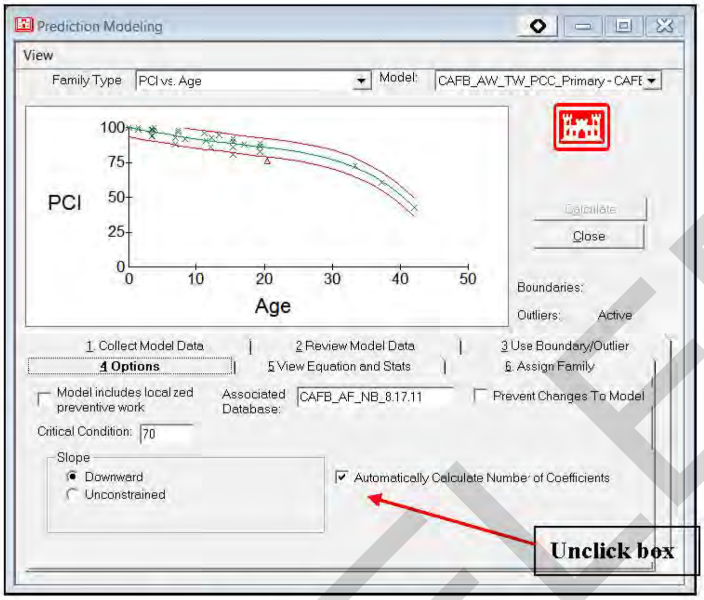


Figure A2.1. Example Family Curve

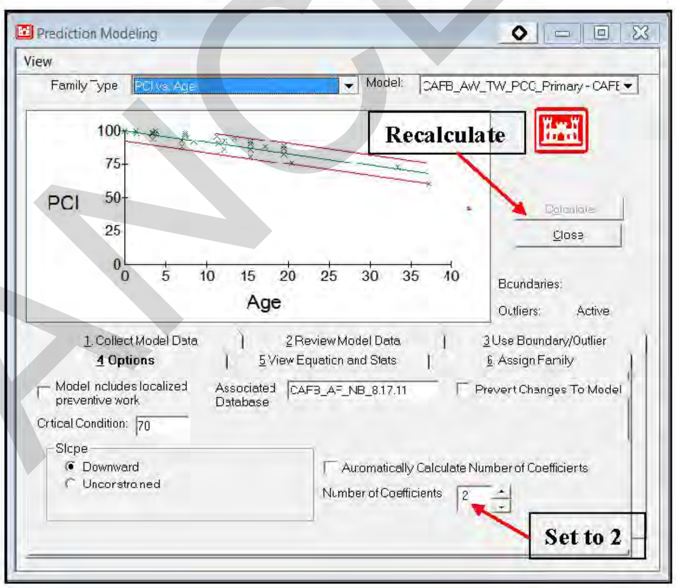


Figure A2.2. Set Number of Coefficients

c. Click on Tab 5 "View Equation and Stats." PAVER will then calculate the rate of deterioration (R_W) based on a straight line deterioration rate. R_W is the second coefficient in the equation, as shown in Figure A2.3. In this example, R_W is determined to be 0.85 PCI points (rounded from 0.8481) per year.

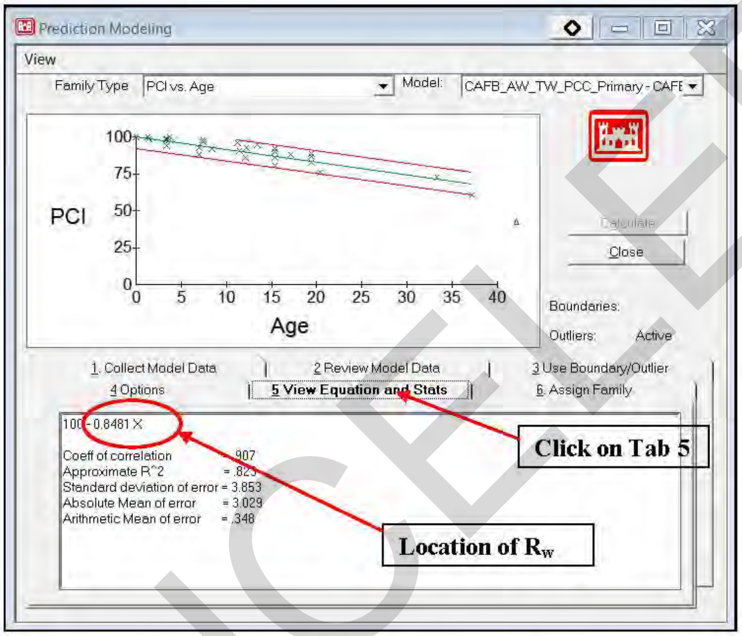


Figure A2.3. View Equation and Stats

2. Calculate age to critical PCI (PCI_C), assuming localized PM is performed (T_W) (Figure A2.4).

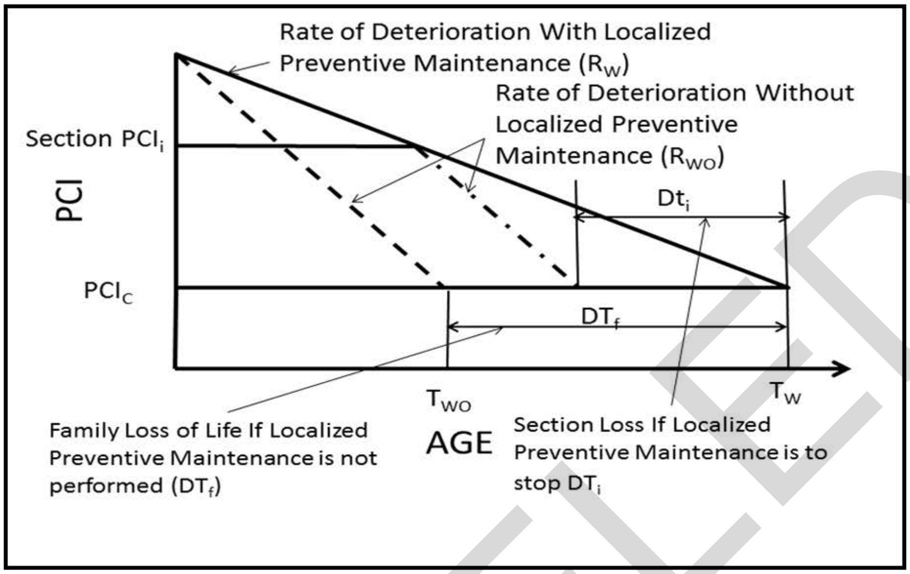


Figure A2.4. Section Deterioration

$T_W = (100 - PCI_C) / R_W$

In the example above, assuming a PCI_C = 70, TW = (100 – 70) / 0.85 = 35.29 years.

3. Estimate the expected loss in pavement life caused by not performing localized PM (DT_f). Loss of pavement life will depend on several factors, including pavement life with localized PM (T_w), pavement type (i.e., asphalt vs. concrete), climate, and traffic. Table A2.1 provides recommended DT_f values when T_w is 20 years.

Table A2.1. Recommended DT_f 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:

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

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

$5 * (.3691 * 35.29 - .0009 *(35.29^2))/7.13 = 8.35$ years

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

$T_{WO} = T_W - DT_f$

In the example above, assuming DT_f = 8.35 years:

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

5. 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

B. Determine the expected loss in life for each pavement section (DT_i) 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 PCIi = 85:

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

See Figure A2.5 to see a depiction of the section deterioration example above.

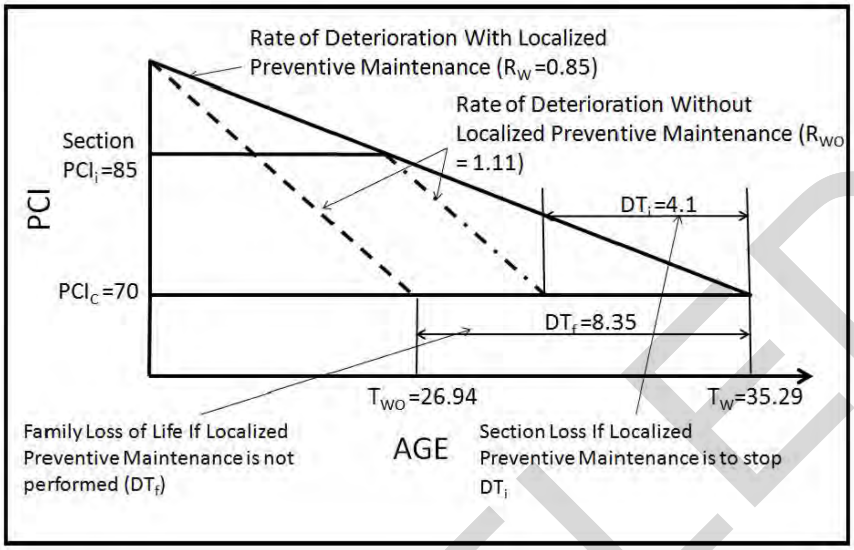


Figure A2.5. Section Deterioration Example

C. Estimate cost due to loss in pavement section life:

The procedure is based on the equivalent uniform annual cost (EUAC) economic analysis methodology. 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.

1. Calculate the EUAC for the localized PM alternative ($EUAC_{Alt1}$):

a. 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. $\$_{Major\text{-}critical}$ can be estimated as one-third the cost of reconstruction for asphalt pavements and one-fourth the cost of reconstruction for concrete pavements.

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.

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

b. 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.

c. $EUAC_{Alt1}$ is determined as the sum of costs from 1.a and 1.b above, as shown in the equation below.

$$EUAC_{Alt1} = (\$_{Annual\text{-}Major\text{-}Alt1}) + \$_{Annual\text{-}Preventive}$$

For the example above:

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

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

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

In the example above:

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

b. Determine the average annual operational maintenance over the life of the alternative ($\$_{Annual\text{-}operational}$). 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.

c. $EUAC_{Alt2}$ is determined as the sum of costs from 2.a and 2.b above as shown in the equation below.

$$EUAC_{Alt2} = (\$_{Annual\text{-}Major\text{-}Alt2}) + \$_{Annual\text{-}Operational}$$

For the example above:

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

3. 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 "B" above which is 4.1 years in this example, i.e., 0.0368*4.1 = $0.151/SF or approximately $1.358/SY.

D. Compute Project Risk Cost

Performing localized PM typically includes more than one pavement section. The risk for the project is simply the sum of the risk associated with every section. It should be noted that for sections where the PCI is less than critical, the risk cost is set to zero. The project cost is best calculated in an Excel sheet as shown in Figure A2.6. 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:

1. Compute DT_i for each section using the equation in paragraph B above. In the example used throughout this attachment: $R_W = 0.85$ and $R_{WO} = 1.11$.

2. 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 C.3 above as $0.0368/SF/YR.

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

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) Dtl	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*Dtl $/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
R08C	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	95,967	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
																				$356,760

Figure A2.6. Sample Table – Local

II. Risk Analysis – Global 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 for the Air Force is limited to the application of seal coats to asphalt surfaces. For this ETL, 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.

For each pavement section, calculate the pavement life in years with (T_{W_G}) and without (T_{WO_G}) performing global PM. Figure A2.7 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.

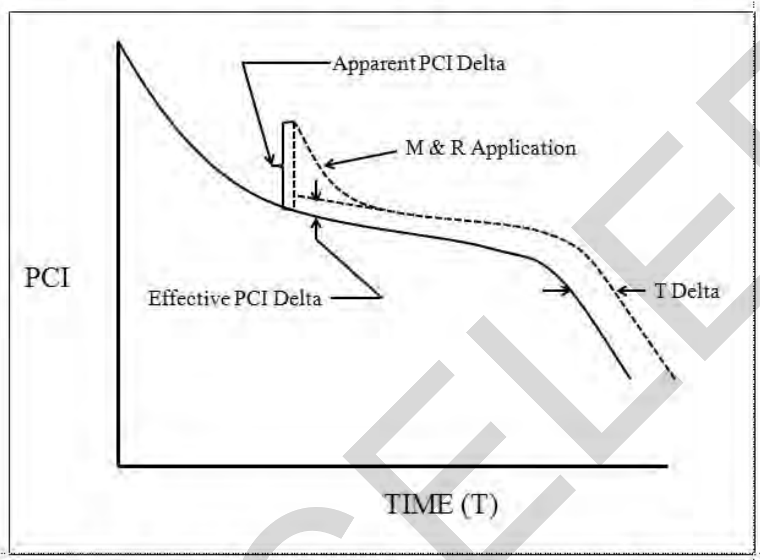


Figure A2.7. Effect of Global Maintenance on PCI

A. Calculate the pavement family rate of deterioration with and without performing global PM:

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

a. Create a family curve in PAVER that includes the pavement section(s) under consideration. Figure A2.8 shows an example family curve that was created for primary asphalt taxiways located at an Air Force base.

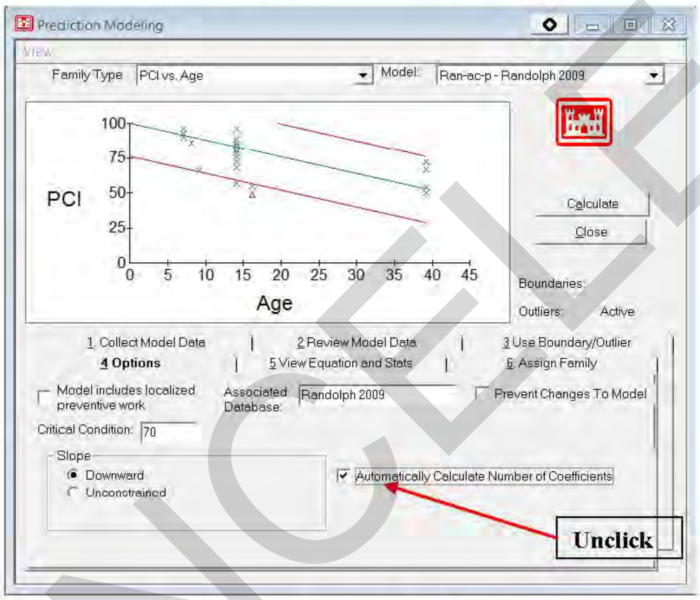


Figure A2.8. Example Family Curve

b. In Tab #4 (Options) unclick the "Automatically Calculate Number of Coefficients" button (Figure A2.8) then set the number of coefficients to 2 and press the "Calculate" button (Figure A2.9).

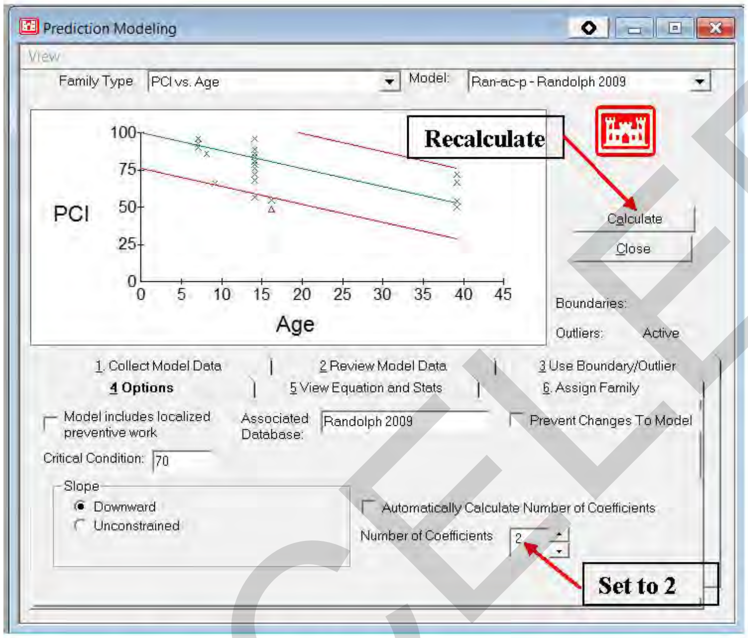


Figure A2.9. Set Number of Coefficients

c. Click on Tab 5 "View Equation and Stats." PAVER will then calculate the rate of deterioration (R_{WO_G}) based on a straight line deterioration rate. R_{WO_G} is the second coefficient in the equation as shown in Figure A2.10. In this example, R_{WO_G} is determined to be 1.21 PCI points (rounded from 1.20653) per year.

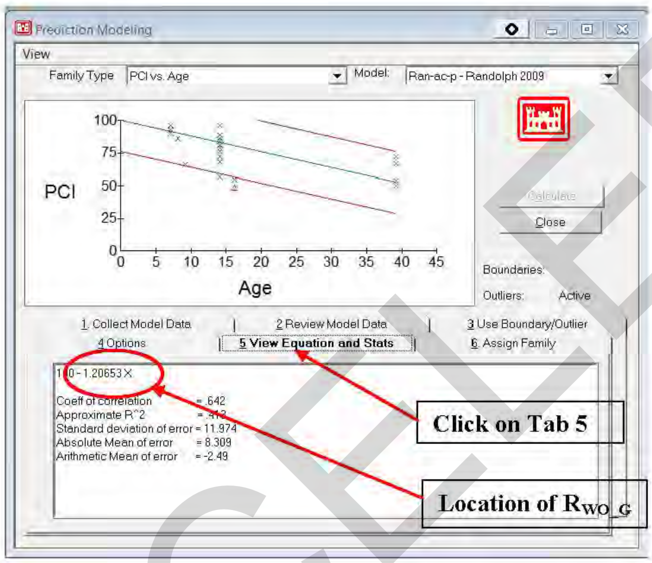


Figure A2.10. View Equation and Stats

2. Calculate age to critical PCI (PCI_C), assuming global PM has not been performed (T_{WO_G}). (**Note:** R_{WO_G} is used in this analysis because historically the Air Force has not used global PM on airfields.)

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

In the example above, assuming a $PCI_C = 70$:

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

3. 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 A2.2

provides a range of recommended DT values for fog seals, rejuvenators, and slurry seals. Use the midpoint of the range unless local experience and condition indicate other values within the range are more appropriate.

Table A2.2. Range of Recommended DT Values

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

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

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

In the example above, assuming DT = 5 years:

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

B. Estimate Cost Due to Loss in Pavement Section Life

Performing global maintenance will increase pavement life, but a risk analysis should 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 methodology. 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.

1. Calculate the EUAC for the global PM alternative ($EUAC_{Alt1}$):

a. 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.

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

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

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

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

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

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

c. $EUAC_{Alt1}$ is determined as the sum of costs from 1.a and 1.b above, as shown in the equation below:

$$EUAC_{Alt1} = (\$_{Annual\text{-}Major\text{-}Alt1}) + \$_{Global}$$

For the example above:

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

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

Determine the annual major M&R cost ($\$_{Annual\text{-}Major\text{-}Alt2}$) by dividing the major M&R cost at critical PCI ($\$_{Major\text{-}critical}$) by the life of the alternative (T_{WO_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.

In the example above:

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

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

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

For the example above:

$$EUAC_{LOSS} = \$0.0806 - \$0.0771 = \$\ 0.0035/\text{SF/YR}$$

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

C. 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. It should be noted that for sections where the PCI is less than critical, the risk cost is set to zero. The project cost is best calculated in an Excel sheet as shown in Figure A2.11. 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 shown above. Note that negative costs or costs shown in red/parentheses indicate that these applications may not be justified based on the assumptions.

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

Figure A2.11. Sample Table - Global

EXAMPLE PREVENTIVE MAINTENANCE PLAN

Atch 3
(1 of 23)

JOINT BASE SAN ANTONIO
RANDOLPH AIR FORCE BASE
TEXAS

PREVENTIVE MAINTENANCE PLAN
FOR
AIRFIELD PAVEMENTS
2013

Plan Revision:______________

THE CONTENTS:

PREVENTIVE MAINTENANCE PLAN FOR AIRFIELD PAVMENTS 2013

EXECUTIVE SUMMARY

The purpose of this Pavement Maintenance Plan for Airfield Pavements is to establish a prioritized preventive maintenance program based on condition and risk. Timely preventive maintenance can extend pavement life, significantly reduce life cycle cost and decrease premature pavement failures. In other words, keep our good pavements good. Improving the preventive maintenance process will help to optimize operations at minimum cost, extend the life of the airfield pavements and provide commanders with a risk assessment of deferring funding.

Maps for reference are located in Tab B.2. Tab B.2.1 is the map of the PCI from the last PCI done by AFCEC in 2011. Tab B.2.2 is the pavement maintenance plan showing project locations (in orange) and operational maintenance locations (in blue). Tab B.2.3 is a comprehensive yearly assessment of the airfield pavements. Tab C.1 is the Assessment Schedule and Tab C.2 is the Assessment Report for verification.

Conclusions:

1. Assessment: A pavement assessment is done every year to verify the condition of the airfield pavements and develop a realistic Preventive Maintenance Plan. The overall surface condition of the airfield pavements at Randolph AFB ranges from POOR to GOOD, with a majority (75% by area) in GOOD condition. Most pavements will only require routine maintenance and repair to sustain the condition. However, the pavements that rated FAIR or worse are due for more major maintenance and repair and, in some cases, a new design and complete reconstruction will be required. Of the 87 sections, 71 are PCC and the remaining 16 are AC or AC over PCC. Refer to Tab B.2 for details.

2. Operational Maintenance: Major rehabilitation/reconstruction projects are programmed for the West Runway, Taxiway G, East Apron, Hangar Access Aprons, and the Overruns. These pavements will only receive minimum (stop-gap) maintenance to maintain operational capabilities. Based on pavement usage, current distresses and past history of repairs, a budget of $91,182 will be required to address the high-severity conditions. To address both high- and medium-severity distresses requires a total of $620,123. Refer to Tabs D.2 and D.3 for a detailed list and priority. Tab D.1 shows total replacement costs for all airfield pavements.

3. Preventive Maintenance Projects: Sustainment projects were developed based on distress levels and quantities, pavement usage, and execution method. A total of 7 projects valued at approximately $807,000 were developed for execution. Refer to Tab E.2 for details.

4. Risk: The risk model was run for each of the 7 projects. Service life of the airfield pavements will be extended from 3 to 7 years and a cost avoidance of approximately $669,000 (beyond the cost of the projects) will be obtained if all projects are funded. Refer to Tab F.1 by section and F.2 by project for details.

Recommendations:
Recommended projects in priority order for 2013:

Project	Cost
Crack Seal West Runway 14R/32R	$322,747.00
Repair Joint Seal/Spalls/Cracks West Runway 14L/32R	$60,695.00
Repair Joint Seal/Spalls Taxiway A, A1, A4 and Hush House, Hangar 4	$182,872.00
Joint Seals Taxiway E	$2,082.00
Joint Seal/Spall/Crack Taxiway F	$23,414.00
Joint Seal/Spall/Crack South Apron	$120,198.00
Crack Seal, Weathered/Raveling Overrun 14L	$94,902.00
TOTAL	$806,910.00

Refer to Tab G.1 for prioritization process and details.

TAB A

AIRFIELD INFORMATION

A.1 – TEAM COMPOSITION

Senior Civil Engineer	XXXXX XXXXX 210-652-XXXX xxxxx.xxxxx@us.af.mil
Base Pavement Engineer	XXXXX XXXXX 210-652-XXXX xxxxx.xxxxx@us.af.mil
CE Operations	XXXXX XXXXX 210-652-XXXX xxxxx.xxxxx@us.af.mil
Airfield Management	XXXXX XXXXX 210-652-XXXX xxxxx.xxxxx@us.af.mil
Wing Safety	XXXXX XXXXX 210-652-XXXX xxxxx.xxxxx@us.af.mil

A.2 – BACKGROUND INFORMATION

Location - Randolph AFB is located northeast of San Antonio, TX, in south-central Texas and borders the towns of Converse and Universal City. The airfield is geographically located at 29° 32’ north latitude and 98° 17’ west longitude. The base lies on a flat plain at an elevation of 762 feet above mean sea level.

Construction History - Original construction of Randolph Field began in the late 1920s and was dedicated on 20 June 1930. On 25 October 1931 Randolph Field officially became the Air Corps Training Center, with its first class starting training on 2 November 1931. A major reconstruction effort was undertaken from 1943 to 1951 to replace the original flexible pavement structure with the rigid PCC structure, some of which is still used today. In 1965 the East Runway was extended 1350 feet and in 1970 the West Runway was extended 1350 feet. In 1990 the East Runway and a majority of the taxiways associated with this runway were reconstructed. In 1993 portions of the South Apron were reconstructed to support relocated missions. Several maintenance and construction projects also occurred during the early 2000s and recent or on-going projects include a new PCC section connecting Taxiway Golf between Taxiways G4 and G5, as well as a reconstruction of the west portion of Taxiway Delta that was rated FAIR in the 2009 PCI report. Finally, the auxiliary field at Seguin was undergoing a major rehabilitation at the time of this evaluation.

Climate - Randolph AFB has long, hot summers and mild winters with short periods of cold temperatures. Rainfall is typically well distributed throughout the year. From April to September rain falls during thunderstorms with large quantities in a short period of time. In winter months precipitation is in the form of light rains and drizzle, but thunderstorms may occur. Average annual precipitation is 28 inches, although 2010 and 2011 have been some of the driest years on record with only 7.63 inches of rain from October 2010 to August 2011. The early summer and fall months have higher rainfall rates than other months, typically over 3 inches per month in May, June, September, and October. Historically, the wettest month of the year is May with an average rainfall of just under 4 inches. August and July are the warmest months when daily high temperatures can exceed 100 degrees in June through September. Based on record low temperatures, frost may occur October through March and the record low is 0 degrees Fahrenheit. However, since the average low in these months is near 40 degrees, frost is rare. The climate at Randolph AFB does not warrant a frost evaluation or thaw-weakened AGLs to be produced since the frost depth is 0 inches on a 50-year recurrence.

Soil Conditions - In 1991, the Soil Conservation Service (SCS) published a soil survey of Bexar County, which includes relatively detailed mapping of the soil classifications for the soils found on the airfield. The specific named and classified soils include Lewisville Silty Clay (LvA) and Houston Black Clay (HtA) and are both derivatives of old Alluvium. These soil types bisect the airfield nearly in half with the Houston Black Clay beneath the western portion of the base while the Lewisville Silty Clay is on the eastern portion of the base. The Lewisville Silty Clay is a low-plasticity clay. The Houston Black Clay is a high-plasticity clay. In general, clays are not a desirable subgrade soil. Clays are vulnerable to strength loss when wet and susceptible to swelling, which can be felt under the bumpy roads at Randolph AFB. Due to the drought occurring at the time of the field evaluation, the clays found during auguring were very dry and DCP data reflected unusually high strengths for the known types of material. Both visual field classifications and formal laboratory classifications of subgrade soils were consistent with the SCS mapping.

Aircraft Traffic - Randolph AFB is home to several units with flying missions hosted by the 12th Flying Training Wing (FTW). The 12th FTW graduates more than 850 instructor pilots and more than 350 combat systems officers each year. In fiscal year 2011, Randolph AFB recorded a traffic count of 225,143 take-offs and landings where aircraft were at a full stop. The runways each receive approximately the same amount of sorties, with slightly higher numbers on the West Runway, 14R/32L. Present aircraft flown at Randolph AFB include the T-6 Texan, T-38 Talon, and T-1 Jayhawk. All three aircraft fall in either Air Force Aircraft Load Group 1 (T-1, T-6) or Load Group 2 (T-38).

Previous Evaluations - Several structural evaluations have been previously performed at Randolph AFB. The most recent pavement condition index (PCI) report from November 2009 was also referenced. The PCI inspection was performed by Applied Research Associates, Inc. The full 2009 PCI was primarily referenced after performing the cursory PCI to validate the distresses observed, their quantity and severity, and reasons why the condition had deteriorated or improved. These previous reports (listed below) provided reference data for the structural evaluation, mainly in terms of past construction history, and referring to subgrade soil classifications from the 1974 report test pits and 1985 test data. The 1954 report also has historical construction history and subgrade soil information.

- "Airfield Pavement Evaluation, Randolph Field, San Antonio, TX," War Department, U.S. Army Corps of Engineers, US Engineer Office, San Antonio District, Fort Sam Houston, Texas, August 1944
- "Airfield Pavement Evaluation, Randolph AFB, San Antonio, TX," Department of the Army Corps of Engineers, Galveston District, Galveston, Texas, May 1954
- "Airfield Pavement Evaluation and Condition Survey Report, Randolph AFB, TX," Air Force Civil Engineering Center (AFCEC), Tyndall Air Force Base, Florida, June 1974
- "Airfield Pavement Evaluation Randolph Air Force Base and Seguin Auxiliary Field, Texas," Air Force Engineering and Services Center (AFESC), Tyndall Air Force Base, Florida, November 1985
- "Airfield Pavement Evaluation Randolph Air Force Base, Texas," Air Force Civil Engineer Support Agency (AFCESA), Tyndall Air Force Base, Florida, April 1993
- "Airfield Pavement Evaluation Randolph Air Force Base, Randolph Auxiliary Field (Seguin), Texas," Air Force Civil Engineer Support Agency (AFCESA), Tyndall Air Force Base, Florida, August 2001
- "Airfield Pavement Condition Assessment Report, Randolph Air Force Base, Texas," Applied Research Associates, Inc., November 2009
- "Airfield Structural Evaluation Randolph Air Force Base, Texas" Air Force Civil Engineer Support Agency (AFCESA), Tyndall Air Force Base, Florida, February 2012

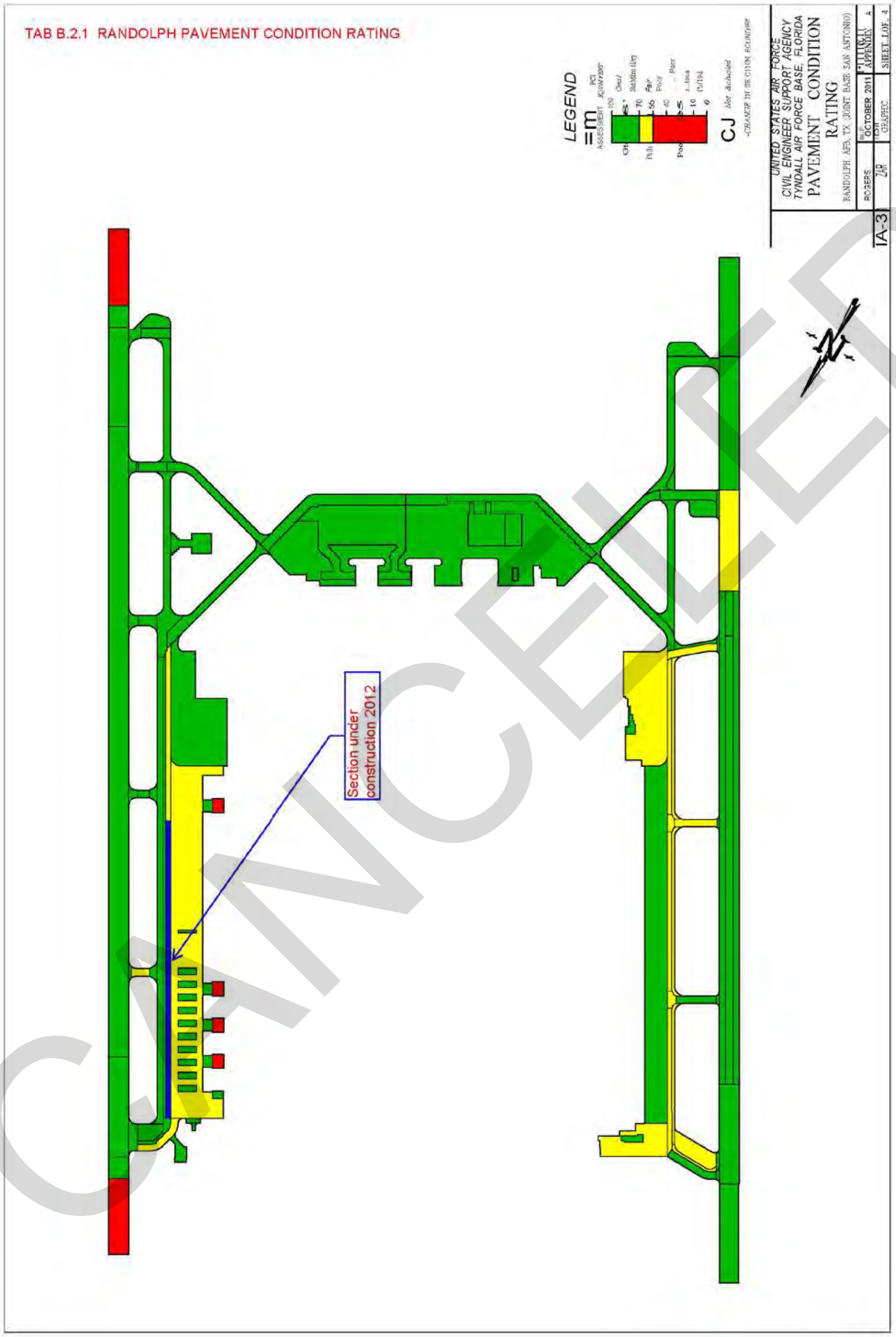
TAB B

TOOLS

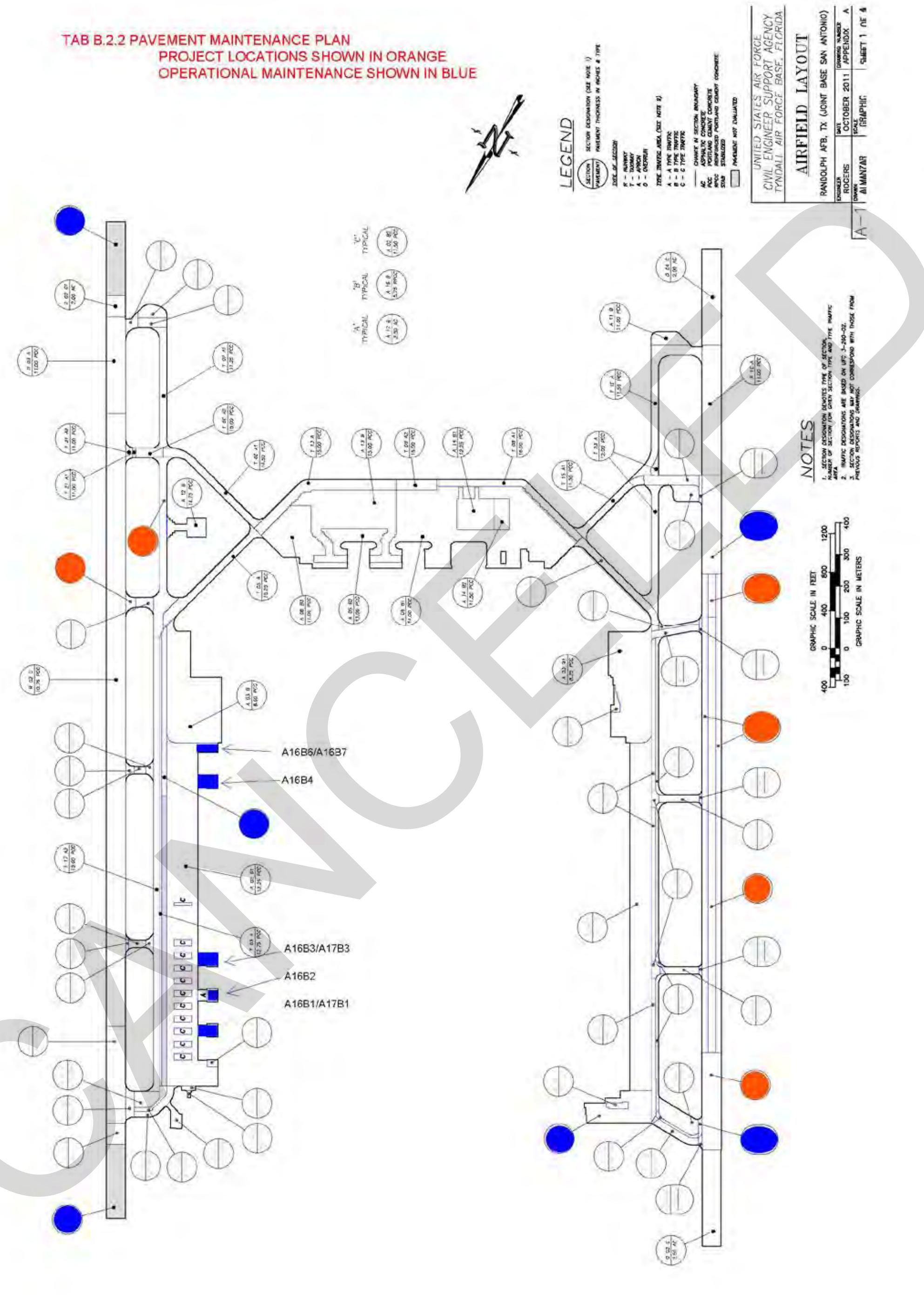
B.1 – REFERENCE DOCUMENTS

AIRFIELD PAVMENT EVALUATION	February 2012
AIRFIELD PAVEMENT CONDITION ASSESSMENT REPORT	November 2009
OPERATIONS CERTIFICATION ASSESSMENT (AOCI)	February 2012
AIRFIELD OPERATIONS BOARD (AOB) MINUTES	March 2012
RUNWAY FRICTION CHARACTERISTICS EVALUATION	July 2012

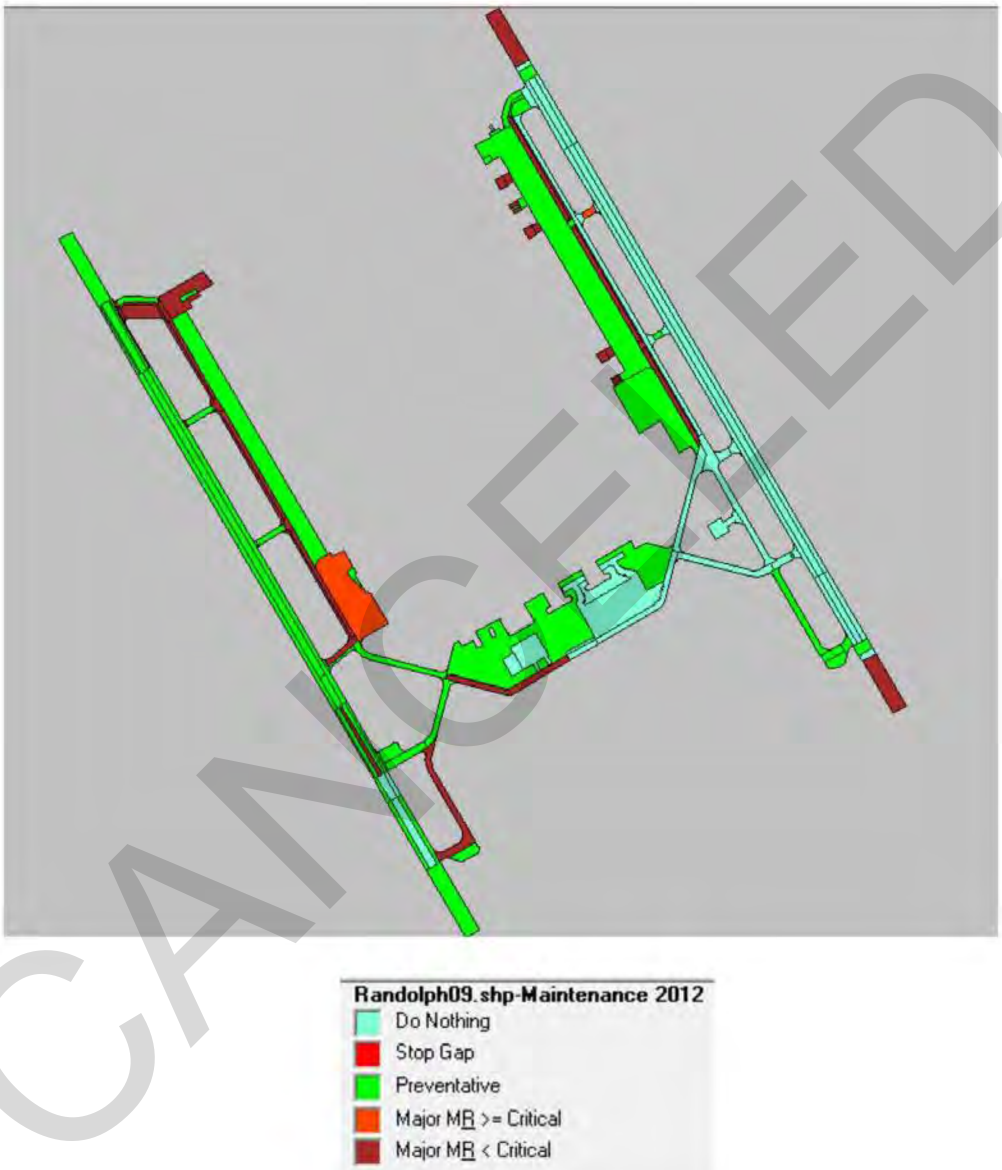
All reference documents are located at _____________. POC is ________________



TAB B.2.1 RANDOLPH PAVEMENT CONDITION RATING


TAB B.2.2 PAVEMENT MAINTENANCE PLAN
PROJECT LOCATIONS SHOWN IN ORANGE
OPERATIONAL MAINTENANCE SHOWN IN BLUE
A16B6/A16B7
A16B4
A16B3/A17B3
A16B2
A16B1/A17B1
AIRFIELD LAYOUT

TAB B.2.3 - MAINTENANCE BY PCI



TAB C

ASSESSMENT

TAB C.1 - ASSESSMENT SCHEDULE (EXAMPLE)

Pavement	Branch	Branch PCI	Planned Date	Actual Date
Apron	East Apron	68	1/1/13	
Apron	Hangar Access Apron	34	2/1/13	
Apron	Northwest Apron	65	2/1/13	
Apron	Power Check Pad	98	2/1/13	
Apron	South Apron	86	3/1/13	3/1/13
Apron	Southeast Apron	86	3/1/13	
Apron	Southwest Apron	69	3/1/13	
Apron	TW A1 Apron	75	4/1/13	
Apron	TW A6 Apron	86	4/1/13	
Apron	TW G1 Apron	74	4/1/13	
Apron	TW G5 Apron	83	4/1/13	
Apron	TW G6 Apron	79	4/1/13	
Apron	West Apron	82	5/1/13	
Overrun	Overrun RW 14L/32R	61	6/1/13	
Overrun	Overrun RW 14R/32L	86	7/1/13	
Runway	Runway 14L/32R	99	6/1/13	
Runway	Runway 14R/32L	85	7/1/13	
Taxiway	Hush House Taxiway	84	8/1/13	
Taxiway	Taxiway A	88	8/1/13	
Taxiway	Taxiway A1	91	8/1/13	
Taxiway	Taxiway A2	83	8/1/13	
Taxiway	Taxiway A3	87	8/1/13	
Taxiway	Taxiway A4	98	8/1/13	
Taxiway	Taxiway A5	98	8/1/13	
Taxiway	Taxiway B	97	9/1/13	
Taxiway	Taxiway C	99	9/1/13	
Taxiway	Taxiway D	83	9/1/13	
Taxiway	Taxiway E	82	9/1/13	
Taxiway	Taxiway F	82	9/1/13	
Taxiway	Taxiway G	68	10/1/13	
Taxiway	Taxiway G1	67	10/1/13	
Taxiway	Taxiway G2	74	10/1/13	
Taxiway	Taxiway G3	86	10/1/13	
Taxiway	Taxiway G4	73	10/1/13	
Taxiway	Taxiway G6	72	10/1/13	

TAB C.2 - ASSESSMENT REPORT (EXAMPLE):

Section:				**TOTAL**
Description:				
61	BLOW-UP	L		
		M		
		H		
62	CORNER BREAK < 1/8 L, 1/8 - 1 M, > 1 H	L		
		M		
		H		
63	CRACKS LONG/TRANS/DIAG < 1/8 L, 1/8 - 1 M, > 1 H	L		
		M		
		H		
64	DURABILITY "D" CRACKING if "D" don't record scaling	L		
		M		
		H		
65	JOINT SEAL DAMAGE some damage L replace 2 yrs M replace immediate H	L		
		M		
		H		
66	SMALL PATCH (<5 SF) count highest severity once if more than 1 patch	L		
		M		
		H		
67	LARGE PATCH (>5 SF) count highest severity once if more than 1 patch	L		
		M		
		H		
68	POPOUTS >3/SY overall	N/A		
69	PUMPING count all slab	ANY		
70	SCALING count highest severity once if more than one distress	L		
		M		
		H		
71 *	SETTLEMENT FAULTING <1/4rwy/twy L 1/8-1/2 apr 1/4-1/2rwy/twy M 1/2-1apr > 1/2 rwy/twy H >1 apron	L		
		M		
		H		
72 **	SHATTERED SLAB INTERSECTING SLAB L & M & H 4-5 pieces M & H 6 or more pieces	L		
		M		
		H		
73	SHRINKAGE CRACK	ANY		
74	JOINT SPALLING	L		
		M		
		H		
75	CORNER SPALLING within approx 2 ft of corner	L		
		M		
		H		
76	ASR No other distresses recorded if High ASR	L		
		M		
		H		

TAB C.2 - ASSESSMENT REPORT (EXAMPLE):

NOTES

RUBBER BUILD UP:

DRAINAGE:

JOINT SEALS:

CRACK:

SPALLS:

PATCHES:

INSPECTION DATE:____________________________

INSPECTED BY:______________________________

TAB D

REHABILITATION/RECONSTRUCTION

TAB D.1- REHABILITATION/RECONSTRUCTION COSTS

Pavement	Branch	Branch PCI	Branch Area SF	Rehab Cost
Apron	AP-TWYA6	86	35,400	$ 405,880.67
Apron	AP-TWYG1	74	43,870	$ 502,993.92
Apron	AP-TWYG5	83	45,560	$ 522,370.71
Apron	AP-TWYG6	79	46,953	$ 538,342.23
Apron	AP-TWYA1	75	50,781	$ 582,232.38
Apron	AP-POWER	98	63,140	$ 723,935.18
Apron	AP-NTHWST	65	191,057	$ 2,190,574.65
Apron	AP-HNGACC	34	230,075	$ 2,637,937.69
Apron	AP-STHWEST	69	477,866	$ 5,478,999.17
Apron	AP-STHEAST	86	512,720	$ 5,878,619.64
Apron	AP-WEST	82	813,600	$ 9,328,376.00
Apron	AP-EAST	68	1,445,486	$ 16,573,300.04
Apron	AP-SOUTH	86	2,260,400	$ 25,916,741.78
Overrun	OR-14L/32R	61	394,800	$ 3,056,629.33
Overrun	OR-14R/32L	86	400,000	$ 3,096,888.89
Runway	RW-14L/32R	99	1,670,000	$ 25,380,288.89
Runway	RW-14R/32L	85	1,673,826	$ 25,438,435.59
Taxiway	TW-HUSH	84	8,564	$ 61,242.12
Taxiway	TW-A	88	671,865	$ 4,804,581.27
Taxiway	TW-A1	91	63,240	$ 452,236.27
Taxiway	TW-A2	83	35,785	$ 255,902.51
Taxiway	TW-A3	87	35,635	$ 254,829.84
Taxiway	TW-A4	98	35,037	$ 250,553.48
Taxiway	TW-A5	98	41,600	$ 297,486.22
Taxiway	TW-A6	88	47,500	$ 339,677.78
Taxiway	TW-B	97	115,275	$ 824,344.33
Taxiway	TW-C	99	101,700	$ 727,268.00
Taxiway	TW-D	99	284,100	$ 2,031,630.67
Taxiway	TW-E	82	97,275	$ 695,624.33
Taxiway	TW-F	82	73,200	$ 523,461.33
Taxiway	TW-G	68	382,233	$ 2,733,390.65
Taxiway	TW-G1	67	100,919	$ 721,682.98
Taxiway	TW-G2	74	32,998	$ 235,972.36
Taxiway	TW-G3	86	35,038	$ 250,560.63
Taxiway	TW-G4	73	57,458	$ 410,888.54
Taxiway	TW-G5	80	65,609	$ 469,177.25
Taxiway	TW-G6	72	160,575	$ 1,148,289.67

TAB D.2 - OPERATIONAL MAINTENANCE ONLY AREAS (PCI Below 70) -

Pavement	Branch	Section	PCI	Surface	Severity	Cost
Apron	West Flightline, near Hgr 80	A06B1	63	PCC	High	$ 5,304.00
Apron	West Flightline, south Hgr 61	A09B1	69	PCC	High	$ 36,636.00
Apron	East Flightline, north Hgr 5	A16B2	5	RPCC	High	$ 3,268.00
Apron	East Flightline, south Hgr 5	A16B3	15	RPCC	High	$ 1,560.00
Apron	East Flightline, north Hgr 16	A16B4	35	RPCC	High	$ 1,648.00
Apron	East Flightline, south Hgr 16	A16B6 A16B7	14 43	RPCC	High	$ 948.00
Overrun	East Flightline, north overrun 14L	O01C3	55	AC	High	$ 1,551
Overrun	East Flightline, south overrun 32R	O02C3	49	AC	High	$ 423.00
Taxiway	West Flightline	T11A2	67	PCC	High	$ 39,844.00
				High Total		$ 91,182.00
Apron	West Flightline, near Hgr 80	A06B1	63	PCC	Medium	$ 9,461.00
Apron	East Flightline, north Hgr 4	A16B1	28	RPCC	Medium	$ 17,152.00
Apron	East Flightline, south Hgr 4	A16B2	5	RPCC	Medium	$ 3,272.00
Apron	East Flightline, south Hgr 5	A16B3	15	RPCC	Medium	$ 10,576.00
Apron	East Flightline, north Hgr 16	A16B4	35	RPCC	Medium	$ 124.00
Apron	East Flightline, south Hgr 16	A16B6 A16B7	14	RPCC PCC	Medium	$ 12,840.00
Apron	East Flightline, north Hgr 16	A17B4	67	AC	Medium	$ 96,995.00
Apron	East Flightline, near Taxiway A	A19B2	59	PCC	Medium	$ 9,108.00
Apron	East Flightline, near Taxiway A	A19B3	62	PCC	Medium	$ 6,316.00
Overrun	East Flightline, north 14L	O01C3	55	AC	Medium	$ 98,164.00
Overrun	East Flightline, south 32R	O02C3	49	AC	Medium	$ 111,848.00
Runway	West Flightline, Runway	R08C1	64	PCC	Medium	$ 5,528.00
Taxiway	West Flightline, Taxiway G1	T09A	68	PCC	Medium	$ 11,740.00
Taxiway	West Flightline, Taxiway G	T11A1	67	PCC	Medium	$ 61,726.00
Taxiway	West Flightline, Taxiway G	T11A2	68	PCC	Medium	$ 39,844.00
Taxiway	West Flightline, Taxiway G, intersections ladder taxiways	T11A3	68	PCC	Medium	$ 19,055.00
Taxiway	West Flightline, Taxiway G4	T13A1	68	PCC	Medium	$ 14,988.00
Taxiway	West Flightline, Taxiway G1	T22A	57	AC	Medium	$ 204.00
				Medium Total		$ 528,941.00
					TOTAL	$ 620,123.00

TAB D.3 - PROGRAMMED REHABILATION/RECONSTRUCTION PROJECTS

Project Number	Project Title	Location	PCI	FY	Priority
TYMX101019	Repair West Runway - South End (South Runway 14R/32R between G4 and G5)	R08C1	64	2013	1
TYMX989345A	Repair/Replace Taxiway G (From G1 to G4)	T11A1-3	68	2013	2
TYMX989174A	Repair/Replace Taxiway G1 and G4	T09A T13A	67 73	2013	3
TYMX131002A	Repair Slabs East Apron Ph1	A03B	68	2013	4
TYMX131002B	Repair Slabs East Apron Ph2 (DV parking area)	A02B1	68	2013	5
TYMX092782	Repair Hanger Access Apron (East flightline between hgrs 4, 5, 16)	A16B A17B	34 34	2013	6
TYMX990266	Repair Overrun (14L overrun and 32R overrun)	O02C3 O01C3	49 55	2013	7

TAB E

PROJECTS

TAB E.1 - DISTRESS QUANTITIES/COST ESTIMATE - TOTAL BY PAVEMENT TYPE

PCC					Joint Seals				Cracks				Large Patch				Joint Spalls			
Pavement	Branch	Section	PCI	Area, SF	High Severity	Medium Severity	Unit Cost	Total Cost	High Severity	Medium Severity	Unit Cost	Total Cost	High Severity	Medium Severity	Unit Cost	Total Cost	High Severity	Medium Severity	Unit Cost	Total Cost
Taxiway	TW-G3	T12C1	65	35,038.00		62.5	$3.77	$ 235.63										2	$11.75	$23.50
Taxiway	TW-G3	T12C2	47	35,038.00	120		$3.77	$ 452.40		135	$1.94	$261.90	562.5		$14.10	$7,931.25				
							TOTAL	$ 688.03				$261.90				$7,931.25				$23.50
						TOTAL														
						High Severity		$8,383.65												
						Medium Severity		$ 521.03												

NOTE : EXAMPLE OF ONE LOCATION, WHEN DOING FULL REPORT ALL LOCATIONS WILL BE REPRESENTED

TAB E.2 - PREVENTIVE MAINTENANCE PROJECTS

Pavement	Location	ID	Cost	Distress	Type	Method
West Runway	14R/32L	R05, R06, R07	$ 322,747.00	Crack Sealing	AC	Contract
West Runway	14R/32L	R04, R08, R10	$ 58,829.00	Joint Seals, spalls, cracks	PCC	Contract
Taxiway	Alpha	T17A	$ 178,000.00	Joint seal, Patch	PCC	Contract
Taxiway	Alpha 1	T01A	$ 25.00	Patch	PCC	In House
Taxiway	Alpha 4	T17A6	$ 88.00	Patch	PCC	In House
Taxiway	Echo	T14A	$ 2,082.00	Joint Seals	PCC	In House
Taxiway	Foxtrot	T15A	$ 23,414.00	Joint Seals, cracks, spalls	PCC	Contract
Apron	South Ramp	A05B1, A05B, A13B, A14B	$ 120,198.00	Joint Seals, patchs, cracks	PCC	Contract
Overrun	14L end	O01C	$ 94,902.00	Cracks, weathered/raveling	AC	Contract
Taxiway	Hush House	T18C	$ 1,550.00	Cracks, spalls, joint seals	PCC	Contract
Apron	Hgr 4 south	A16B	$ 1,866.00	Joint Seals	PCC	Contract
		TOTAL	$ 803,701.00			

TAB F

RISK ANALYSIS

TAB F.1 - RISK ANALYSIS CALCULATIONS BY SECTIONS

Section	Section ID	Rank	Surface	Area SF	2009 PCI	PCI Critical ETL	Deterioration Rate with SRM Rw	Pavement Life with SRM (Year) Tw	Assumed Pavement Loss Life (Year) DTf	Deterioration Rate w/o SRM Rwo	Section Loss Life (Year) DTi	Annual Preventative Cost $/SF/YR	Alternate 1 $ Annual with Major SRM Cri $/SF/YR	EUAC Alternate 1 Annual Prev. + Alt 1 $/SF/YR	$ Annual Safety $/SF/YR	Alternate 2 $ Annual w/o Major SRM Cri $/SF/YR	EUAC Alternate 2 $Annual w/o Major + Safety $/SF/YR	EUAC Loss Alt 2 - Alt 1 $/SF/YR	EUACi EUAC*Dti $/SF	Risk Cost = EUACi * Area
Alpha	T17A	P	PCC	556,290	96	70	0.79	37.97	8.92	1.03	7.73	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.062	$ 34,617
Alpha 1	T01A	P	PCC	63,240	99	70	0.79	37.97	8.92	1.03	8.62	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.069	$ 4,389
Alpha 4	T17A6	P	PCC	14,352	97	70	0.79	37.97	8.92	1.03	8.03	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.065	$ 927
East Flightline (overrun)	O01C	T	AC	200,000	93	70	1.23	24.39	5.94	1.63	4.55	$ 0.0096	$ 0.1093	$ 0.119	$ 0.0004	$ 0.271	$ 0.271	$ 0.152	$ 0.694	$ 138,778
Echo	T14A	P	PCC	97,275	82	70	0.79	37.97	8.92	1.03	3.57	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.029	$ 2,794
Foxtrot	T15A	P	PCC	73,200	79	70	0.79	37.97	8.92	1.03	2.68	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.022	$ 1,577
Charlie	T06A	P	PCC	101700	99	70	0.79	37.97	8.92	1.03	$ 8.6218	$ 0.0232	$ 0.145	$ 0.1680	$ 0.004	$ 0.172	$ 0.176	$ 0.008	$ 0	$ 7,059
Hgr 4 south	A16B	S	PCC	3,600	93	70	0.99	30.30	7.26	1.30	5.57	$ 0.0232	$ 0.1815	$ 0.205	$ 0.0040	$ 0.217	$ 0.221	$ 0.016	$ 0.091	$ 327
Hush House	T18C	P	PCC	8,564	76	70	0.79	37.97	8.92	1.03	1.78	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.014	$ 123
South Ramp	A05B1	S	PCC	1,555,150	80	70	0.99	30.30	7.26	1.30	2.42	$ 0.0232	$ 0.1815	$ 0.205	$ 0.0040	$ 0.217	$ 0.221	$ 0.016	$ 0.040	$ 61,463
South Ramp	A05B	S	PCC	111,500	93	70	0.99	30.30	7.26	1.30	5.57	$ 0.0232	$ 0.1815	$ 0.205	$ 0.0040	$ 0.217	$ 0.221	$ 0.016	$ 0.091	$ 10,135
South Ramp	A13B	S	PCC	522,000	97	70	0.99	30.30	7.26	1.30	6.54	$ 0.0232	$ 0.1815	$ 0.205	$ 0.0040	$ 0.217	$ 0.221	$ 0.016	$ 0.107	$ 55,703
South Ramp	A14B	S	PCC	173,250	97	70	0.99	30.30	7.26	1.30	6.54	$ 0.0232	$ 0.1815	$ 0.205	$ 0.0040	$ 0.217	$ 0.221	$ 0.016	$ 0.107	$ 18,488
West Flightline	R05C, R06C R07C	P	AC	999,975	81	70	0.79	37.97	8.92	1.03	3.27	$ 0.0096	$ 0.0702	$ 0.080	$ 0.0004	$ 0.172	$ 0.172	$ 0.093	$ 0.303	$ 303,026
West Flightline	R08C	P	PCC	153,000	74	70	0.79	37.97	8.92	1.03	1.19	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.010	$ 1,465
West Flightline	R10A	P	PCC	200,000	81	70	0.79	37.97	8.92	1.03	3.27	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.026	$ 5,265
West Flightline	R04A	P	PCC	150,000	91	70	0.79	37.97	8.92	1.03	6.24	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.050	$ 7,539
West Flightline	R09C	P	PCC	70,000	93	70	0.79	37.97	8.92	1.03	6.84	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.055	$ 3,853
West Flightline	R10A	P	PCC	200,000	94	70	0.79	37.97	8.92	1.03	7.14	$ 0.0232	$ 0.1448	$ 0.168	$ 0.0040	$ 0.172	$ 0.176	$ 0.008	$ 0.057	$ 11,488
																			TOTAL	$ 669,015

TAB F.2 - RISK ANALYSIS CALCULATIONS BY PROJECT

Project:	Cost	Execution	Section	Lost Life	Risk Cost
West Runway: 14R/32L Cracking Sealing	$ 322,747.00	Contract	R05 R06 R07	3.27	$303,026
West Runway: 14R/32L Joint Seals, Spalls, Cracks	$ 58,829.00	Contract	R04 R08 R09 R10	6.24 1.19 6.84 7.14	$7,539 $1,465 $3,853 $16,753
Taxiway: Alpha, Alpha 1, Alpha 4, Hush House, Hgr 4 south Joint Seal, Spalls	$ 182,872.00	Contract	T17A T01A T17A6 T18C	7.73 8.62 8.62 1.78	$34,617 $4,389 $927 $123 $327
Taxiway: Echo Joint Seals	$ 2,082.00	In House	T14A	3.57	$2,794
Taxiway: Foxtrot Joint Seals, Spalls, Cracks	$ 23,414.00	In House	T15A	2.68	$1,577
Taxiway: Charlie Joint Seals, Spalls	$ 75.00	In House	T06A	8.62	$7,059
Apron: South Ramp Joint Seals, Spalls, Cracks	$ 120,198.00	Contract	A05B1 A05B A13B A14B	2.42 5.57 6.54 6.54	$61,463 $10,135 $55,703 $18,488
Overrun: at 14L Cracks, Weathered/Raveling	$ 94,902.00	Contract	O01C	4.55	$138,778
TOTAL	$ 805,119.00				$669,015.00

TAB G

PRIORITIZATION

TAB G.1 - PRIORITIZATION OF PROJECTS -

Project	Cost	Risk Years	Risk Years Score	Cost Risk	Cost Risk Score	Mission Impact	Mission Impact Score	Use	Use Score	Location	Location Score	Total Score
Crack Seal West Runway 14R/32R	$ 322,747.00	3.27	75	$303,025.00	100	1	100	R	80	P	50	405
Repair Joint Seal/Spalls/Cracks West Runway 14L/32R	$ 60,695.00	5.35	95	$ 29,611.00	80	2	95	R	80	P	50	400
Repair Joint Seal/Spalls Taxiway A, A1, A4 and Hush House, Hanger 4 south	$ 182,872.00	6.69	100	$ 40,056.00	85	3	90	T	50	P	50	375
Joint Seals Taxiway E	$ 2,082.00	3.57	80	$ 2,794.00	75	4	85	T	50	P	50	340
Joint Seal/Spall/Crack Taxiway F	$ 23,414.00	2.68	70	$ 1,577.00	70	5	80	T	50	P	50	320
Joint Seal/Spall/Crack South Apron	$ 120,198.00	5.27	90	$145,787.00	95	6	75	A	30	S	25	315
Crack Seal, Weathered/Raveling Overrun 14L	$ 94,902.00	4.55	85	$138,778.00	90	7	70	O	10	T	10	265
TOTAL	$ 806,910.00											

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APPENDIX C GLOSSARY

C-1 ACRONYMS

AFCEC	Air Force Civil Engineer Center
AC	asphalt concrete
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AMP	Activity Management Plan
ASTM	American Society for Testing and Materials
BIA	Bilateral Infrastructure Agreement
DoD	Department of Defense
ETL	Engineering Technical Letter
EUAC	equivalent uniform annual cost
FOD	foreign object damage
Ft	foot
ft2	square feet
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HNFA	Host Nation Funded Construction Agreements
KPI	Key Performance Indicator
LoS	levels of service
M&R	maintenance and repair
MAJCOM	major command
NAVFAC	Naval Facilities Engineering Command
PACES	Parametric Cost Engineering System
PAVER	pavements management software
PCC	Portland cement concrete
PCI	pavement condition index

PM	preventive maintenance
PMP	preventive maintenance plan
SF	square foot
SF/Yr	square feet per year
SOFA	Status of Forces Agreements
UFC	Unified Facilities Criteria
U.S.	United States
USAF	United States Air Force

C-2 DEFINITION OF TERMS

Critical PCI: The PCI value of a section at which the rate of deterioration significantly increases and return on investment of PM decreases. Critical PCI (or breakdown point) will depend on the pavement type, pavement use, and traffic level, and is unique for each base. Until the PAVER software is configured to calculate the critical PCI, the policy PCI of 70 will be the default critical PCI for primary pavements and 55 for secondary and tertiary pavements. In the future, PAVER will develop critical PCIs for runways, taxiways, aprons, overruns, shoulders, asphalt concrete (AC), and portland cement concrete (PCC) pavements.

Global Preventive Maintenance (PM): Global PM is used to retard or slow pavement deterioration. Generally, global PM is effective at the beginning of pavement life and/or when climate-caused distresses have not started or, in some cases, the severity is low or medium. Global PM, like localized PM, may be performed in response to the appearance or progression of distress, but is more commonly performed on a recurring schedule (i.e., at set time intervals) without regard for the distresses present.

Localized Preventive Maintenance (PM): Localized PM consists of maintenance actions performed on pavement at the location of individual distresses to slow down the rate of pavement deterioration. It differs from global PM in that it typically is not applied to pavement outside of the location of the distress, whereas global PM is applied to areas of the pavement that may not be distressed.

Operational Maintenance: Operational maintenance is also referred to as safety maintenance, stop-gap maintenance, and breakdown maintenance. Operational maintenance is performed to mitigate distresses on pavements that are below the critical PCI to keep them operationally safe for use.

Pavement Condition Index (PCI): PCI is a numerical indicator between 0 and 100 that reflects the surface condition of the pavement.

Policy PCI: A project should be programmed before the pavement reaches these conditions:

- Sections with a PCI greater than or equal to 71 generally require minor maintenance and repair (M&R)
- Sections with a PCI of 56 to 70 generally require major and/or minor M&R
- Sections with a PCI of 41 to 55 generally require major and minor M&R or reconstruction
- Sections with a PCI of 26 to 40 generally require major repair or reconstruction
- Sections with a PCI less than or equal to 25 generally require reconstruction

Preventive Maintenance (PM): PM is a program of activities that preserves the investment in pavements, reduces the rate of degradation due to specific distresses, extends pavement life, enhances pavement performance, and reduces mission impact. PM includes localized PM and global PM. Both are performed on pavements that are above the critical PCI and are intended to maintain good pavements in good condition at minimal cost.

Preventive Maintenance Plan (PMP):

- A document that informs base leaders how to sustainment their pavements:

  • When maintenance is needed

  • What maintenance activities are to be performed

  • How the work is to be accomplished

  • What is the cost for the work

  • What is the risk if the work is not accomplished

- As a minimum, the PMP should include a prioritized list of projects by contract and in-house with location, quantity, estimated cost, and the risk associated with not performing the work.

Primary Pavements: 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 used by aircraft on a daily basis or frequently used transient taxiways and parking areas are considered primary pavements.

Rate of Pavement Deterioration: This is the rate at which a specific pavement at a specific location deteriorates over time. This rate is dependent on climatic conditions, pavement use, and traffic level.

Secondary Pavements: 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 used to test aircraft arresting gear). In general, any pavements that are not in daily use by aircraft are secondary pavements.

Tertiary Pavements: 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 for takeoff 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 Pavements: Unused pavements include any pavements that are inactive, abandoned, or scheduled for demolition.