Creston Municipal Airport

PAVEMENT MANAGEMENT REPORT

PREPARED BY

Applied Pavement Technology, Inc.
115 West Main Street, Suite 400
Urbana, Illinois 61801
(217) 398-3977
www.appliedpavement.com

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applied pavement TECHNOLOGY

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CRESTON MUNICIPAL AIRPORT
PAVEMENT MANAGEMENT REPORT

Prepared For:

Iowa Department of Transportation
Modal Transportation Bureau – Aviation
800 Lincoln Way
Ames, Iowa 50010
515-239-1691
https://iowadot.gov/aviation/

Prepared By:

Applied Pavement Technology, Inc.
115 West Main Street, Suite 400
Urbana, Illinois 61801
217-398-3977
https://www.appliedpavement.com

In Association With:

Robinson Engineering Company
Consulting Engineers
819 Second Street NE
Independence, Iowa 50644
319-334-7211

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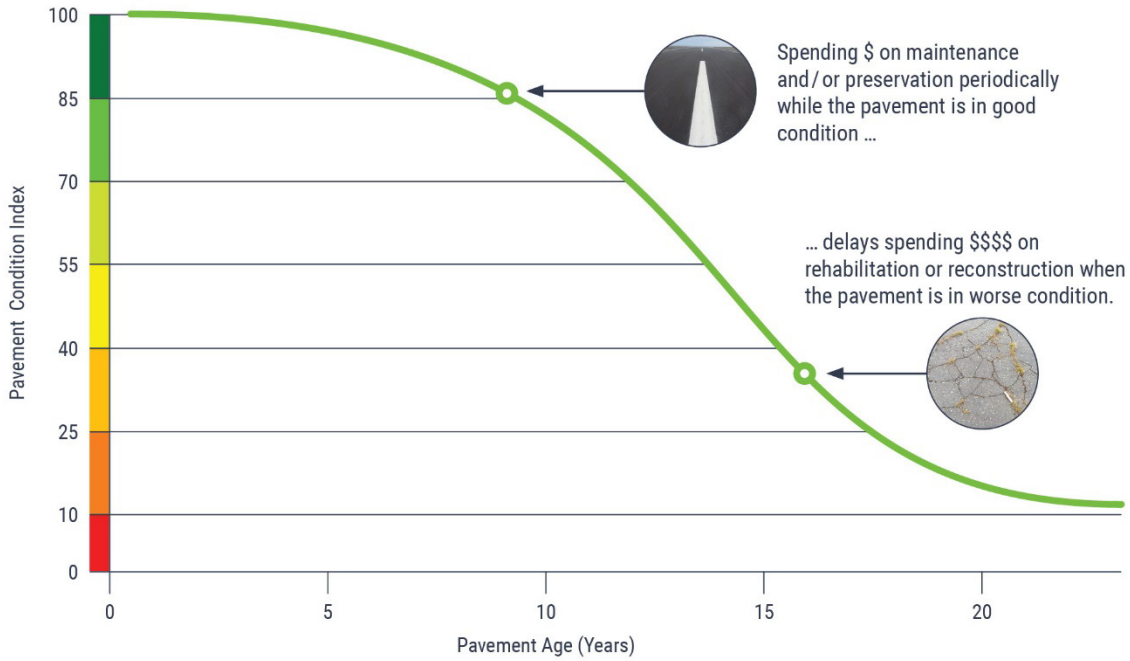
INTRODUCTION

Applied Pavement Technology, Inc. (APTech), with assistance from Robinson Engineering Company, updated the Airport Pavement Management System (APMS) for the Iowa Department of Transportation, Modal Transportation Bureau – Aviation (Iowa DOT). The APMS provides a means to monitor the condition of the pavements within the state of Iowa and to proactively plan for their preservation.

As part of this project, pavement conditions at Creston Municipal Airport were assessed in November 2021 using the Pavement Condition Index (PCI) procedure. During a PCI inspection, the types, severities, and amounts of distress present in a pavement are quantified. This information is then used to develop a composite index that represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent). The PCI provides an overall measure of condition and an indication of the level of work that will be required to maintain or repair a pavement. The distress information also provides insight into what is causing the pavement to deteriorate, which is the first step in selecting the appropriate repair action to correct the problem.

Programmed into an APMS, PCI information is used to determine when preventive maintenance actions (such as crack or joint sealing) are advisable and to identify the most cost-effective time to perform major rehabilitation (such as an overlay or whitetopping). Delaying maintenance and rehabilitation (M&R) until a pavement structure has seriously degraded can cost many times more than if M&R was applied earlier in a pavement's life cycle, as shown in Figure 1. From a safety perspective, pavement distresses, such as cracks and loose debris, may pose risks in terms of the potential for aircraft tire damage and the ability of a pilot to safely control aircraft.

Figure 1. Pavement condition versus cost of repair.



The pavement evaluation results for Creston Municipal Airport are presented within this report and can be used by Creston Municipal Airport, the Iowa DOT, and the Federal Aviation Administration (FAA) to identify, prioritize, and schedule pavement M&R actions at the airport. In addition to this report, the interactive pavement management data visualization tool IDEA, containing the pavement management information collected during this project, was updated and may be accessed from the Iowa DOT's website (https://iowadot.gov/aviation).

PAVEMENT INVENTORY

The project began with a review of the existing inventory information pertaining to the pavements at Creston Municipal Airport. The date of original construction, along with the date of any subsequent rehabilitation; the location of completed work; and the type of work undertaken were gathered. The information was used to update the pavement management database and associated maps as necessary to account for pavement-related work that had been undertaken since the last time the airport was evaluated in 2018.

The pavement network at Creston Municipal Airport was then divided into branches, sections, and sample units. A branch is a single entity that serves a distinct function. For example, a runway is considered a branch because it serves a single function (allowing aircraft to take off and land). Taxiways, aprons, and T-hangars are also separate branches.

Each branch was further divided into sections. Traditionally, sections are defined as parts of the branch that share common attributes, such as cross-section, date of last construction, traffic level, and performance. Using this approach, if a runway was built in 1968 and then extended in 1984, it would contain two separate sections.

To estimate the overall condition of a pavement section, each section was subdivided into sample units. Portions of these sample units were evaluated during the pavement inspection, and the collected information was extrapolated to predict the overall section condition and quantities of distress.

Approximately 519,900 square feet of pavement were evaluated at Creston Municipal Airport, as illustrated in Figure 2. This figure also shows the area-weighted age, in years, of the pavements at the time of the inspection. Figure 3 provides a map that details how the pavement network was divided into management units and identifies the sample units that were evaluated during the pavement inspection at Creston Municipal Airport.

Figure 2. Pavement area by branch use at Creston Municipal Airport.

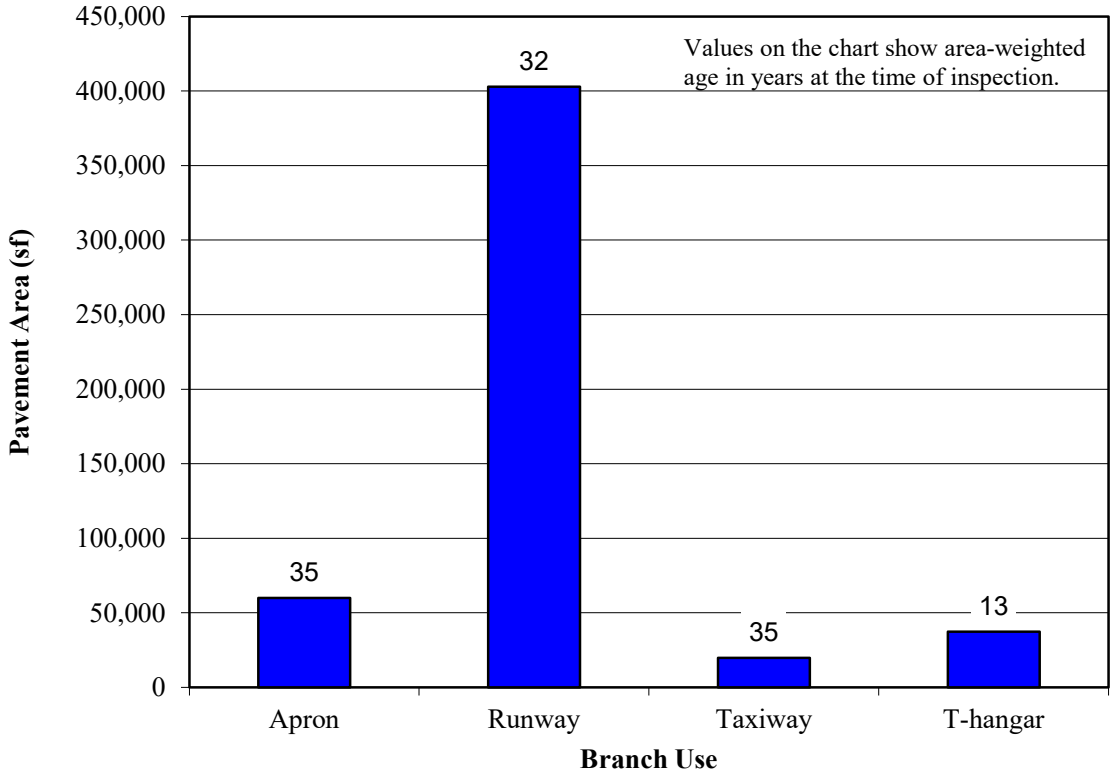
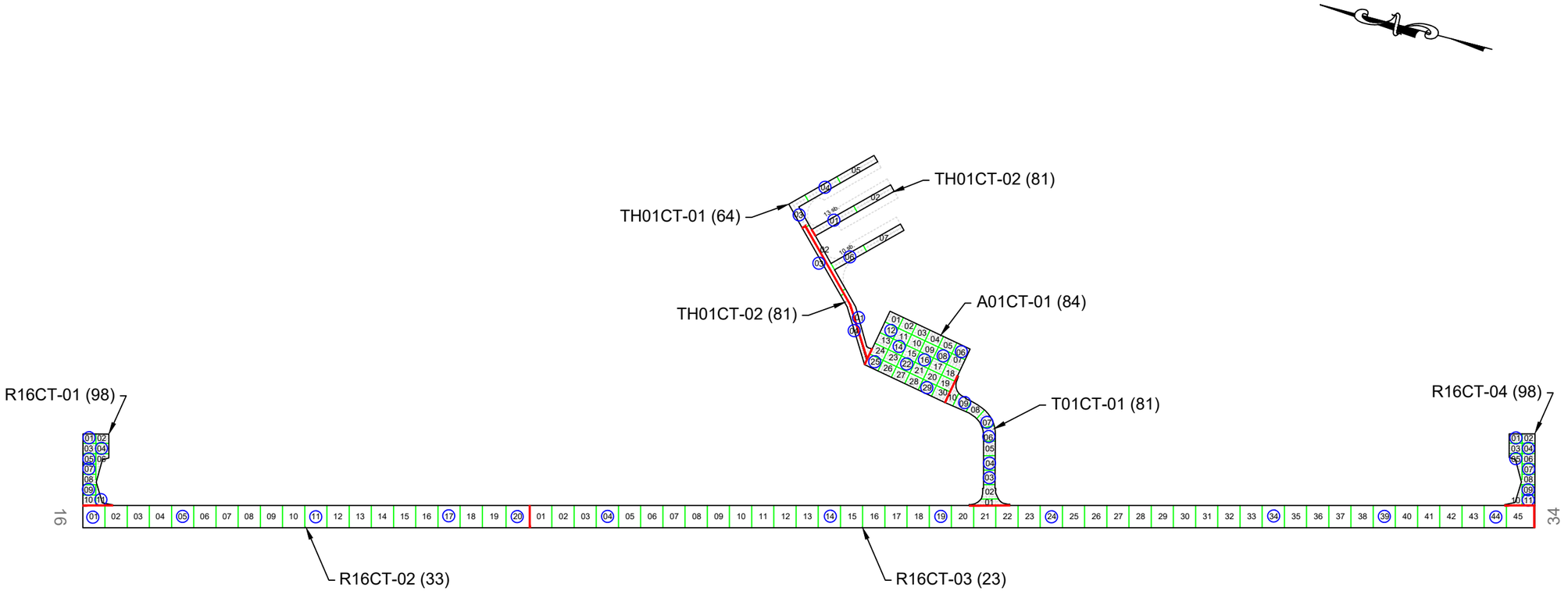


FIGURE 3. NETWORK DEFINITION MAP.



NETWORK DEFINITION LEGEND

R18AL-01 (71)
- BRANCH IDENTIFIER
- SECTION IDENTIFIER
- PCI VALUE

- SECTION BREAK LINE
- SAMPLE UNIT BREAK LINE
- SLAB JOINT
- 03 SAMPLE UNIT NUMBER
- (03) SAMPLE UNIT INSPECTED
- (03) ADDITIONAL SAMPLE UNIT

applied pavement TECHNOLOGY
115 W. Main Street, Suite 400
Urbana, IL 61801
Tel: (217) 398-3977
Fax: (217) 398-4027

AGENCY:	Iowa Department of Transportation Modal Transportation Bureau - Aviation
LOCATION:	Creston Municipal Airport Creston, Iowa
PAGE TITLE:	Network Definition Map

PROJECT DATE:	CREATION DATE:	PROJECT MANAGER:	JOB NUMBER:
SEP. 2021	SEP. 2021	LJR	17-020-AM05
DRAWING SCALE:	LAST MODIFIED DATE:	REVISED BY:	DRAWN BY:
1"=400'	JAN. 2022	KEW	DSP
FILENAME:		LAYOUT NAME/NUMBER:	PAGE NUMBER:
Creston.dwg		NET. DEF.	5

PAVEMENT EVALUATION

Pavement Evaluation Procedure

APTech inspected the pavements at Creston Municipal Airport using the PCI procedure described in:

- FAA Advisory Circular 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf).
- FAA Advisory Circular 150/5380-7B, *Airport Pavement Management Program (PMP)* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-7B.pdf).
- ASTM D5340-20, *Standard Test Method for Airport Pavement Condition Index Surveys*.

The PCI provides a numerical indication of overall pavement condition, as illustrated in Figure 4. The types and amounts of deterioration are used to calculate the PCI of the section. The PCI ranges from a value of 0, which represents a pavement in a failed condition, to a value of 100, which represents a pavement in excellent condition. It is important to note that factors other than overall PCI need to be considered when identifying the appropriate type of repair, including types of distress present and rate of deterioration. Also, since the PCI does not assess the structural integrity or capacity of the pavement structure, further testing may be needed to validate and refine the treatment strategy.

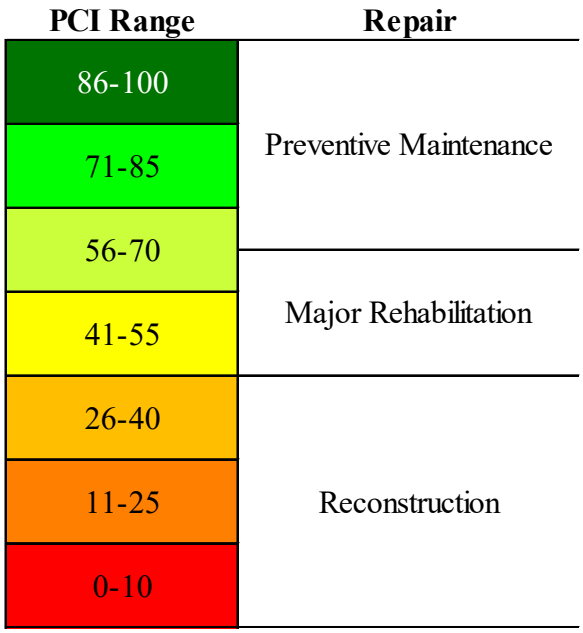
Figure 4. Visual representation of PCI scale on typical pavement surfaces[1].

PCI = 100 PCI = 60 PCI = 35

[1]Photographs shown are not specific to Creston Municipal Airport.

Generally, pavements with relatively high PCIs that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing or joint resealing. As the PCI drops, the pavements may require major rehabilitation, such as an overlay or whitetopping. In some situations where the PCI has dropped low enough, reconstruction may be the only viable alternative due to the substantial damage to the pavement structure. Figure 5 illustrates how the appropriate repair type varies with the PCI of a pavement section and provides the corresponding colors used for the maps and charts in this report for each range of PCIs.

Figure 5. PCI versus repair type.



The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration, which in turn helps in selecting a rehabilitation alternative that corrects the cause, thus eliminating or delaying its recurrence. PCI distress types are characterized as load-related (such as alligator cracking on asphalt-surfaced pavements or shattered slabs on portland cement concrete [PCC] pavements), climate/durability-related (such as weathering [a climate-related distress type on asphalt-surfaced pavements] and durability cracking [a durability-related distress type on PCC pavements]), and other (distress types that cannot be attributed solely to load or climate/durability).

Appendix A identifies the distress types considered during a PCI inspection and describes the likely cause of each distress type. It should be noted that a PCI is based on visual signs of pavement deterioration and does not provide a measure of structural capacity.

Pavement Evaluation Results

The pavements at Creston Municipal Airport were inspected in November 2021. The 2021 area-weighted condition of Creston Municipal Airport is 43, with conditions ranging from 23 to 98 (on a scale of 0 [failed] to 100 [excellent]). During the previous pavement inspection in 2018, the area-weighted PCI of the airport was 62.

Figure 6 summarizes the overall condition of the pavements at Creston Municipal Airport, and Figure 7 presents area-weighted condition (average PCI adjusted to account for the relative size of the pavement sections) by branch use. Figure 8 is a map that displays the condition of the evaluated pavements. Table 1 summarizes the results of the pavement evaluation. Appendix B presents photographs taken during the PCI inspection, and Appendix C contains detailed information on the distress types observed during the visual survey. Appendix D includes detailed work history information that was collected during the record review process.

Figure 6. Pavement area by PCI range at Creston Municipal Airport.

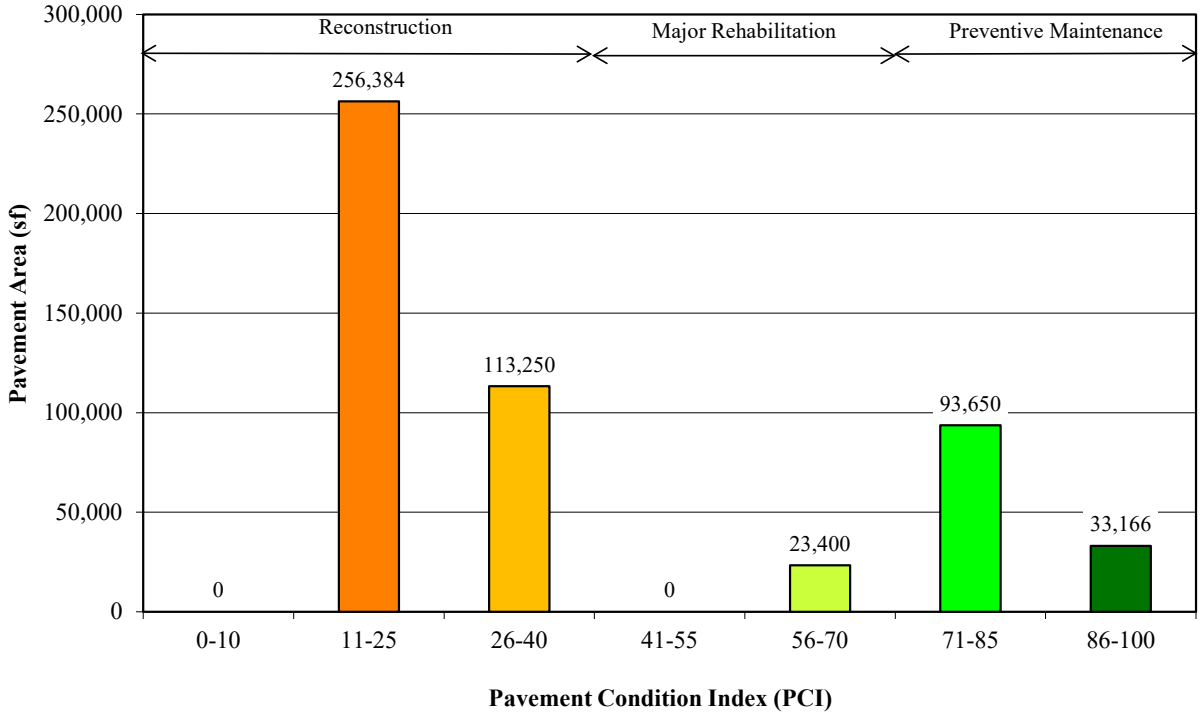


Figure 7. Area-weighted PCI by branch use at Creston Municipal Airport.
(Values on chart are area-weighted)

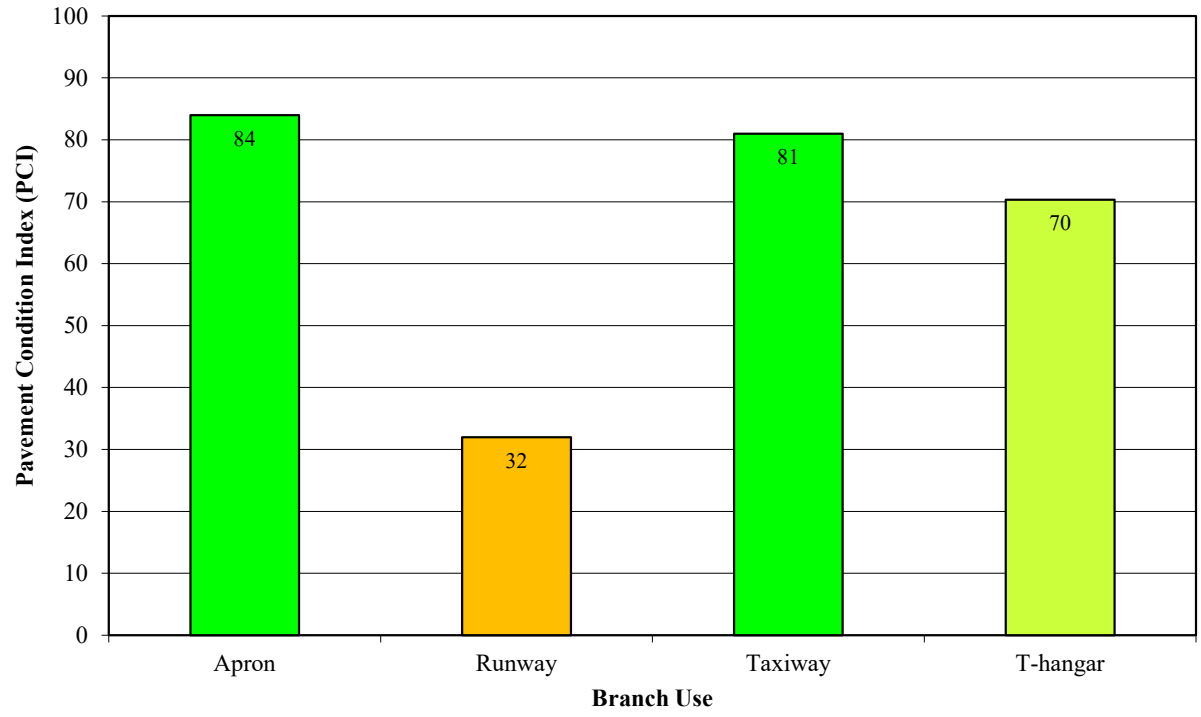
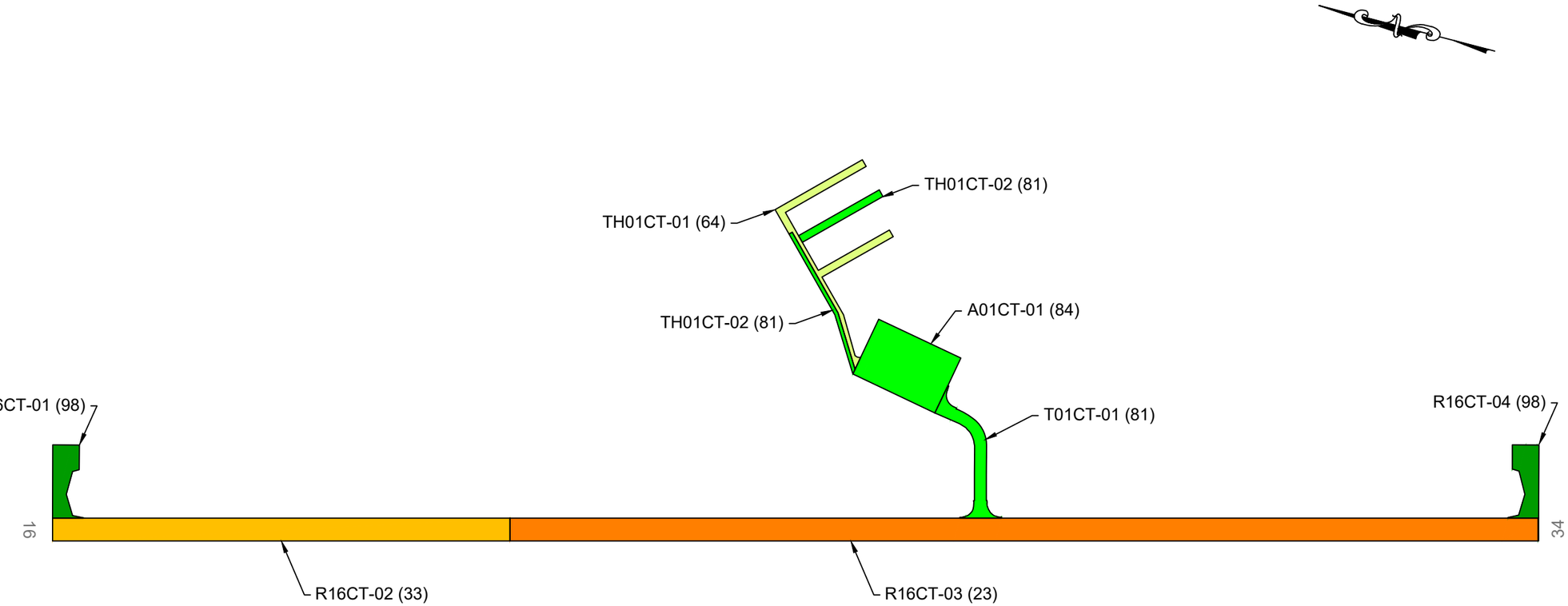


FIGURE 8. PCI MAP.



LEGEND

BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI VALUE
R18AL-01 (71)

SECTION BREAK LINE

PAVEMENT CONDITION INDEX

PCI

86-100
71-85
56-70
41-55
26-40
11-25
0-10

applied pavement TECHNOLOGY
115 W. Main Street, Suite 400
Urbana, IL 61801
Tel: (217) 398-3977
Fax: (217) 398-4027

Robinson Engineering Company
Consulting Engineers
322 1st Street East
Independence, IA 50644
Tel: (319) 334-7211

AGENCY: Iowa Department of Transportation Modal Transportation Bureau - Aviation			
LOCATION: Creston Municipal Airport Creston, Iowa			
PAGE TITLE: 2021 Pavement Condition Index Map			
PROJECT DATE: SEP. 2021	CREATION DATE: SEP. 2021	PROJECT MANAGER: LJR	JOB NUMBER: 17-020-AM05
DRAWING SCALE: 1"=400'	LAST MODIFIED DATE: APR. 2022	REVISED BY: DSP	DRAWN BY: DSP
FILENAME: Creston.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 9

Table 1. 2021 pavement evaluation results.

Branch	Section	Surface Type	Section Area (sf)	LCD	2021 PCI	% Distress Due to Load	% Distress Due to Climate/ Durability	% Distress Due to Other	Type of Distress
A01CT	01	PCC	60,000	6/1/1986	84	35	53	12	Corner Break, Faulting, Joint Spalling, Joint Seal Damage, LTD Cracking, Shattered Slab
R16CT	01	PCC	16,460	6/3/2019	98	0	100	0	Joint Seal Damage
R16CT	02	AAC	113,250	5/1/1986	33	29	65	6	Alligator Cracking, Depression, L&T Cracking, Patching, Raveling, Rutting, Swelling, Weathering
R16CT	03	AAC	256,384	6/1/1986	23	18	82	0	Alligator Cracking, L&T Cracking, Patching, Raveling
R16CT	04	PCC	16,706	6/3/2019	98	0	100	0	Joint Seal Damage
T01CT	01	PCC	19,783	6/1/1986	81	13	51	36	ASR, Corner Break, Corner Spalling, Faulting, Joint Seal Damage, LTD Cracking
TH01CT	01	PCC	23,400	8/1/2007	64	40	20	40	ASR, Corner Break, Joint Spalling, Joint Seal Damage, LTD Cracking, Popouts, Shattered Slab
TH01CT	02	PCC	13,867	7/3/2009	81	16	31	53	ASR, Faulting, Joint Spalling, Joint Seal Damage, LTD Cracking

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Surface Type: AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.
3. LCD = last construction date.
4. Distress due to load includes distress types that are attributed to a structural deficiency in the pavement, such as alligator cracking or rutting on asphalt-surfaced pavements or shattered slabs on PCC pavements.
5. Distress due to climate or durability includes distress types that are attributed to either the aging of the pavement and the effects of the environment (such as weathering, raveling, or block cracking on asphalt-surfaced pavements) or to a materials-related problem (such as durability cracking or alkali-silica reaction [ASR] on PCC pavements). If materials-related distresses were recorded during the inspection, further laboratory testing is required to definitively determine the type present.
6. Distress due to other refers to distress types that are not attributed to one factor but rather may be caused by a combination of factors.
7. Distress types are defined by ASTM D5340-20. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

Inspection Comments

Creston Municipal Airport was inspected on November 19, 2021. There were eight pavement sections defined during the inspection. Suspected alkali-silica reaction (ASR) was recorded at this airport in accordance with ASTM D5340-20. It should be noted that laboratory testing in the form of petrographic analysis is the only definitive way to validate the presence of ASR; however, the formation of a precipitate is evidence of a reaction consistent with this type of materials-related distress.

Runway

Runway 16/34 was defined by four sections. Sections 01 and 04 were located at the Runway 16 and 34 approaches, respectively, and were both in excellent condition with only low-severity joint seal damage identified throughout. Sections 02 and 03 were both in poor condition. Areas of low- and medium-severity alligator cracking, high-severity depression and raveling, all severities of longitudinal and transverse (L&T) cracking, medium- and high-severity patching and weathering, low- and medium-severity rutting, and low-severity swelling were noted during the inspection in Section 02. Section 03 contained low- and medium-severity alligator cracking, all severities of L&T cracking and patching, and medium- and high-severity raveling.

Taxiway

Taxiway 01 connected Runway 16/34 with the apron area and consisted of one section. Areas of medium-severity corner break; medium- and high-severity corner spalling and joint seal damage; and low-severity ASR, faulting, and longitudinal, transverse, and diagonal (LTD) cracking were noted in Section 01.

Apron

The apron contained one section that had areas of low-severity faulting; all severities of joint seal damage; medium-severity shattered slab; and low- and medium-severity corner break, joint spalling, and LTD cracking recorded during the inspection.

T-Hangar

The T-hangar area was divided into two sections. Section 01 contained low-severity ASR, LTD cracking, and joint spalling; low- and medium-severity corner break; low- and high-severity joint seal damage; popouts; and all severities of shattered slab. Areas of low-severity ASR and faulting, medium-severity joint seal damage and LTD cracking, and medium- and high-severity joint spalling were identified in Section 02.

PAVEMENT MAINTENANCE AND REHABILITATION PROGRAM

Using the information collected during the pavement inspection, the PAVER pavement management software was used to develop a 5-year M&R program for Creston Municipal Airport. In addition, a 1-year plan for localized preventive maintenance (such as crack sealing and patching) was prepared.

Analysis Parameters

Critical PCIs

PAVER uses critical PCIs to determine whether localized preventive maintenance or major rehabilitation is the appropriate repair action. Above the critical PCI, localized preventive maintenance activities are recommended. Below the critical PCI, major rehabilitation actions, such as an overlay or reconstruction, are recommended. The Iowa DOT set the critical PCIs at 65 for runways, 60 for taxiways, and 55 for aprons and T-hangars.

Localized Preventive Maintenance Policies and Unit Costs

Localized preventive maintenance policies were developed for asphalt-surfaced and PCC pavements. These policies, shown in Appendix E, identify the localized preventive maintenance actions that the Iowa DOT considered appropriate to correct for the different distress types and severities. The Iowa DOT provided unit costs for each of the localized preventive maintenance actions included in these policies, and these costs are detailed in Appendix E. Please note that this information is of a general nature for the entire state. The localized preventive maintenance policies and unit costs may require adjustment to reflect specific conditions at Creston Municipal Airport.

Major Rehabilitation Unit Costs

PAVER estimates the cost of major rehabilitation based on the predicted PCI of the pavement section. The Iowa DOT provided the costs for major rehabilitation, and they are presented in Appendix E. If major rehabilitation is recommended in the 5-year program, further engineering investigation will be needed to identify the most appropriate rehabilitation action and to estimate the cost of such work more accurately.

Budget and Inflation Rate

An unlimited budget with a start date of July 1, 2022 and an inflation rate of 4.0 percent was used during the analysis.

Analysis Approach

The 5-year M&R program was prepared with the goal of maintaining the pavements above established critical PCIs. During this analysis, major rehabilitation was recommended for pavements in the year they dropped below their critical PCI. For the first year (2022) of the analysis only, a localized preventive maintenance plan was developed for those pavement sections that were above their critical PCI. If major rehabilitation was triggered for a section in 2023 or 2024, then localized preventive maintenance was not recommended for 2022. While localized preventive maintenance should be an annual undertaking at Creston Municipal Airport, it is not possible to accurately predict the propagation of cracking and other distress types. Therefore, the airport should budget for maintenance every year and can use the 2022 localized

preventive maintenance plan as a baseline for that work. As the pavements age, it can be assumed that the amount of localized preventive maintenance required will increase.

Analysis Results

A summary of the M&R program for Creston Municipal Airport is presented in Table 2. Detailed information on the recommended localized preventive maintenance plan for 2022 is provided in Appendix F.

Table 2. 5-year M&R program under an unlimited funding analysis scenario.

Year	Branch	Section	Surface Type	Type of Repair	Estimated Cost
2022	A01CT	01	PCC	Preventive Maintenance	$36,613
2022	R16CT	02	AAC	Major Rehabilitation	$1,179,434
2022	R16CT	03	AAC	Major Rehabilitation	$2,670,093
2022	T01CT	01	PCC	Preventive Maintenance	$13,565
2022	TH01CT	01	PCC	Major Rehabilitation	$192,393
2022	TH01CT	02	PCC	Preventive Maintenance	$6,266
				Total Estimated Cost:	**$4,098,000**

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Surface Type: AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.
3. Type of Repair: Major Rehabilitation such as pavement reconstruction or an overlay; Localized Preventive Maintenance such as crack sealing or patching.
4. The estimated costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at Creston Municipal Airport.

The recommendations made in this report are based on a broad network-level analysis and meant to provide Creston Municipal Airport with an indication of the type of pavement-related work required during the next 5 years. Further engineering investigation may be necessary to identify which repair action is most appropriate. In addition, the cost estimates provided are based on overall unit costs for the entire state, and Creston Municipal Airport should adjust the plan to reflect local costs.

Because an unlimited budget was used in the analysis, it is possible that the pavement repair program may need to be adjusted to consider economic or operational constraints. The identification of a project need does not necessarily mean that state or federal funding will be available in the year it is indicated. It is important to remember that regardless of the recommendations presented within this report, Creston Municipal Airport is responsible for repairing pavements where existing conditions pose a hazard to safe operations.

General Maintenance Recommendations

In addition to the specific maintenance actions presented in Appendix F, it is recommended that the following strategies be considered for prolonging pavement life:

1. Regularly inspect all safety areas of the airport and document all inspection activity. A sample form that can be used to perform these inspections is provided in Table 3 of this report.
2. Provide a method of tracking all maintenance activities that occur as a result of inspections. These need to be reported to the FAA and the Iowa DOT. This information is used to update the APMS records and is required to remain in compliance with Public Law 103-305 (see the next section of this report for further information on this law).
3. Conduct an aggressive campaign against weed growth through timely herbicide applications and mowing programs of the safety areas. Vegetation growth in pavement cracks is destructive and significantly increases the rate of pavement deterioration.
4. Implement a periodic crack and joint sealing program. Keeping water and debris out of the pavement system by sealing cracks and joints is a proven and cost-effective method of extending the life of the pavement system.
5. Ensure that dirt does not build up along the edges of the pavements. This can create a "bathtub" effect, reducing the ability of water to drain away from the pavement system.
6. Closely monitor the movement of heavy equipment (particularly farming, construction, and fueling equipment) to make sure it is only operating on pavements that are designed to accommodate heavy loads. Failure to restrict heavy equipment to appropriate areas may result in the premature failure of airport pavements.

FAA Requirements (Public Law 103-305)

Because Creston Municipal Airport is in the National Plan of Integrated Airport Systems (NPIAS), the airport sponsor is required to keep the airport in a viable operating condition. This includes maintaining airport pavements in accordance with Public Law 103-305. Public Law 103-305 states that after January 1, 1995, NPIAS airport sponsors must provide assurances or certifications that an airport has implemented an effective airport pavement maintenance management system (PMMS) before the airport will be considered for federal funding of pavement replacement or reconstruction projects. To be in full compliance with the federal law, the PMMS must include the following components at minimum: pavement inventory, pavement inspections, record keeping, information retrieval, and program funding.

This report serves as a complete pavement inventory and detailed inspection. To remain in compliance with the law, Creston Municipal Airport will also need to undertake monthly drive-by inspections of pavement conditions and track pavement-related maintenance activities.

FAA Advisory Circular 150/5380-7B provides detailed guidance pertaining to the requirements for an acceptable pavement management program (PMP). Appendix A of the FAA Advisory Circular 150/5380-7B outlines what needs to be included in a PMP to remain in compliance with this law and Grant Assurance #11. The following is a copy of this Appendix, along with instructions for supplementing this report so that all requirements are met. Note that the italicized words are direct quotations from the FAA Advisory Circular.

FAA Advisory Circular 150/5830-7B, Appendix A. Pavement Management Program (PMP)

A-1.0. *An effective PMP specifies the procedures to follow to assure that proper preventative and remedial pavement maintenance is performed. The program should identify funding or anticipated funding and other resources available to provide remedial and preventive maintenance activities. An airport sponsor may use any format deemed appropriate, but the program needs to, as a minimum, include the following:*

A-1.1. Pavement Inventory. *The following must be depicted:*

a. *Identification of all runways, taxiways, and aprons with pavement broken down into sections each having similar properties.*

   The network definition map provided in Figure 3 of this report shows the location of all runways, taxiways, aprons, and T-hangars at Creston Municipal Airport. If any new pavements are constructed or any pavement areas are permanently closed, this map must be updated. Project plans should be submitted to the Iowa DOT after project completion.

b. *Dimensions of pavement sections.*

   The dimensions of all runways, taxiways, aprons, and T-hangars are stored in the PAVER database. Appendix C provides information on length, width, and area. In addition, the network definition map (Figure 3) is drawn to scale. Any changes to pavement dimensions must be recorded.

c. *Type of pavement surface.*

   The type of pavement for each section at Creston Municipal Airport is listed in Table 1 of this report and is also stored in the PAVER database. Any changes to pavement type (through an overlay or reconstruction) must be recorded.

d. *Year of construction and/or most recent major rehabilitation.*

   Dates for pavement construction, rehabilitation, or reconstruction must be recorded. The current pavement history for Creston Municipal Airport is provided in Appendix D of this report.

e. *Whether AIP [Airport Improvement Program] or PFC [Passenger Facility Charge] funds were used to construct, reconstruct, or repair the pavement.*

   Funding sources for all pavement projects should be recorded.

A-1.2. PMP Pavement Inspection Schedule. *Airports must perform a detailed inspection of airfield pavements at least once a year for the PMP. If a pavement condition index (PCI) survey is performed, as set forth in ASTM D5340, Standard Test Method for Airport Pavement Condition Index Surveys, the frequency of the detailed inspection by PCI surveys may be extended to three years. Less comprehensive routine daily, weekly, and monthly maintenance inspections required for operations should be addressed.*

This report consists of a detailed inspection that will extend the inspection period to 3 years. It is the airport sponsor's responsibility to perform monthly drive-by inspections. A sample pavement inspection report form is provided in Table 3 of this report.

A-1.3. Record Keeping. *The airport must record and keep on file complete information about all detailed inspections and maintenance performed until the pavement system is replaced. The types of distress, their locations, and remedial action, scheduled or performed, must be documented. The minimum information recorded includes:*

a. *Inspection date*

b. Location

c. Distress types

d. Maintenance scheduled or performed

Items a through c are satisfied by this inspection report. Item d is the responsibility of the airport, as is record keeping of the monthly drive-by inspections.

A-1.4. Information Retrieval. *An airport sponsor may use any form of record keeping it deems appropriate so long as the information and records from the pavement survey can generate required reports, as necessary.*

Keep this report, monthly drive-by inspection reports, construction updates, and all records of maintenance activities in a readily accessible location so that they can be easily retrieved as requested by the FAA.

Table 3. Pavement inspection report.

Inspected By: _____

Date Inspected: _____

Branch	Section	Distress Description/Dimensions/Severity/ Recommended Action	Description of Repair	Date Performed	Cost	Funding Source
A01CT	01					
R16CT	01					
R16CT	02					
R16CT	03					
R16CT	04					
T01CT	01					

Table 3. Pavement inspection report (continued).

Inspected By: _____

Date Inspected: _____

Branch	Section	Distress Description/Dimensions/Severity/ Recommended Action	Description of Repair	Date Performed	Cost	Funding Source
TH01CT	01					
TH01CT	02					

Table Notes:

1. See Figure 3 for the location of the branch and section.

SUMMARY

This report documents the results of the pavement evaluation conducted at Creston Municipal Airport. A visual inspection of the pavements in 2021 found that the overall condition of the pavement network is a PCI of 43. A 5-year pavement repair program, shown in Table 2, was generated for Creston Municipal Airport, which revealed that approximately $4,098,000 needs to be expended on M&R. Creston Municipal Airport should utilize these study results to assist in planning for future maintenance needs as part of the airport CIP planning process.

APPENDIX A

CAUSE OF DISTRESS TABLES

Table A-1. Cause of pavement distress, asphalt-surfaced pavements.

Distress Type	Probable Cause of Distress
Alligator Cracking	Fatigue failure of the asphalt surface under repeated traffic loading.
Bleeding	Excessive amounts of asphalt cement or tars in the mix or low air void content, or both.
Block Cracking	Shrinkage of the asphalt and daily temperature cycling; it is not load associated.
Corrugation	Traffic action combined with an unstable pavement layer.
Depression	Settlement of the foundation soil or can be "built up" during construction.
Jet-Blast Erosion	Bituminous binder has been burned or carbonized.
Joint Reflection Cracking	Movement of the concrete slab beneath the asphalt surface due to thermal and moisture changes.
L&T Cracking	Cracks may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the asphalt surface due to low temperatures or hardening of the asphalt, or (3) reflective cracking caused by cracks in an underlying PCC slab.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.
Patching	N/A
Polished Aggregate	Repeated traffic applications.
Raveling	Asphalt binder may have hardened significantly, causing coarse aggregate pieces to dislodge.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads.
Shoving	Where PCC pavements adjoin flexible pavements, PCC "growth" may shove the asphalt pavement.
Slippage Cracking	Low strength surface mix or poor bond between the surface and the next layer of the pavement structure.
Swelling	Usually caused by frost action or by swelling soil.
Weathering	Asphalt binder and/or fine aggregate may wear away as the pavement ages and hardens.

Table A-2. Cause of pavement distress, PCC pavements.

Distress Type	Probable Cause of Distress
ASR	Chemical reaction of alkalis in the portland cement with certain reactive silica minerals. ASR may be accelerated by the use of chemical pavement deicers.
Blowup	Incompressible materials in the joints.
Corner Break	Load repetition combined with loss of support and curling stresses.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles.
Faulting	Upheaval or consolidation.
Joint Seal Damage	Stripping of joint sealant, extrusion of joint sealant, weed growth, hardening of the filler (oxidation), loss of bond to the slab edges, or absence of sealant in the joint.
LTD Cracking	Combination of load repetition, curling stresses, and shrinkage stresses.
Patching (Small and Large)	N/A
Popouts	Freeze-thaw action in combination with expansive aggregates.
Pumping	Poor drainage, poor joint sealant.
Scaling	Over finishing of concrete, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate.
Shattered Slab	Load repetition.
Shrinkage Cracking	Setting and curing of the concrete.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at the joint combined with traffic loads.

APPENDIX B

INSPECTION PHOTOGRAPHS

A01CT-01. Overview.

A01CT-01. LTD Cracking (Sample Unit No. 12).

R16CT-01. Overview.

R16CT-01. Joint Seal Damage (Sample Unit No. 01).

R16CT-02. Overview.

R16CT-02. L&T Cracking (Sample Unit No. 20).

R16CT-02. Weathering (Sample Unit No. 11).

R16CT-03. Overview.

R16CT-03. L&T Cracking (Sample Unit No. 44).

R16CT-03. Raveling (Sample Unit No. 44).

R16CT-04. Overview.

R16CT-04. Joint Seal Damage (Sample Unit No. 04).

T01CT-01. Overview.

T01CT-01. ASR (Sample Unit No. 03).

TH01CT-01. Overview.

TH01CT-01. ASR (Sample Unit No. 04).

TH01CT-01. Shattered Slab (Sample Unit No. 03).

TH01CT-02. Overview.

TH01CT-02. LTD Cracking (Sample Unit No. 04).

APPENDIX C

INSPECTION REPORT

RE-INSPECTION REPORT
CRESTON MUNICIPAL AIRPORT

Branch - Section ID: A01CT - 01

Branch Name: APRON Use: APRON

LCD: 6/1/1986
Surface Type: PCC
Rank: P
Section Area (sf): 60,000.00
Length (ft): 300.00
Width (ft): 200.00
From:
To:

PCI Family: IowaPCCAPSC

Slabs: 600
Slab Length (ft): 10.00
Slab Width (ft): 10.00
Joint Length (ft): 11,500.00

Section Comments:

Last Insp Date: 11/19/2021
PCI: 84
Total Samples: 30
Surveyed: 8

Inspection Comments:

Sample Number: 006

Sample Type: R
Sample PCI: 54
Sample Area (Slabs): 20

Sample Comments:

62 CORNER BREAK	M	1 Slabs
63 LINEAR CR	M	1 Slabs
65 JT SEAL DMG	M	20 Slabs
71 FAULTING	L	1 Slabs
72 SHAT. SLAB	M	1 Slabs
74 JOINT SPALL	L	2 Slabs
74 JOINT SPALL	M	1 Slabs
74 JOINT SPALL	M	1 Slabs

Sample Number: 008

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 012

Sample Type: R
Sample PCI: 62
Sample Area (Slabs): 20

Sample Comments:

62 CORNER BREAK	L	1 Slabs
63 LINEAR CR	L	2 Slabs
63 LINEAR CR	M	2 Slabs
65 JT SEAL DMG	H	20 Slabs
71 FAULTING	L	3 Slabs

Sample Number: 014

Sample Type: R
Sample PCI: 93
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	M	20 Slabs

RE-INSPECTION REPORT
CRESTON MUNICIPAL AIRPORT

Sample Number: 016

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20
Sample Comments:

65 JT SEAL DMG	L	20	Slabs

Sample Number: 022

Sample Type: R
Sample PCI: 93
Sample Area (Slabs): 20
Sample Comments:

65 JT SEAL DMG	M	20	Slabs

Sample Number: 025

Sample Type: R
Sample PCI: 88
Sample Area (Slabs): 20
Sample Comments:

65 JT SEAL DMG	H	20	Slabs

Sample Number: 029

Sample Type: R
Sample PCI: 87
Sample Area (Slabs): 20
Sample Comments:

65 JT SEAL DMG	M	20	Slabs
71 FAULTING	L	2	Slabs

Branch - Section ID: R16CT - 01

Branch Name: RUNWAY 16/34 Use: RUNWAY

LCD: 6/3/2019
Surface Type: PCC
Rank: P
Section Area (sf): 16,460.00
Length (ft): 240.00
Width (ft): 68.00
From: TURNAROUND
To: RUNWAY END 16

PCI Family: IowaPCCRWSC_General

Slabs: 216
Slab Length (ft): 8.70
Slab Width (ft): 8.75
Joint Length (ft): 3,464.22

Section Comments:

Last Insp Date: 11/19/2021
PCI: 98
Total Samples: 11
Surveyed: 6

Inspection Comments:

Sample Number: 01

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 04

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 05

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 07

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 09

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 11

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 19

Sample Comments:

65 JT SEAL DMG	L	19 Slabs

RE-INSPECTION REPORT
CRESTON MUNICIPAL AIRPORT

Branch - Section ID: R16CT - 02

Branch Name: RUNWAY 16/34 Use: RUNWAY

LCD: 5/1/1986
Surface Type: AAC
Rank: P
Section Area (sf): 113,250.00
Length (ft): 1,510.00
Width (ft): 75.00
From: RUNWAY END 16
To: RUNWAY SECT 03

PCI Family: IowaAACRWSC&SW

Slabs:
Slab Length (ft):
Slab Width (ft):
Joint Length (ft):

Section Comments:

Last Insp Date: 11/19/2021
PCI: 33
Total Samples: 20
Surveyed: 5

Inspection Comments:

Sample Number: 001

Sample Type: R
Sample PCI: 29
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	M	80	SF	
48 L & T CR	H	120	Ft	1ft
48 L & T CR	L	420	Ft	
48 L & T CR	M	310	Ft	
50 PATCHING	M	75	SF	
52 RAVELING	H	42	SF	
57 WEATHERING	M	5,508	SF	

Sample Number: 005

Sample Type: R
Sample PCI: 45
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	L	60	SF	edge
48 L & T CR	L	540	Ft	lu
48 L & T CR	M	440	Ft	fs sec
50 PATCHING	M	19	SF	
57 WEATHERING	M	5,606	SF	

Sample Number: 011

Sample Type: R
Sample PCI: 32
Sample Area (SF): 5,625

Sample Comments:

48 L & T CR	L	600	Ft	lu
48 L & T CR	M	425	Ft	fs sec
50 PATCHING	H	230	SF	
53 RUTTING	M	75	SF	
57 WEATHERING	H	40	SF	
57 WEATHERING	M	5,355	SF	

Sample Number: 017

Sample Type: R
Sample PCI: 30
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	L	50	SF	
48 L & T CR	H	90	Ft	1ft
48 L & T CR	L	490	Ft	lu
48 L & T CR	M	505	Ft	fs sec
53 RUTTING	L	120	SF	
57 WEATHERING	H	80	SF	
57 WEATHERING	M	5,545	SF	

Sample Number: 020

Sample Type: R
Sample PCI: 30
Sample Area (SF): 6,000

Sample Comments:

41 ALLIGATOR CR	M	12	SF	
45 DEPRESSION	H	2	SF	
48 L & T CR	H	75	Ft	1ft at break
48 L & T CR	H	30	Ft	1ft
48 L & T CR	L	10	Ft	ls
48 L & T CR	L	340	Ft	lu
50 PATCHING	M	1,200	SF	
52 RAVELING	H	80	SF	
53 RUTTING	L	74	SF	
56 SWELLING	L	25	SF	
57 WEATHERING	M	4,720	SF	

Branch - Section ID: R16CT - 03

Branch Name: RUNWAY 16/34 Use: RUNWAY

LCD: 6/1/1986
Surface Type: AAC
Rank: P
Section Area (sf): 256,384.00
Length (ft): 3,394.00
Width (ft): 75.00
From: RUNWAY SECT 02
To: RUNWAY END 34

PCI Family: IowaAACRWSC&SW

Slabs:
Slab Length (ft):
Slab Width (ft):
Joint Length (ft):

Section Comments:

Last Insp Date: 11/19/2021
PCI: 23
Total Samples: 45
Surveyed: 7

Inspection Comments:

Sample Number: 004

Sample Type: R
Sample PCI: 28
Sample Area (SF): 5,625

Sample Comments:

48 L & T CR	H	5	Ft	1ft
48 L & T CR	L	350	Ft	lu
48 L & T CR	M	345	Ft	fs sec
52 RAVELING	M	5,625	SF	

Sample Number: 014

Sample Type: R
Sample PCI: 25
Sample Area (SF): 5,625

Sample Comments:

48 L & T CR	L	85	Ft	lu
48 L & T CR	M	350	Ft	w fs sec
50 PATCHING	H	190	SF	
50 PATCHING	L	340	SF	
52 RAVELING	H	4	SF	lightstrike
52 RAVELING	M	5,091	SF	

Sample Number: 019

Sample Type: R
Sample PCI: 23
Sample Area (SF): 5,625

Sample Comments:

48 L & T CR	H	12	Ft	1ft
48 L & T CR	L	470	Ft	lu
48 L & T CR	M	460	Ft	fs w sec
50 PATCHING	M	7	SF	
52 RAVELING	M	5,618	SF	

Sample Number: 024

Sample Type: R
Sample PCI: 22
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	L	20	SF	edge
41 ALLIGATOR CR	M	15	SF	edge
48 L & T CR	H	81	Ft	1ft
48 L & T CR	L	15	Ft	ls
48 L & T CR	L	210	Ft	lu
48 L & T CR	M	310	Ft	fs w sec
50 PATCHING	H	150	SF	
50 PATCHING	M	10	SF	
52 RAVELING	M	5,465	SF	

Sample Number: 034

Sample Type: R
Sample PCI: 22
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	L	75	SF	edge
48 L & T CR	H	43	Ft	spall
48 L & T CR	L	161	Ft	lu
48 L & T CR	M	375	Ft	fs spall
50 PATCHING	H	150	SF	
52 RAVELING	M	5,475	SF	

Sample Number: 039

Sample Type: R
Sample PCI: 22
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	M	75	SF	edge
48 L & T CR	H	30	Ft	1ft
48 L & T CR	L	190	Ft	lu
48 L & T CR	M	380	Ft	fs wsec
52 RAVELING	M	5,625	SF	

Sample Number: 044

Sample Type: R
Sample PCI: 22
Sample Area (SF): 5,625

Sample Comments:

41 ALLIGATOR CR	L	70	SF	edge
41 ALLIGATOR CR	M	55	SF	edge
48 L & T CR	H	78	Ft	1ft
48 L & T CR	L	350	Ft	lu
48 L & T CR	M	340	Ft	fs w
52 RAVELING	M	5,625	SF	

Branch - Section ID: R16CT - 04

Branch Name: RUNWAY 16/34 Use: RUNWAY

LCD: 6/3/2019
Surface Type: PCC
Rank: P
Section Area (sf): 16,706.00
Length (ft): 245.00
Width (ft): 70.00
From: End of Runway 34
To: END

PCI Family: IowaPCCRWSC_General

Slabs: 219
Slab Length (ft): 8.70
Slab Width (ft): 8.75
Joint Length (ft): 3,522.64

Section Comments:

Last Insp Date: 11/19/2021
PCI: 98
Total Samples: 11
Surveyed: 6

Inspection Comments:

Sample Number: 01

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 04

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 05

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 24

Sample Comments:

65 JT SEAL DMG	L	24 Slabs

Sample Number: 07

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 09

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Sample Number: 11

Sample Type: R
Sample PCI: 98
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs

Branch - Section ID: T01CT - 01

Branch Name: TAXIWAY 01 Use: TAXIWAY

LCD: 6/1/1986
Surface Type: PCC
Rank: P
Section Area (sf): 19,783.00
Length (ft): 440.00
Width (ft): 40.00
From: APRON 01
To: RUNWAY 16/34

PCI Family: IowaPCCTWSC_General

Slabs: 198
Slab Length (ft): 10.00
Slab Width (ft): 10.00
Joint Length (ft): 3,417.06

Section Comments:

Last Insp Date: 11/19/2021
PCI: 81
Total Samples: 10
Surveyed: 5

Inspection Comments:

Sample Number: 003

Sample Type: R
Sample PCI: 81
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	M	20 Slabs
76 ASR	L	6 Slabs

Sample Number: 004

Sample Type: R
Sample PCI: 83
Sample Area (Slabs): 20

Sample Comments:

62 CORNER BREAK	M	1 Slabs
65 JT SEAL DMG	M	20 Slabs
75 CORNER SPALL	M	1 Slabs

Sample Number: 006

Sample Type: R
Sample PCI: 83
Sample Area (Slabs): 20

Sample Comments:

62 CORNER BREAK	M	1 Slabs
65 JT SEAL DMG	M	20 Slabs
75 CORNER SPALL	M	1 Slabs

Sample Number: 007

Sample Type: R
Sample PCI: 83
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	H	20 Slabs
75 CORNER SPALL	H	1 Slabs

Sample Number: 009

Sample Type: R
Sample PCI: 75
Sample Area (Slabs): 23

Sample Comments:

63 LINEAR CR	L	1	Slabs
65 JT SEAL DMG	M	23	Slabs
71 FAULTING	L	3	Slabs
75 CORNER SPALL	M	3	Slabs

Branch - Section ID: TH01CT - 01

Branch Name: T-HANGAR 01 Use: T-HANGAR

LCD: 8/1/2007
Surface Type: PCC
Rank: P
Section Area (sf): 23,400.00
Length (ft): 900.00
Width (ft): 25.00
From: SEE MAP
To: SEE MAP

PCI Family: IowaPCCTH_SC&SW

Slabs: 150
Slab Length (ft): 12.50
Slab Width (ft): 12.50
Joint Length (ft): 2,782.00

Section Comments:

Last Insp Date: 11/19/2021
PCI: 64
Total Samples: 7
Surveyed: 4

Inspection Comments:

Sample Number: 01

Sample Type: R
Sample PCI: 51
Sample Area (Slabs): 22

Sample Comments:

62 CORNER BREAK	L	1 Slabs
63 LINEAR CR	L	2 Slabs
65 JT SEAL DMG	H	22 Slabs
68 POPOUTS	N	21 Slabs
74 JOINT SPALL	L	1 Slabs
76 ASR	L	18 Slabs

Sample Number: 03

Sample Type: R
Sample PCI: 46
Sample Area (Slabs): 24

Sample Comments:

62 CORNER BREAK	M	1 Slabs
63 LINEAR CR	L	1 Slabs
65 JT SEAL DMG	H	24 Slabs
72 SHAT. SLAB	H	1 Slabs
72 SHAT. SLAB	L	1 Slabs
72 SHAT. SLAB	M	1 Slabs

Sample Number: 04

Sample Type: R
Sample PCI: 81
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	H	20 Slabs
76 ASR	L	4 Slabs

Sample Number: 06

Sample Type: R
Sample PCI: 83
Sample Area (Slabs): 20

Sample Comments:

65 JT SEAL DMG	L	20 Slabs
76 ASR	L	7 Slabs

Branch - Section ID: TH01CT - 02

Branch Name: T-HANGAR 01 Use: T-HANGAR

LCD: 7/3/2009
Surface Type: PCC
Rank: P
Section Area (sf): 13,867.00
Length (ft): 306.00
Width (ft): 25.00
From: SEE MAP
To: SEE MAP

PCI Family: IowaPCCTH_SC&SW

Slabs: 89
Slab Length (ft): 12.50
Slab Width (ft): 12.50
Joint Length (ft): 1,618.72

Section Comments:

Last Insp Date: 11/19/2021
PCI: 81
Total Samples: 4
Surveyed: 3

Inspection Comments:

Sample Number: 01

Sample Type: R
Sample PCI: 88
Sample Area (Slabs): 26

Sample Comments:

65 JT SEAL DMG	M	26 Slabs
71 FAULTING	L	2 Slabs

Sample Number: 03

Sample Type: R
Sample PCI: 74
Sample Area (Slabs): 22

Sample Comments:

65 JT SEAL DMG	M	22 Slabs
74 JOINT SPALL	H	1 Slabs
74 JOINT SPALL	M	2 Slabs
76 ASR	L	1 Slabs

Sample Number: 04

Sample Type: R
Sample PCI: 81
Sample Area (Slabs): 21

Sample Comments:

63 LINEAR CR	M	1 Slabs
65 JT SEAL DMG	M	21 Slabs
74 JOINT SPALL	M	1 Slabs

APPENDIX D

WORK HISTORY REPORT

Work History

Pavement Database: IA 2021

Network: CRESTON MUNICIPAL AIRPORT

Branch - Section ID: A01CT - 01

LCD: 6/1/1986
Use: APRON
Rank: P
Surface: PCC

Length (ft): 300.00
Width (ft): 200.00
True Area (sf): 60,000.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-01-2014	PA-PF	Patching - PCC Full Depth	$0.00	0.00	False	-
06-01-2014	CS-PC	Crack Sealing - PCC	$0.00	0.00	False	-
06-01-2014	JS-LC	Joint Seal (Localized)	$0.00	0.00	False	-
06-01-1986	NC-PC	New Construction - PCC	$0.00	0.00	True	-

Branch - Section ID: R16CT - 01

LCD: 6/3/2019
Use: RUNWAY
Rank: P
Surface: PCC

Length (ft): 240.00
Width (ft): 68.50
True Area (sf): 16,460.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-03-2019	CR-PC	Complete Reconstruction - PCC	$0.00	6.00	True	6" P-501 PCC SURFACE COURSE
06-02-2019	BA-AG	Base Course - Aggregate	$0.00	6.00	False	6" P-208 base course
06-01-2019	SG-CO	Subgrade - Compacted	$0.00	12.00	False	12" P-152 subgrade prepared with fly ash.
05-01-1987	NC-PC	New Construction - PCC	$0.00	0.00	True	-

Branch - Section ID: R16CT - 02

LCD: 5/1/1986
Use: RUNWAY
Rank: P
Surface: AAC

Length (ft): 1,510.00
Width (ft): 75.00
True Area (sf): 113,250.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-01-2004	CS-AC	Crack Sealing - AC	$28,495.00	0.00	False	Total Project Cost $94,985
05-01-1986	OL-AS	Overlay - AC Structural	$0.00	5.00	True	5" P401 AC OVERLAY
06-04-1974	NC-AC	New Construction - AC	$0.00	2.00	True	2" P401 AC
06-03-1974	BA-BI	Base Course - Bituminous	$0.00	4.00	False	4" P201 BIT. BASE
06-02-1974	SG-ST	Subgrade - Stabilized	$0.00	6.00	False	6" P155 SUBGRADE
06-01-1974	SG-CO	Subgrade - Compacted	$0.00	9.00	False	9" COMPACTED SUBGRADE

Branch - Section ID: R16CT - 03

LCD: 6/1/1986
Use: RUNWAY
Rank: P
Surface: AAC

Length (ft): 3,394.00
Width (ft): 75.00
True Area (sf): 256,384.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-01-2004	CS-AC	Crack Sealing - AC	$66,490.00	0.00	False	Total Project Cost $94,985
06-01-1986	OL-AS	Overlay - AC Structural	$0.00	5.00	True	SOUTH 2350' & NORTH 1150': 5" P401 AC OVER
06-01-1969	NC-AC	New Construction - AC	$0.00	2.00	True	SOUTH 2350' & NORTH 1150': 2" P401 AC SURF
05-31-1969	BA-BI	Base Course - Bituminous	$0.00	4.00	False	NORTH 1150': 4" P201 BIT BASE
05-30-1969	SB-AG	Subbase - Aggregate	$0.00	6.00	False	NORTH 1150': 6" P154 SUBBASE
06-02-1960	ST-SC	Surface Treatment - Seal Coat	$0.00	0.00	False	SOUTH 2350': P609 SURFACE TREATMENT
06-01-1960	BA-AG	Base Course - Aggregate	$0.00	9.00	False	SOUTH 2350': 9" P209 CABC

Work History

Pavement Database: IA 2021

Branch - Section ID: R16CT - 04

LCD: 6/3/2019
Use: RUNWAY
Rank: P
Surface: PCC

Length (ft): 245.00
Width (ft): 70.00
True Area (sf): 16,706.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-03-2019	NC-PC	New Construction - PCC	$0.00	6.00	True	6" P-501 PCC SURFACE COURSE
06-02-2019	BA-AG	Base Course - Aggregate	$0.00	6.00	False	6" P-208 base course
06-01-2019	SG-CO	Subgrade - Compacted	$0.00	12.00	False	12" P-152 subgrade prepared with fly ash.

Branch - Section ID: T01CT - 01

LCD: 6/1/1986
Use: TAXIWAY
Rank: P
Surface: PCC

Length (ft): 440.00
Width (ft): 40.00
True Area (sf): 19,783.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
06-01-2014	JS-LC	Joint Seal (Localized)	$0.00	0.00	False	-
06-01-2014	CS-PC	Crack Sealing - PCC	$0.00	0.00	False	-
06-01-2014	PA-PF	Patching - PCC Full Depth	$0.00	0.00	False	-
06-01-1986	NC-PC	New Construction - PCC	$0.00	0.00	True	-

Branch - Section ID: TH01CT - 01

LCD: 8/1/2007
Use: T-HANGAR
Rank: P
Surface: PCC

Length (ft): 900.00
Width (ft): 25.00
True Area (sf): 23,400.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
08-01-2007	NC-PC	New Construction - PCC	$0.00	0.00	True	EST. VIA GE

Branch - Section ID: TH01CT - 02

LCD: 7/3/2009
Use: T-HANGAR
Rank: P
Surface: PCC

Length (ft): 306.00
Width (ft): 25.00
True Area (sf): 13,867.00

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major MR	Comments
07-03-2009	NC-PC	New Construction - PCC	$0.00	5.00	True	5" P-505 PCC
07-02-2009	SB-AG	Subbase - Aggregate	$0.00	4.00	False	4" P-154 SUBBASE
07-01-2009	SG-CO	Subgrade - Compacted	$0.00	8.00	False	8" P-152 SUBGRADE

APPENDIX E

LOCALIZED PREVENTIVE MAINTENANCE POLICIES AND UNIT COST TABLES

Table E-1. Localized preventive maintenance policy, asphalt-surfaced pavements.

Distress Type	Severity Level	Maintenance Action
Alligator Cracking	Low	Monitor
Alligator Cracking	Medium	Asphalt Patch
Alligator Cracking	High	Asphalt Patch
Bleeding	N/A	Monitor
Block Cracking	Low	Monitor
Block Cracking	Medium	Crack Seal—Asphalt
Block Cracking	High	Crack Seal—Asphalt
Corrugation	Low	Monitor
Corrugation	Medium	Asphalt Patch
Corrugation	High	Asphalt Patch
Depression	Low	Monitor
Depression	Medium	Monitor
Depression	High	Asphalt Patch
Jet-Blast Erosion	N/A	Asphalt Patch
Joint Reflection Cracking	Low	Monitor
Joint Reflection Cracking	Medium	Crack Seal—Asphalt
Joint Reflection Cracking	High	Crack Seal—Asphalt
L&T Cracking	Low	Monitor
L&T Cracking	Medium	Crack Seal—Asphalt
L&T Cracking	High	Crack Seal—Asphalt
Oil Spillage	N/A	Asphalt Patch
Patching	Low	Monitor
Patching	Medium	Asphalt Patch
Patching	High	Asphalt Patch
Polished Aggregate	N/A	Monitor
Raveling	Low	Monitor
Raveling	Medium	Asphalt Patch
Raveling	High	Asphalt Patch
Rutting	Low	Monitor
Rutting	Medium	Monitor
Rutting	High	Asphalt Patch
Shoving	Low	Monitor
Shoving	Medium	Asphalt Patch
Shoving	High	Asphalt Patch
Slippage Cracking	N/A	Asphalt Patch
Swelling	Low	Monitor
Swelling	Medium	Monitor
Swelling	High	Asphalt Patch
Weathering	Low	Monitor
Weathering	Medium	Monitor
Weathering	High	Asphalt Patch

Table E-2. Localized preventive maintenance policy, PCC pavements.

Distress Type	Severity Level	Maintenance Action
ASR	Low	Monitor
ASR	Medium	Slab Replacement
ASR	High	Slab Replacement
Blowup	Low	Slab Replacement
Blowup	Medium	Slab Replacement
Blowup	High	Slab Replacement
Corner Break	Low	Crack Seal—PCC
Corner Break	Medium	Full Depth PCC Patch
Corner Break	High	Full Depth PCC Patch
Durability Cracking	Low	Monitor
Durability Cracking	Medium	Full Depth Patch
Durability Cracking	High	Slab Replacement
Faulting	Low	Monitor
Faulting	Medium	Grinding
Faulting	High	Slab Replacement
Joint Seal Damage	Low	Monitor
Joint Seal Damage	Medium	Joint Seal
Joint Seal Damage	High	Joint Seal
LTD Cracking	Low	Monitor
LTD Cracking	Medium	Crack Seal—PCC
LTD Cracking	High	Slab Replacement
Patching (Small and Large)	Low	Monitor
Patching (Small and Large)	Medium	Full Depth PCC Patch
Patching (Small and Large)	High	Full Depth PCC Patch
Popouts	N/A	Monitor
Pumping	N/A	Monitor
Scaling	Low	Monitor
Scaling	Medium	Partial Depth PCC Patch
Scaling	High	Slab Replacement
Shattered Slab	Low	Crack Seal—PCC
Shattered Slab	Medium	Slab Replacement
Shattered Slab	High	Slab Replacement
Shrinkage Cracking	N/A	Monitor
Spalling (Joint and Corner)	Low	Monitor
Spalling (Joint and Corner)	Medium	Partial Depth PCC Patch
Spalling (Joint and Corner)	High	Partial Depth PCC Patch

Table E-3. 2022 unit costs for preventive maintenance actions.

Maintenance Action	Unit Cost
Asphalt Patch—Asphalt-Surfaced Pavement	$14.66/sf
Crack Sealing—Asphalt-Surfaced Pavement	$2.51/lf
Partial Depth PCC Patch—PCC Pavement	$37.54/sf
Full Depth PCC Patch—PCC Pavement	$16.76/sf
Crack Sealing—PCC Pavement	$3.02/lf
Joint Sealing—PCC Pavement	$3.02/lf
Grinding—PCC Pavement	$0.36/sf
Slab Replacement—PCC Pavement	$16.76/sf

Table E-4. 2022 unit costs (per square foot) based on pavement type and PCI ranges.

Pavement Type	PCI Range 0–40	PCI Range 40–50	PCI Range 50–60	PCI Range 60–70	PCI Range 70–80	PCI Range 80–90	PCI Range 90–100
AC	$10.41	$4.93	$4.93	$4.93	$0.00	$0.00	$0.00
PCC	$17.38	$8.22	$8.22	$8.22	$0.00	$0.00	$0.00

APPENDIX F

YEAR 2022 LOCALIZED PREVENTIVE MAINTENANCE DETAILS

Table F-1. Year 2022 localized preventive maintenance details.

Branch	Section	Distress Type	Severity	Distress Quantity	Distress Unit	Maintenance Action	Unit Cost	2022 Estimated Cost
A01CT	01	Corner Break	Low	4	Slabs	Crack Sealing - PCC	$3.02	$93
A01CT	01	Corner Break	Medium	4	Slabs	Patching - PCC Full Depth	$16.76	$2,030
A01CT	01	Joint Seal Damage	Medium	300	Slabs	Joint Seal (Localized)	$3.02	$17,365
A01CT	01	Joint Seal Damage	High	150	Slabs	Joint Seal (Localized)	$3.02	$8,682
A01CT	01	Joint Spalling	Medium	8	Slabs	Patching - PCC Partial Depth	$37.54	$1,818
A01CT	01	LTD Cracking	Medium	11	Slabs	Crack Sealing - PCC	$3.02	$340
A01CT	01	Shattered Slab	Medium	4	Slabs	Slab Replacement - PCC	$16.76	$6,285
T01CT	01	Corner Break	Medium	4	Slabs	Patching - PCC Full Depth	$16.76	$2,081
T01CT	01	Corner Spalling	Medium	10	Slabs	Patching - PCC Partial Depth	$37.54	$971
T01CT	01	Corner Spalling	High	2	Slabs	Patching - PCC Partial Depth	$37.54	$194
T01CT	01	Joint Seal Damage	Medium	160	Slabs	Joint Seal (Localized)	$3.02	$8,316
T01CT	01	Joint Seal Damage	High	38	Slabs	Joint Seal (Localized)	$3.02	$2,004
TH01CT	02	Joint Seal Damage	Medium	89	Slabs	Joint Seal (Localized)	$3.02	$4,889
TH01CT	02	Joint Spalling	Medium	4	Slabs	Patching - PCC Partial Depth	$37.54	$938
TH01CT	02	Joint Spalling	High	1	Slabs	Patching - PCC Partial Depth	$37.54	$391
TH01CT	02	LTD Cracking	Medium	1	Slabs	Crack Sealing - PCC	$3.02	$49

Table Notes:

1. See Figure 3 for the location of the branch and section.
2. Distress types are defined by ASTM D5340-20. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.
3. The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at Creston Municipal Airport.

PREPARED FOR

Iowa Department of Transportation
Modal Transportation Bureau — Aviation
800 Lincoln Way
Ames, Iowa 50010
515-239-1691
iowadot.gov/aviation

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