MONTANA
Aviation System Plan
2021 PCI Update

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Montana Department of Transportation - Aeronautics Division

Contents

Chapter 1 – Program Introduction

1.1 Statewide Aviation System Plan (SASP) Background

The Aeronautics Division (Division) of the Montana Department of Transportation (MDT) has been conducting regular updates to the SASP since 1988. As part of the program, the Division provides an update to the Pavement Condition Index (PCI) values for participating airports every three years. Kimley-Horn was contracted by MDT in coordination with the Federal Aviation Administration (FAA) and Helena Airports District Office to provide the 2021 PCI update.

Airport pavement infrastructure represents a large capital investment in the Montana airports system. Timely and appropriate maintenance and strategic rehabilitation are essential as repair costs increase in proportion to deterioration. Additionally, airport pavement distresses can contribute to the development of loose debris and decreased ride quality, which can be a safety concern for aircraft operations. The PCI methodology analyzes an overall measure of the pavement condition and provides an indication of the degree of maintenance, repair, or rehabilitation efforts that will be required to sustain functional pavement. A statewide PCI survey allows for the systematic and objective review of facilities within the program to assist in the identification of pavement needs. This objective study helps provide the sponsor justification for redevelopment of existing facilities. The State and FAA are funding this program to assist airports in remaining compliant with the AIP Handbook requirement of maintaining an ASTM PCI inspection of airfield pavements every three years.

1.2 Participating Airports

The participating airports list for the 2021 update was informed by the FAA and MDT staff. In reviewing the 2018 airport list in conjunction with the programmed AIP grant list, the FAA was able to exclude certain airports that would be undergoing significant infrastructure development in the near future. Airports that participated in past updates but were excluded from the 2021 update due to ongoing development were: 29S, 6S5, 9U0, EKS, RPX, S64, and THM.

Table 1.1 2021 Program Participating Airports

Airport ID	Airport Name	Airport ID	Airport Name
00F	Broadus Airport	CTB	Cut Bank International Airport
00U	Big Horn County (Hardin) Airport	DLN	Dillon Airport
1S3	Tillitt Field (Forsyth) Airport	GDV	Dawson Community (Glendive) Airport
32S	Stevensville Airport	GGW	Wokal Field/Glasgow-Valley County Airport
38S	Deer Lodge-City-County Airport	HVR	Havre City-County Airport
3U3	Bowman Field (Anaconda) Airport	HWQ	Wheatland County Airport
3U7	Benchmark (Augusta) Airport	JDN	Jordan Airport
3U8	Big Sandy Airport	LTY	Liberty County (Chester) Airport
48S	Harlem Airport	LVM	Mission Field (Livingston) Airport
4U6	Circle Town County Airport	LWT	Lewistown Municipal Airport

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Airport ID	Airport Name	Airport ID	Airport Name
4U9	Dell Flight Strip Airport	M46	Colstrip Airport
6S0	Big Timber Airport	M75	Malta Airport
6S3	Woltermann Memorial (Columbus) Airport	MLS	Frank Wiley Field (Miles City) Airport
6S8	Laurel Municipal Airport	OLF	L. M. Clayton (Wolf Point) Airport
79S	Fort Benton Airport	PO1	Poplar Municipal Airport
7S0	Ronan Airport	PWD	Sher-Wood (Plentywood) Airport
7S6	White Sulphur Springs Airport	RED	Red Lodge Airport
88M	Eureka Airport	RVF	Ruby Valley Field Airport
8S0	Starr-Browning Airstrip	S01	Conrad Airport
8S1	Polson Airport	S34	Plains Airport
8U6	Terry Airport	S59	Libby Airport
8U8	Townsend Airport	S69	Lincoln Airport
97M	Ekalaka Airport	S71	Edgar G. Obie (Chinook) Airport
9S2	Scobey Airport	S85	Big Sky Field (Culbertson) Airport
9S4	Mineral County (Superior) Airport	SBX	Shelby Airport
9S5	Three Forks Airport	SDY	Sidney-Richland Regional Airport
BHK	Baker Municipal Airport	U05	Riddick Field (Phillipsburg) Airport
CII	Choteau Airport	WYS	Yellowstone (West Yellowstone) Airport

1.3 Project Scope and Objectives

In accordance with FAA AC 150/5380-7B *Airport Pavement Management Program (PMP),* an effective pavement management program consists of a system that achieves specific objectives. The MDT Statewide Aviation System Plan (SASP) PCI study objectives are as follows:

1. Update airport pavement database for tracking maintenance and construction history.
2. Calibrate the database to the ASTM pavement inventory hierarchy.
3. Achieve a systematic means for collecting and storing information regarding the existing pavement structure and condition.
4. Achieve an objective and repeatable system for evaluating pavement condition.
5. Report new pavement conditions in an intuitive manner for improved use during AIP Grant applications.

Kimley-Horn, in association with both MDT and FAA, developed a scope to meet the project objectives. The MDT SASP PCI scope of services consists of the following:

A. The project will include fifty-six (56) airports in the program. The participating airports have changed from the 2018 update based on the discretion of MDT and the FAA. Cut Bank, Wolfpoint, and Poplar were included under the pre-tense that MDT staff would be required to perform the field data collection if a PSA could not be obtained in time.

B. A program-wide response form will be issued to achieve an updated contact list and request record drawings for all completed projects since the last update. Received documents will be incorporated into the PAVER database.

C. Update existing PAVER database to the standard ASTM pavement inventory hierarchy.

D. Update base map drawings for geometry and facility construction updates. Utilize the 93% confidence interval as indicated in the scope. Confirm any missing pavement areas via document review and include area if confirmed in the field.

E. Conduct visual ASTM D5340 pavement condition index (PCI) survey for fifty-three (53) general aviation (GA) airports throughout the state of Montana. Three (3) airports CTB, OLF, P01 will be inspect by MDT staff.

F. Obtain current PCI values using the most recent version of PAVER.

G. Produce an appendix of representative photos for each airport.

H. Produce a summary report of the observed distresses from each airport inspection.

I. Summarize the data and findings in a technical report.

Chapter 2 – System Inventory and Network Definition

2.1 Pavement Management System Database

The database to store inventory information and analyze conditions is fundamental to the condition assessment. For this update, the MDT SASP has implemented the PAVER pavement management software. In general, a PAVER database is used to achieve the following objectives:

- Implement a system for managing pavement asset inventories, and
- Store and analyze pavement condition information.

Additionally, this software has the capabilities to create performance models to forecast conditions and develop pavement maintenance, repair, and major rehabilitation recommendations based on funding scenarios and/or constraints.

2.1.1 PAVER Computer Program

PAVER was developed by the U.S. Army Construction Engineering Research Laboratory (USA-CERL) and uses the guidelines contained in FAA Advisory Circular 150/5380-6C *Guidelines and Procedures for Maintenance of Airport Pavements.* PAVER is a Windows-based program that can store information relating to pavements including, but not limited to, pavement type (layer and material property data), dates of construction, pavement condition data, traffic data, construction and maintenance history information, and nondestructive testing data, to name a few. Using the data stored in the PAVER database provides the user with many capabilities, including evaluating current condition, predicting future condition, determining maintenance and rehabilitation (M&R) needs, scheduling future inspections, and identifying budget needs based on various analysis scenarios. The existing PAVER database was updated to Version 7.0.10 as part of this update and was used to assist in updating the PCI for MDT airports.

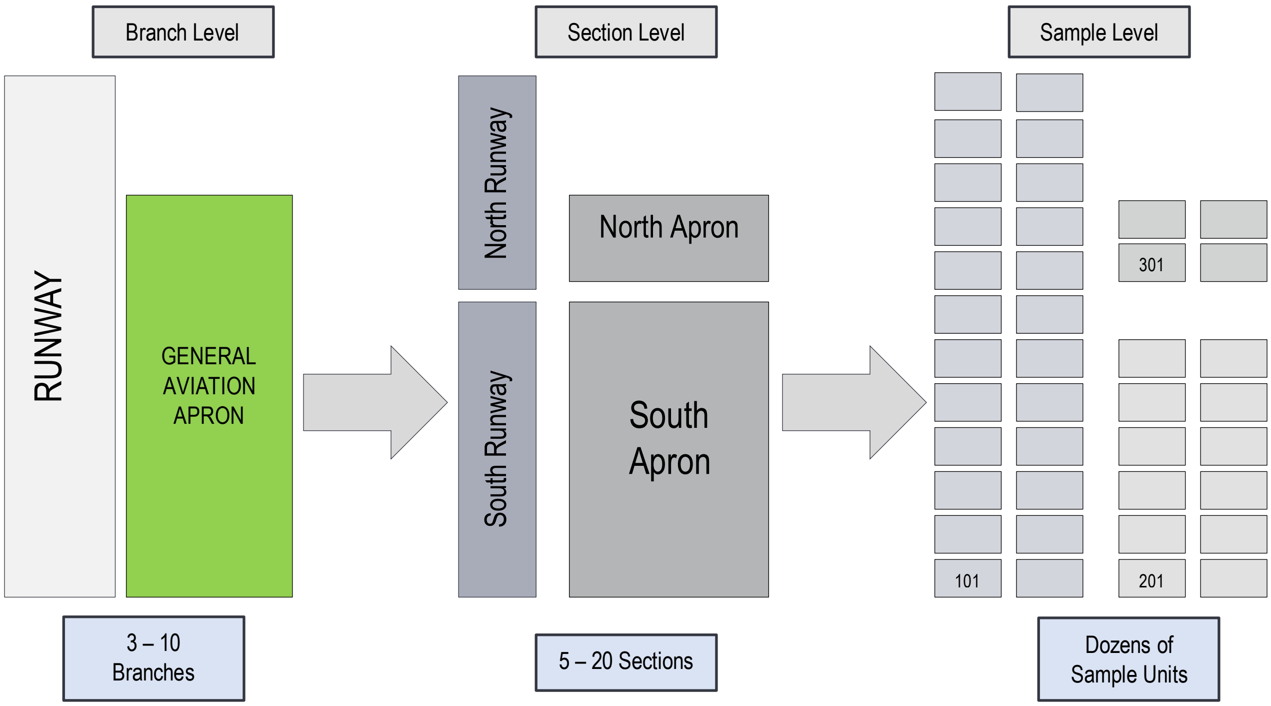
The following steps were completed to update the existing airside PAVER database for MDT:

- Update the existing PAVER database to Version 7.0.10;
- Update PAVER inventory based on recent airfield work since 2018;
- Calibrate the existing PAVER inventory to the ASTM pavement inventory hierarchy (i.e., Network ID, Branch ID, and Section ID)
- Data collection and entry;
- Data integrity and quality control;
- Determination of current PCIs; and
- PAVER report generation and interpretation.

2.2 Network Inventory Definitions

In a PCI study, a pavement network is established and then subdivided into smaller, manageable working units. **Figure 2.1** shows the relationship between branches, sections, and sample units within a pavement network. The following terms describe this network definition hierarchy and will be referred to throughout this report.

Figure 2.1 Pavement Network Definitions



2.2.1 Pavement Network

A pavement network is the starting point for the hierarchy of pavement management organization and is a logical unit for organizing airfield pavements. For example, for MDT and most other statewide systems, the network includes all non-privately maintained pavement facilities at the airport. Thus, the network name is interchangeable with the airport name.

2.2.2 Pavement Branch

A pavement branch, or facility, is a logical unit of generally identifiable pavement within a network with a distinct functional classification. For example, in an airfield environment, runways, taxiways, and aprons are considered separate branches. A branch must consist of at least one section.

2.2.3 Pavement Section

A pavement section is a subdivision of a branch that has consistent characteristics and condition levels throughout its area. These characteristics include structural composition (pavement layer material type and thickness), construction history, age, traffic type and frequency, and pavement condition. A section is the basic management unit of a pavement network and is the level at which condition results are analyzed.

2.2.4 Pavement Sample

A pavement sample (or sample unit) is a part of a pavement section that is evaluated according to the ASTM D5340 methodology. Sample unit areas are typically 5,000 contiguous square feet (± 2,000 square feet) for flexible (asphalt) pavement and 20 contiguous slabs (± 8 slabs) for rigid (concrete) pavement.

2.2.5 Pavement Inventory Hierarchy Update

The PAVER database is programmed to store pavement inventory data in the typical ASTM hierarchy format explained herein, beginning with Network, followed by Branch and Section, respectively. An effort was undergone in the 2021 update to correctly categorize pavement inventory data according to the ASTM hierarchy. The existing 2018 MDT PAVER database inherited by Kimley-Horn contained inventory information improperly categorized. Previously, all airports contained the same Network-Level Identifier, Airport Identifiers (Network IDs) were stored as the Branch Name, and Branch IDs were not identified beyond an arbitrary number followed by a simple "R" for runway, "T" for Taxiway, etc. This resulted in the absence of pavement Branch delineation. In other words, separate taxiway facilities (Taxiway A and Taxiway B for example) had no Branch ID to delineate them as separate facilities or to summarize PCI data according to Branch facility.

The update performed to the database hierarchy included separating airports at the Network level and adding Branch IDs. The Network ID for each airport now consists of the FAA Identifier that was previously stored as the Branch ID. The updated Branch ID, however, since not previously delineated, now consists of the Branch Use as the Branch ID for all Taxiway and Apron pavements (i.e., "TW" for all taxiways). It is recommended that in future updates an emphasis be placed on further delineating the airfield Branch IDs to differentiate between different facilities and to more accurately identify them based on actual naming designations (i.e., "TW B" for Taxiway B).

The naming convention for runway facilities was updated from previous studies to reflect the runway designation more accurately. Previously, runway branches were assigned an arbitrary letter/number combination. For example, at Polson Airport, “03R:R11” was previously the Branch ID:Section ID for Runway 18-36. Runway Branch IDs are now presented with part of the actual runway designation in the label for easier identification. For example, “RW18” is the new Branch ID and the new Branch Name reflecting Runway 18-36. Runway 18-36 is identified on the PCI exhibit as RW18:11 as the new Branch-Section Identifier.

2.3 Inventory Updates

As part of the update, Kimley-Horn was tasked with updating the recent work history and CAD files since the last inspection in 2018. In response to a statewide request, MDT, sponsors, and the airport consultants have provided available information regarding recent maintenance or construction. Construction projects that impacted existing pavement sections or geometry were reflected in the PAVER database and associated AutoCAD drawings. Major rehabilitation or construction activities in the twelve months prior to inspection are assumed to restore the PCI to 100 and were omitted from ASTM PCI survey.

Some airports were noted as having areas of pavement that were missing from the network definition map in previous studies. In general, if these areas were part of the airside pavement network, these areas were added into the network definition map prior to the field inspection for verification and inclusion in this PCI study.

There are certain common areas of pavement, however, that have not been included in the airfield pavement network at the airports, including shoulders, blast pads, non-aircraft pavements, areas that are closed or fenced off, and privately owned/maintained areas, such as private hangar aprons. Many of these areas were labeled as “exempt” in previous PCI studies.

2.3.1 Record Documentation

It is encouraged by the FAA that airports maintain records of all airfield construction and maintenance related to the pavement facilities. A history of maintenance and rehabilitation (M&R) performed, and the associated costs can provide valuable information on the cost and effectiveness of various treatments. Relevant record documentation includes the following:

- Location and limits of work
- Type of work
- Cost of work
- Supporting documents (contract documents, construction drawings, specifications, bid tabulations, repair product, photograph records, etc.)

2.3.2 Sample Unit Updates

During a visual condition survey, random samples of a pavement network are taken to provide a statistical reliability as outlined in the FAA Advisory Circular 150/5380-7B *Airport Pavement Management Program.* In total, a sampling rate similar to what was used in the 2018 PCI study was used to inspect the airside pavement networks at MDT airports in 2021.

With the exception of areas where major rehabilitation efforts resulted in an update to the network definition since the previous study, sample units in the same representative area as previous inspections were inspected for data consistency. Subsequent network inspections should be completed with this same frequency and sample locations to better predict the future PCI of the pavements.

Pavement sections added to the scope of the PCI study were inspected at a sampling rate that achieved an estimated 93% confidence interval, matching the standard sampling rate of prior studies.

2.4 Pavement Inventory Summary

2.4.1 Pavement Age

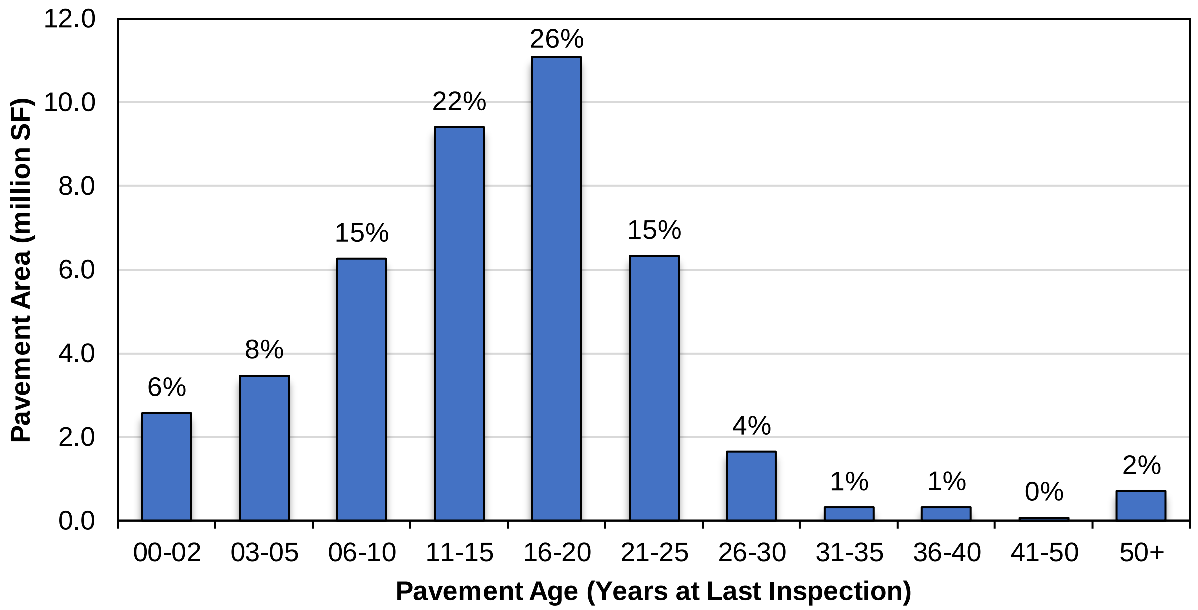
Standard pavement design practices typically consider a 20-year design life. Design inputs include factors such as subgrade soil conditions, pavement material characteristics and layer properties, and anticipated traffic volumes and types for the design period. Based on the review of the historic pavement construction at the participating airports, **Table 2.1** summarizes the age of the inspected pavement sections at the time of the PCI evaluations.

Table 2.1 Pavement Age at Time of Inspection

Age Category	Pavement Area (SF)	% Area	No. of Sections	% Sections	Average Age at Inspection
00-02	2,567,593	6%	41	10.0%	0
03-05	3,467,698	8%	44	11.0%	4
06-10	6,257,802	15%	45	11.0%	8
11-15	9,398,824	22%	86	21.0%	12
16-20	11,084,305	26%	99	23.0%	18
21-25	6,324,323	15%	61	15.0%	23
26-30	1,645,824	4%	21	5.0%	28
31-35	311,876	1%	9	2.0%	34
36-40	317,150	1%	6	1.0%	37
41-50	70,000	0%	1	0.0%	41
50+	701,467	2%	5	1.0%	53
Total/Average	**42,146,862**	**100%**	**418**	**100%**	**15.2**

Pavement age is defined as the number of years since any major construction activity has occurred. Major construction is defined as any construction activity that substantially improves the pavement, such as a mill and overlay or full depth reconstruction. The pavement ages reported here are intended to be a rough estimate based on interpretation of the data provided by MDT or the record documentation. Presently, nearly 48% of airfield pavements are between 10 to 20 years of age, while approximately 29% of all pavements are less 10 years old. Airfield pavements above the standard FAA design life of 20 years represent 23% of all pavement area. **Figure 2.2** summarizes this information graphically.

Figure 2.2 Pavement Age Distribution



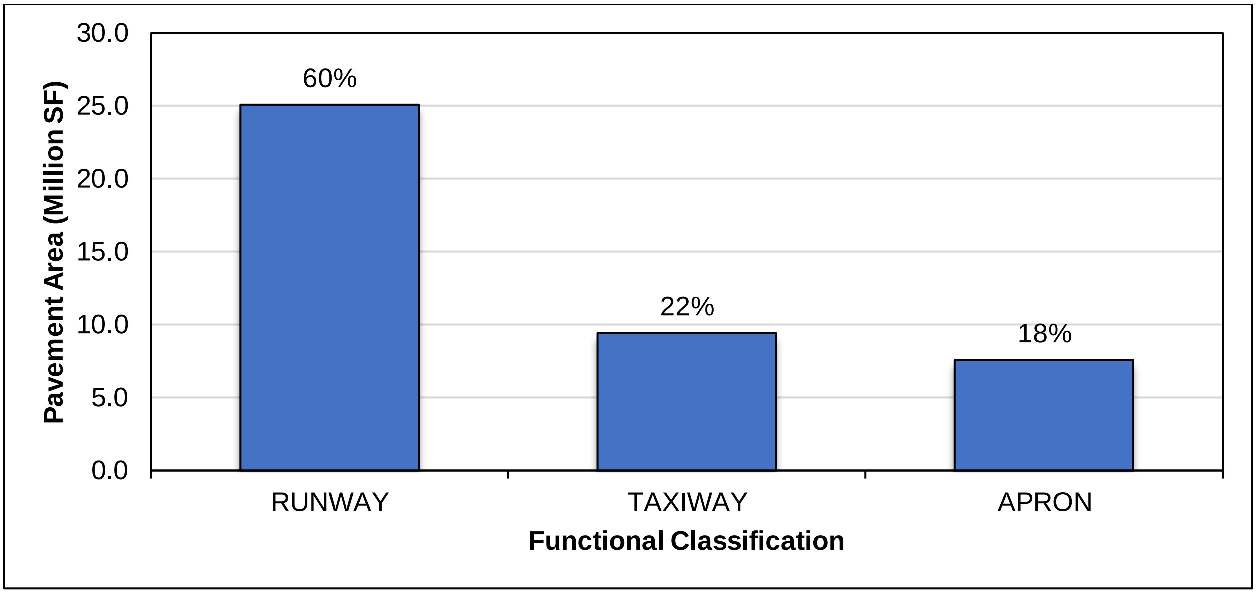
2.4.2 Functional Use Classification

Airfield pavements are subjected to various vehicle loading patterns based on utilization and overall operational use. The functional use categories defined for the Montana statewide program include Runway, Taxiway, and Apron. No shoulder, blast pad, or non-aircraft pavement was evaluated as part of this study. **Table 2.2** provides summary statistics for the various functional classifications and **Figure 2.3** depicts this information graphically.

Table 2.2 Pavement Functional Use Distribution

Functional Classification	Pavement Area (SF)	% Area	# Sections
RUNWAY	25,097,580	60%	89
TAXIWAY	9,448,409	22%	206
APRON	7,600,873	18%	123
TOTAL	**42,146,862**	**100%**	**418**

Figure 2.3 Pavement Functional Classifications by Area



Chapter 3 – Pavement Condition Index Surveys

Visual condition surveys were completed at 56 public-use Montana airports. Visually identifying a specific pavement distress type (i.e., load- or climate-related), determining the severity and quantity of the distress, and computing a PCI value provides valuable information to identify possible causes of the pavement deterioration and eventually help in developing maintenance and rehabilitation (M&R) recommendations.

It should be noted that the PCI method of pavement condition evaluation is strictly a visual and functional evaluation. Further evaluation of the pavement condition may be necessary for design and/or project-level determination of pavement rehabilitation. For example, pavements exhibiting visual indications of load-related distress can be further evaluated by conducting a structural evaluation consisting of non-destructive testing methods prior to project determination and implementation.

3.1 PCI Survey Methodology

Pavement condition assessments on behalf of MDT relied on use of the PCI survey method of inspection to collect pavement distress data. As noted above, the PCI survey is a visual statistical method for recording distress types, quantities, and severity levels. It is the most commonly used method for obtaining and recording airfield pavement distress data.

The method was developed by the United States Army Corps of Engineers (USACE) and later standardized by the ASTM National. The PCI value ranges from 0 to 100, with 0 indicating a failed pavement and 100 indicating a pavement in new condition. Several factors contribute to the PCI score, including the type, severity, and quantity of each distress. Together, these factors help to determine the deduct value, or numerical reduction from 100, that each observed distress contributes to the PCI of the sample unit.

3.2 Pavement Distress Mechanisms

Pavement distress types have varying deduct values that affect the overall PCI of a given sample unit, which is largely due to the underlying factors that cause the distress. Typically, most pavement distresses can be attributed to **loading**, **climate**, or **other** influences.

Load-related distresses typically have the highest PCI deduct values. They exist where the pavement is likely insufficient to accommodate applied wheel loads, and the effects are subsequently visible at the surface of the pavement. Asphalt pavement distresses, such as alligator cracking and rutting, and concrete pavement distresses, such as corner breaks and shattered slabs, are load-related distresses and can be indications of a structural failure of the pavement.

Pavement distresses caused by **climate** are directly related to the process of oxidation and the effects of freeze-thaw cycles. As soon as asphalt pavement is constructed, it is immediately influenced by the effects of oxidation due to exposure to the environment. Over time, the pavement becomes less flexible and more brittle, allowing the effects of climate to gradually deteriorate the pavement. Specifically, the combination of brittle pavement and freeze-thaw action can cause common climate-related distresses such as longitudinal and transverse (L&T) cracking, block cracking, raveling, and weathering in AC pavement, and blow-ups, durability cracking, joint seal damage, and shrinkage cracking in Portland cement concrete (PCC) pavement.

Distresses caused by **other** influences tend to range in criticality. Distresses categorized as “other” can include inconsistent mixes, human error in design and construction, and inadequate pavement materials used during construction. In AC pavement, typical distresses caused from other influences include bleeding, corrugation, depression, and oil spillage, while typical PCC distresses caused from other influences include popouts, pumping, and scaling.

The ASTM distresses can be found in **Table 3.1** with their associated primary mechanism or potential causes. For more information on the distress cause and how they are quantified in the PCI procedure, reference the most recent copy of ASTM D5340.

Table 3.1 Airfield Pavement Distresses and Common Distress Mechanisms

AC Pavement Distresses	
Distress	**Common Distress Mechanisms / Potential Causes**
Alligator Cracking	Load / Fatigue
Bleeding	Construction Quality/ Mix Design
Block Cracking	Climate / Age
Corrugation	Load / Construction Quality
Depression	Load / Subsurface
Jet Blast	Aircraft
Joint Reflection - Cracking	Climate / Subsurface Pavement / Traffic Load
Longitudinal/Transverse Cracking	Climate / Construction Quality
Oil Spillage	Aircraft / Vehicle
Patching	Utility / Pavement Repair / Age
Polished Aggregate	Repeated Traffic Loading
Raveling	Climate / Age
Rutting	Load / Fatigue
Shoving	PCC Pavement Growth / Movement
Slippage Cracking	Load / Pavement Bond / Mix Design
Swelling	Climate / Subsurface
Weathering	Climate / Age

PCC Pavement Distresses	
Distress	**Common Distress Mechanisms**
Blowup	Climate / ASR
Corner Break	Load Repetition / Curling Stresses
Linear Cracking	Load Repetition / Curling Stresses / Shrinkage Stresses
Durability Cracking	Freeze-Thaw Cycling
Joint Seal Damage	Material Deterioration / Construction Quality / Age
Small Patch	Pavement Repair
Large Patch/Utility Cut	Utility / Pavement Repair
Popout	Freeze-Thaw Cycling / ASR / Material Quality
Pumping	Load Repetition / Poor Joint Sealant
Scaling	Construction Quality / Freeze-Thaw Cycling
Faulting	Subgrade Quality / ASR / Inadequate Load Transfer
Shattered Slab	Overloading
Shrinkage Cracking	Construction Quality / Climate
Joint Spalling	Load Repetition / Infiltration of Incompressible Material / Deterioration of Dowel (Load Transfer) Bars
Corner Spalling	Load Repetition / Infiltration of Incompressible Material / Deterioration of Dowel (Load Transfer) Bars
Alkali-Silica Reaction (ASR)	Construction Quality / Climate / Chemical Reaction

3.3 Calculating the Pavement Condition Index

Visual condition data collected during the PCI inspections was entered into the PAVER database. PAVER was then used to calculate the current PCI for each sample unit and section. As noted above, the PCI is a number ranging from 0 to 100 that indicates the apparent structural integrity and surface operational condition of the pavement, with “100” indicating a pavement in new condition and “0” indicating a failed pavement section. Pavement Condition Ratings are associated with PCI ranges and these ratings vary from *Failed* to *Good* and assigned a corresponding color scale as noted in **Table 3.3**.

To calculate a PCI for a given sample unit, each distress type observed is assigned a deduct value based on its density (frequency of occurrence) and severity within that sample area. All deducts are summed and subsequently adjusted (or corrected) for the number of different distresses found. This corrected deduct value is subtracted from 100 to arrive at the PCI for that particular sample unit. The PCI for a pavement section is the mean PCI value of all sample units evaluated within that section.

Based on the visual condition data gathered and the likely causes associated with these distresses (i.e., load-, climate/environment-related), the engineer has some understanding of the cause of deterioration over the life of the pavement. Analyzing the potential causes of deterioration exhibited helps the user identify proper maintenance and rehabilitation strategies.

Table 3.3 shows the Pavement Condition Ratings and range of PCI values to which each descriptive rating corresponds.

Table 3.3 Pavement Condition Index - Condition Range Summary

Representative Photo	Pavement Condition Rating	PCI Range	Description
	**Good**	86 - 100	Pavement has minor or no distresses present and may benefit from routine maintenance
	Satisfactory	71 - 85	Pavement has dispersed low-severity distresses that should require only routine maintenance
	**Fair**	56 - 70	Pavement has a combination of generally low- and medium-severity distresses that may require either routine maintenance or rehabilitation, such as a mill and overlay
	**Poor**	41 - 55	Pavement has a combination of low-, medium, and high-severity distresses that often cause operation issues, often necessitating rehabilitation or reconstruction
	Very Poor	26 - 40	Pavement is categorized by a significant amount of medium- and high-severity distresses that cause prominent operational issues, necessitating reconstruction
	Serious	11 - 25	Pavement contains primarily high-severity distresses that cause operational safety concerns, requiring immediate repairs or complete reconstruction
	Failed	0 - 10	Pavement poses significant safety concerns and is no longer operationally usable or safe, requiring complete reconstruction

3.4 Data Integrity and Quality Control

Because the usefulness of the PAVER database outputs is dependent on the accuracy of the data contained in it, it is essential that all data be carefully reviewed by senior pavement engineers for quality control. Once all the information obtained was entered into the PAVER database, spreadsheets were generated and checked for discrepancies against the tablet-stored data collected in the field and corrections were made as needed.

3.5 Critical PCI

An important concept in pavement management is the critical PCI value, a value that prompts major rehabilitation activities. It serves as a condition threshold that helps determine a section's suitability to receive major work. As soon as a section's PCI reaches the critical PCI value, the rate of PCI loss (deterioration) is expected to increase. The critical PCI concept assumes that once a pavement section deteriorates to the critical level, it is more cost-effective to complete a major rehabilitation project rather than continuing to apply preventive maintenance or to defer major work until more costly reconstruction activities are required.

Historically, critical PCI values can vary and are typically based on a pavement's surface type, functional use, and importance, or priority, in daily operations. Based on FAA Order 5100.38D Change 1 Airport Improvement Handbook, issued February 26, 2019, the FAA has established pavement construction based on thresholds that distinguish Rehabilitation and Reconstruction. Pavement sections between PCI Values 56 and 70 will be considered for rehabilitation and sections between PCI Values 0 to 55 will be considered for reconstruction at the planning-level, as shown in **Table 3.4**. It is recommended that participating airports use these PCI thresholds as guidance for future airfield pavement projects to maintain alignment with the FAA AIP eligibility for project planning.

Table 3.4 FAA AIP Handbook M&R PCI Requirements

Pavement Condition Index Requirements for Airfield Pavement Projects	
Airfield Pavement Project Type	**Pavement Condition Index (PCI) Requirement**
Reconstruction	PCI ≤ 55 (Poor and below)
Rehabilitation	55 < PCI ≤ 70 (Fair)
Maintenance	N/A

Source: AIP Handbook, in reference to Runways, Taxiways, and Aprons as seen in table G -2, H-1, and I -1 respectively

Chapter 4 – Statewide Pavement Condition Results

4.1 Statewide-Level Results

The following **Table 4.1** summarizes the pavement condition analysis at each participating airport based on the most recent PCI Survey inspection results. These PCI values are intended for a high-level summary, further detail for each airport's PCI results can be found in the individual airport report.

Table 4.1 2021 PCI Results by Airport

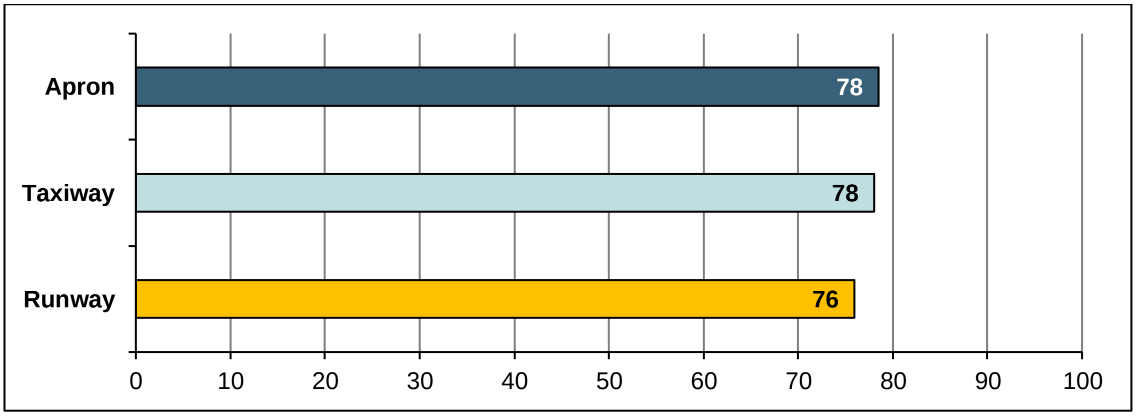
Airport ID	Airport Name	Area-Weighted Pavement Condition Index (PCI)			
		Runway PCI	Taxiway PCI	Apron PCI	Overall PCI
00F	Broadus Airport	80	82	83	80
00U	Big Horn County (Hardin) Airport	87	94	91	89
1S3	Tillitt Field (Forsyth) Airport	86	86	88	86
32S	Stevensville Airport	90	85	100	90
38S	Deer Lodge-City-County Airport	83	92	79	83
3U3	Bowman Field (Anaconda) Airport	80	83	100	83
3U7	Benchmark (Augusta) Airport	56	-	51	55
3U8	Big Sandy Airport	85	92	77	85
48S	Harlem Airport	68	66	68	67
4U6	Circle Town County Airport	72	70	67	71
4U9	Dell Flight Strip	47	56	49	48
6S0	Big Timber Airport	66	76	64	68
6S3	Woltermann Memorial (Columbus) Airport	100	97	97	98
6S8	Laurel Municipal Airport	75	67	68	71
79S	Fort Benton Airport	93	95	94	94
7S0	Ronan Airport	64	67	65	65
7S6	White Sulphur Springs Airport	85	77	94	85
88M	Eureka Airport	92	90	91	91
8S0	Starr-Browning Airstrip	73	56	57	71
8S1	Polson Airport	47	61	59	54
8U6	Terry Airport	72	78	60	70
8U8	Townsend Airport	64	59	56	61
97M	Ekalaka Airport	77	83	67	76
9S2	Scobey Airport	90	67	51	82
9S4	Mineral County (Superior) Airport	82	78	80	81
9S5	Three Forks Airport	68	68	65	68

Airport ID	Airport Name	Area-Weighted Pavement Condition Index (PCI)			
		Runway PCI	Taxiway PCI	Apron PCI	Overall PCI
BHK	Baker Municipal Airport	83	77	78	80
CII	Choteau Airport	72	77	81	73
CTB	Cut Bank International Airport	79	75	100	79
DLN	Dillon Airport	61	59	80	66
GDV	Dawson Community (Glendive) Airport	70	73	75	72
GGW	Wokal Field/Glasgow-Valley County Airport	80	63	62	74
HVR	Havre City-County Airport	94	90	90	92
HWQ	Wheatland County Airport	96	96	95	95
JDN	Jordan Airport	68	77	68	68
LTY	Liberty County (Chester) Airport	82	78	74	79
LVM	Mission Field (Livingston) Airport	88	90	89	88
LWT	Lewistown Municipal Airport	88	62	85	76
M46	Colstrip Airport	80	76	77	79
M75	Malta Airport	79	76	86	80
MLS	Frank Wiley Field Airport	82	74	72	79
OLF	L. M. Clayton (Wolf Point) Airport	74	73	74	73
PO1	Poplar Municipal Airport	87	92	92	88
PWD	Sher-Wood (Plentywood) Airport	83	82	80	82
RED	Red Lodge Airport	17	17	62	40
RVF	Ruby Valley Field Airport	81	85	87	83
S01	Conrad Airport	52	78	58	54
S34	Plains Airport	87	89	80	85
S59	Libby Airport	100	89	82	92
S69	Lincoln Airport	77	85	86	80
S71	Edgar G. Obie (Chinook) Airport	75	81	89	79
S85	Big Sky Field (Culbertson) Airport	83	90	77	83
SBX	Shelby Airport	76	84	77	79
SDY	Sidney-Richland Regional Airport	71	83	74	75
U05	Riddick Field (Phillipsburg) Airport	10	26	18	12
WYS	Yellowstone (West Yellowstone) Airport	71	93	93	82

4.2 PCI by Functional Use

The following **Figure 4.1** depicts the Statewide System area-weighted PCI for each pavement functional use – Runway, Taxiway, and Apron.

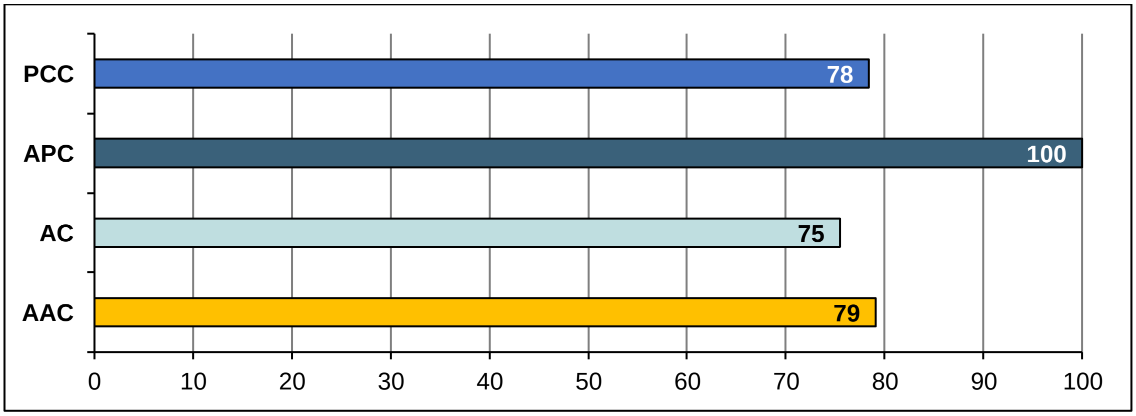
Figure 4.1 2021 PCI by Pavement Functional Use



4.3 PCI by Surface Type

Pavement facility surface types considered for the PCI update consist of the four common types: Portland Cement Concrete (PCC), Asphalt Concrete Overlaid on Portland Cement Concrete Pavement (APC), Asphalt Concrete Pavement (AC), and Asphalt Concrete Overlaid on Asphalt Concrete (AAC). The following **Figure 4.2** summarizes the Statewide System PCI determined based on the various pavement types within the participating airports.

Figure 4.2 2021 PCI by Surface Type



*APC – Asphalt over Portland cement concrete pavements – according to the database, are recently constructed therefore that surface type represents a PCI of 100.

4.4 Statewide PCI Summary

The following **Figure 4.3 (a)** provides the categorical summary of the statewide PCI as a relative area percentage. Furthermore, **Figure 4.3 (b) through (d)** depict the relative area as a percentage based on Functional Use. On a network level, approximately 73% of surveyed pavements are in Good or Satisfactory condition. Presently, roughly 18% of surveyed pavements are in Fair condition and the remaining 9% of surveyed pavements are in Poor or worse condition.

Figure 4.3 (a) Statewide PCI Summary

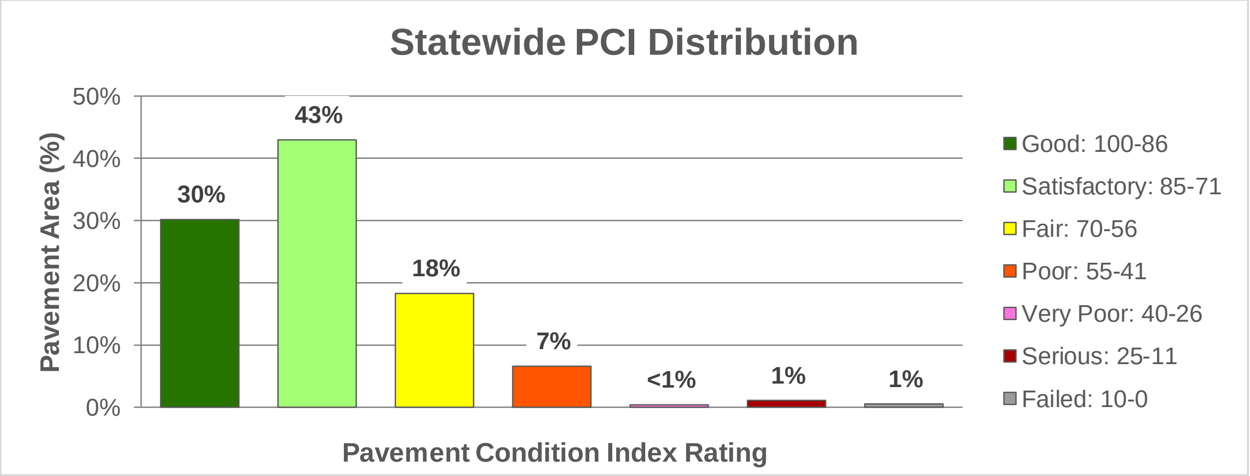


Figure 4.3 (b) Statewide PCI Summary – Runways

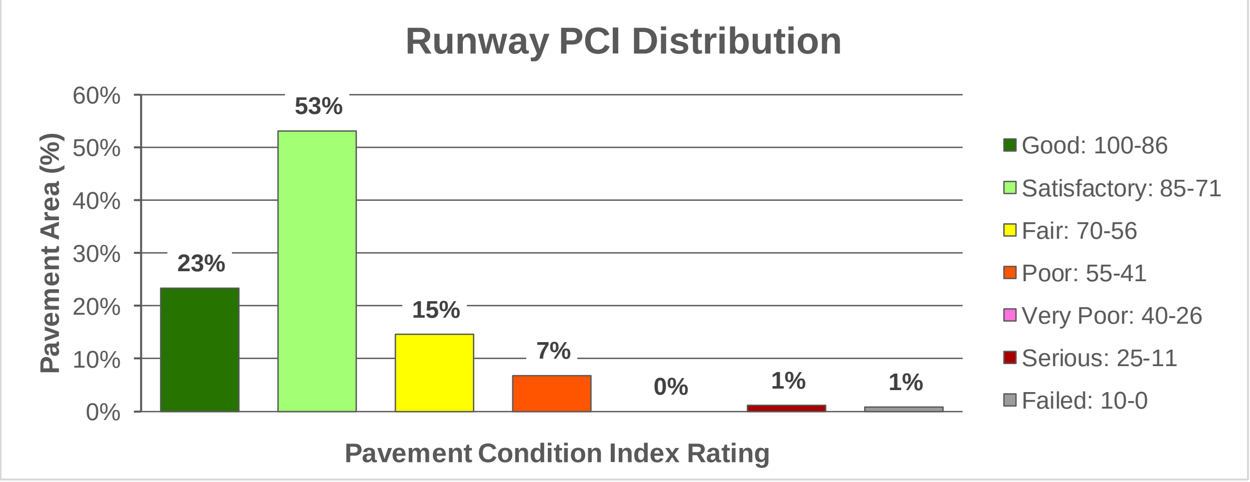


Figure 4.3 (c) Statewide PCI Summary – Taxiways

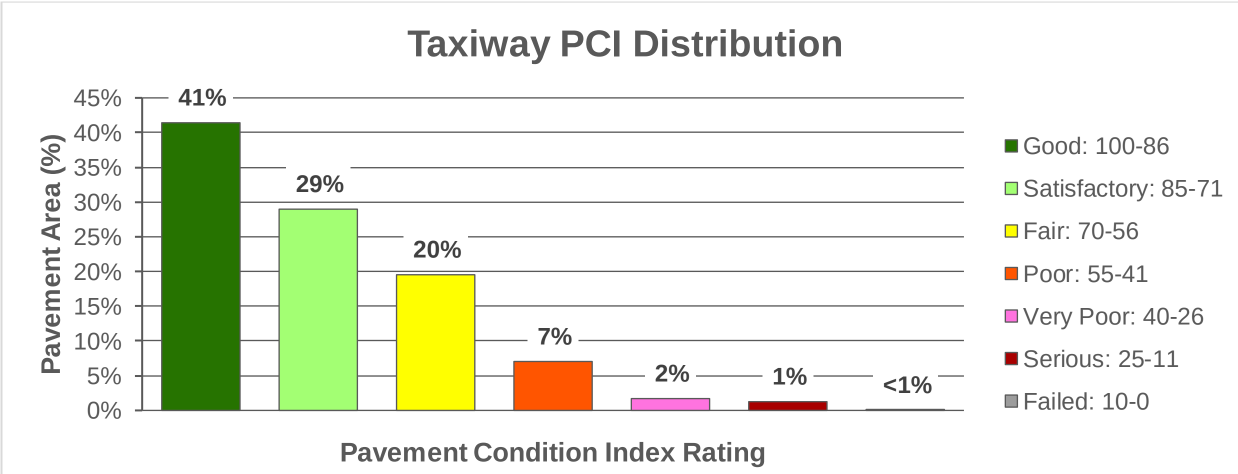
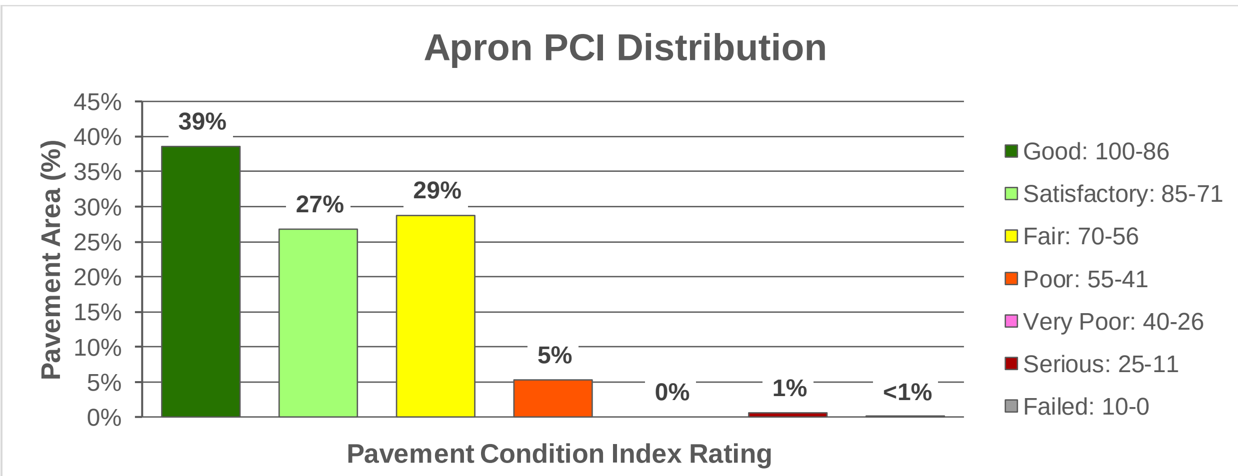


Figure 4.3 (d) Statewide PCI Summary – Aprons



Chapter 5 – Conclusion

5.1 Re-Inspection of Pavements

A high priority should be given for continuous maintenance and re-inspection of pavements to ensure continued safe aircraft operations. While deterioration of the pavements due to usage and exposure to the environment cannot be completely prevented, applying timely and effective maintenance strategies can slow the anticipated rate of deterioration. Lack of adequate and timely maintenance is large contributor to pavement deterioration.

A series of scheduled periodic inspections must be carried out for an effective maintenance program. Re-inspection of pavements should be scheduled to ensure that all areas, particularly those that may not come under day-to-day observation, are thoroughly evaluated and reported. Thorough inspections of all paved areas should be scheduled accordingly. It is recommended that a PCI survey be performed, and the PAVER database be updated on a three-year basis for each pavement section of the network.

5.2 Project Level Rehabilitation Projects (Design Level)

Prior to implementing major rehabilitation projects, it is recommended that each airport and their consultant perform a full project-level evaluation of the specific section(s) of pavements during the design process. Specific pavement rehabilitation alternatives can then be developed based on specific conditions at the time of rehabilitation and a recommended alternative can be selected after a life-cycle cost analysis is performed.

5.3 Pavement Management System Recommendations

The following recommendations are made to fully implement a pavement management program for each MDT airport:

- Develop a detailed preventative maintenance program.
- Further refine and implement the updated recommended rehabilitation program.
- Maintain the PAVER program either through a consultant or trained in-house staff.
- Routinely update PAVER with new construction and maintenance cost data.
- Update the PCI on a three-year cycle to see the greatest benefit.
- Develop a Statewide Pavement Design Criteria Report with design guidelines for each subsequent design project(s) that will take into consideration the recommendations of this report.

Individual Airport Reports

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