

# Maquoketa Municipal Airport

PAVEMENT MANAGEMENT REPORT



## PREPARED BY

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**JUNE 2018**



# **MAQUOKETA MUNICIPAL AIRPORT PAVEMENT MANAGEMENT REPORT**

*PREPARED FOR:*

**IOWA DEPARTMENT OF TRANSPORTATION  
OFFICE OF AVIATION**

*PREPARED BY:*

**APPLIED PAVEMENT TECHNOLOGY, INC.**

*IN ASSOCIATION WITH:*

**ROBINSON ENGINEERING COMPANY**

June 2018

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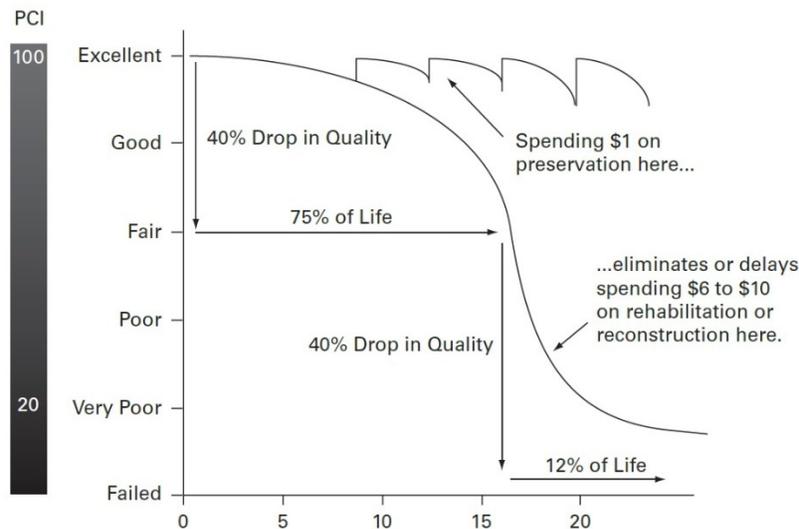
## INTRODUCTION

Applied Pavement Technology, Inc. (APTech), with assistance from Robinson Engineering Company, updated the airport pavement management system (APMS) for the Iowa Department of Transportation, Office of 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 Maquoketa Municipal Airport were assessed in December 2017 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 also to identify the most cost-effective time to perform major rehabilitation (such as an overlay or whitetopping). The importance of identifying not only the type of repair, but also the optimal time of repair is illustrated in Figure 1 (taken from <http://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm>). This figure shows that there is a point in a pavement's life cycle where the rate of deterioration increases. The financial impact of delaying repairs beyond this point can be severe.

Figure 1. Pavement condition versus cost of repair.



The pavement evaluation results for Maquoketa Municipal Airport are presented within this report and can be used by the Iowa DOT, the Federal Aviation Administration (FAA), and Maquoketa Municipal Airport to identify, prioritize, and schedule pavement maintenance and rehabilitation (M&R) actions at the airport. In addition to this report, the web-based Interactive Data Exchange Application (IDEA) containing the pavement management information collected during this project was updated and may be accessed from the Iowa DOT's website.

## PAVEMENT INVENTORY

The pavement network at Maquoketa Municipal Airport was divided into branches, sections, and sample units for pavement management purposes. 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, last construction date, traffic level, and performance. Using this approach, if a runway was built in 1968 and then extended in 1984, it would be comprised of 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 condition of the section as a whole.

Approximately 303,081 square feet of pavement were evaluated at Maquoketa Municipal Airport, as illustrated in Figure 2. This figure also shows the area-weighted age in years of the pavements at the time of 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 Maquoketa Municipal Airport.

Figure 2. Pavement area by branch use.

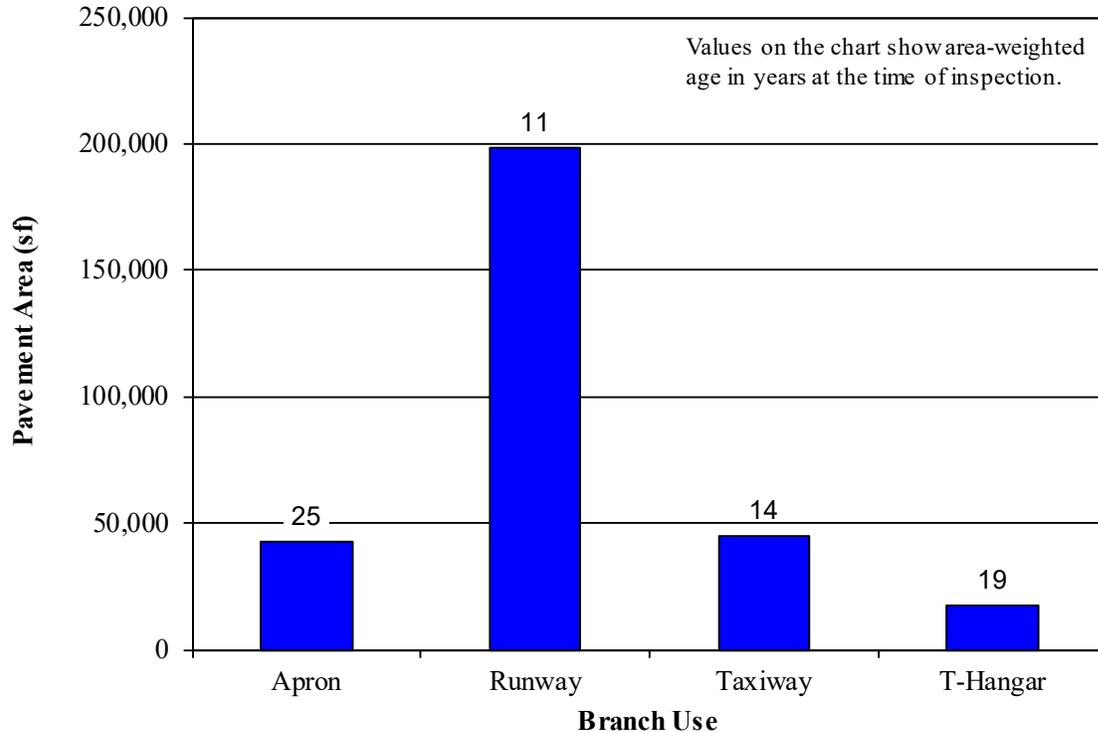
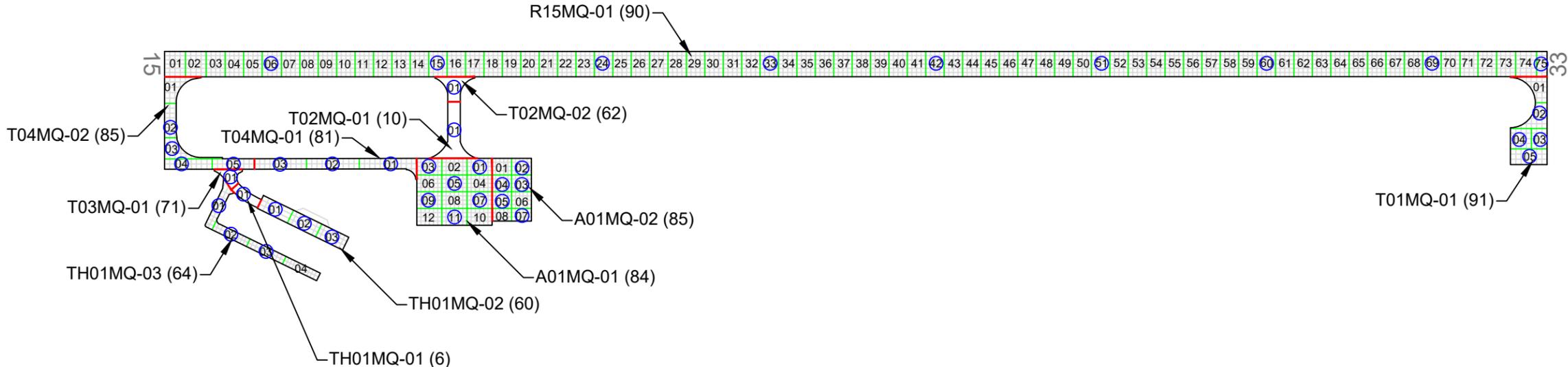


FIGURE 3. NETWORK DEFINITION MAP.



**NETWORK DEFINITION LEGEND**

	BRANCH IDENTIFIER
	SECTION IDENTIFIER
	PCI VALUE
	SECTION BREAK LINE
	SAMPLE UNIT BREAK LINE
	SLAB JOINT
	SAMPLE UNIT NUMBER
	SAMPLE UNIT INSPECTED
	ADDITIONAL SAMPLE UNIT



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AGENCY: Iowa Department of Transportation  
Office of Aviation

LOCATION: Maquoketa Municipal Airport  
Maquoketa, Iowa

PAGE TITLE: Network Definition Map

PROJECT DATE: SEP. 2017	CREATION DATE: SEP. 2017	PROJECT MANAGER: LJR	JOB NUMBER: 2017-020-AM01
DRAWING SCALE: 1"=300'	LAST MODIFIED DATE: MAY 2018	REVISED BY: ABF	DRAWN BY: ABF
FILENAME: Maquoketa.dwg		LAYOUT NAME/NUMBER: NET. DEF.	PAGE NUMBER: 3

## PAVEMENT EVALUATION

### Pavement Evaluation Procedure

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

- FAA Advisory Circular (AC) 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* ([https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/150-5380-6C.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf))
- FAA AC 150/5380-7B, *Airport Pavement Management Program (PMP)* ([https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/150-5380-7B.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-7B.pdf))
- ASTM D5340-12, *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 (representing a pavement in a failed condition) to a value of 100 (representing a pavement in excellent condition).

Figure 4. Visual representation of PCI scale on typical pavement surfaces<sup>1</sup>.



<sup>1</sup>Photographs shown are not specific to Maquoketa Municipal Airport.

In general terms, 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 also provides the corresponding colors used for the maps and charts in this report for each range of PCIs.

Figure 5. PCI versus repair type.

PCI Range	Repair
86-100	Preventive Maintenance
71-85	
56-70	
41-55	Major Rehabilitation
26-40	Reconstruction
11-25	
0-10	

The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration. 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). Understanding the cause of distress helps in selecting a rehabilitation alternative that corrects the cause and thus eliminates its recurrence.

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 Maquoketa Municipal Airport were inspected on December 12, 2017. The 2017 area-weighted condition of Maquoketa Municipal Airport is 85, with conditions ranging from 6 to 91 (on a scale of 0 [failed] to 100 [excellent]). During the previous pavement inspection in 2014, the area-weighted PCI of the airport was 90.

Figure 6 summarizes the overall condition of the pavements at Maquoketa 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 distresses 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 Maquoketa Municipal Airport.

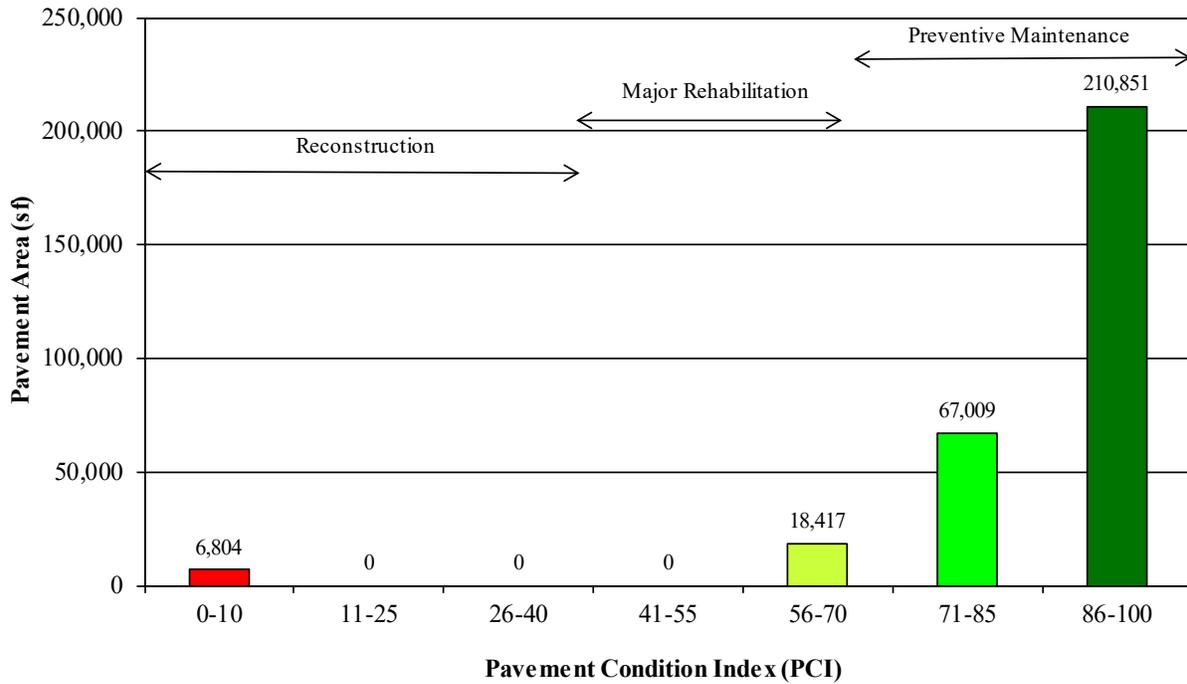


Figure 7. PCI by branch use at Maquoketa Municipal Airport.  
(Values on chart are area-weighted)

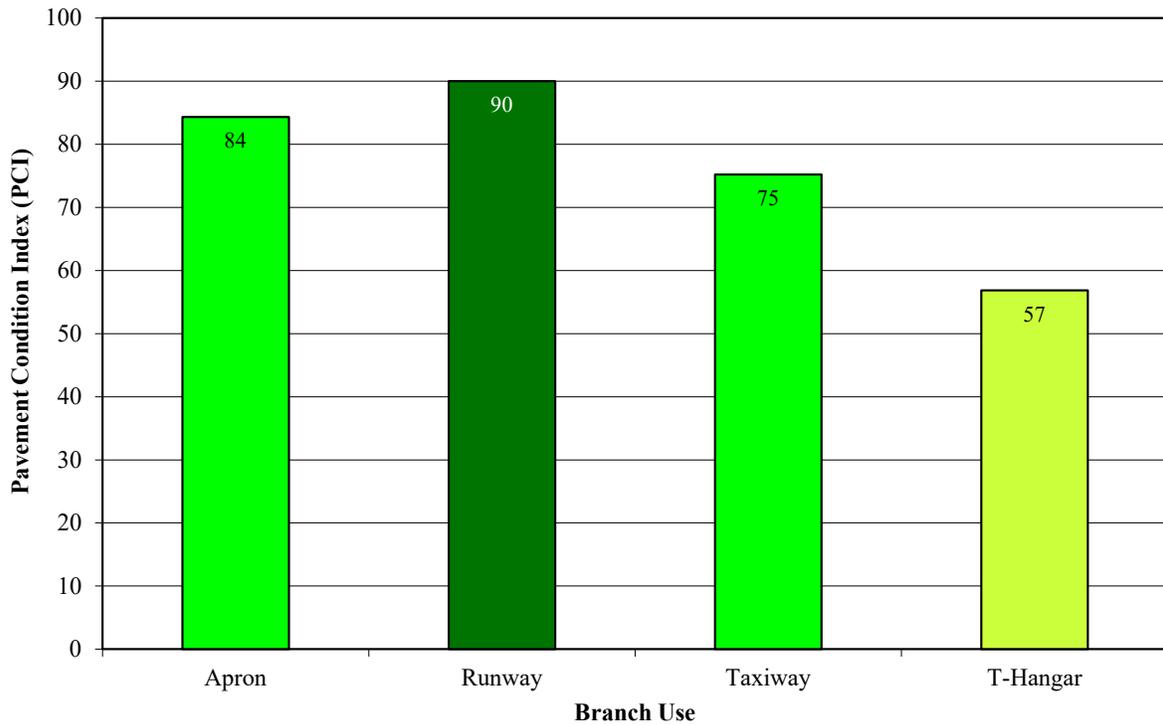
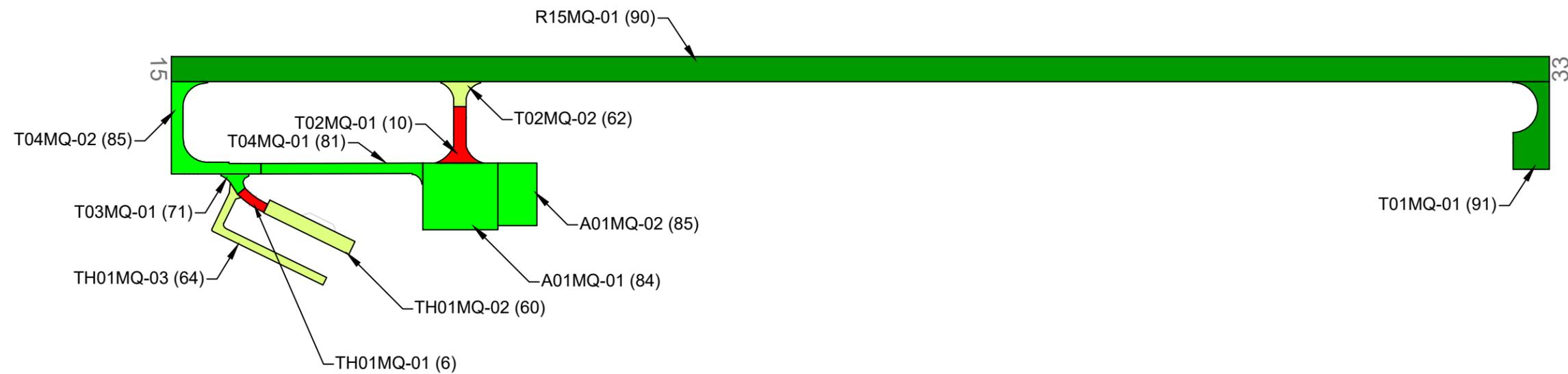


FIGURE 8. PCI MAP.



LEGEND	
	BRANCH IDENTIFIER
	SECTION IDENTIFIER
	PCI VALUE
	SECTION BREAK LINE

PAVEMENT CONDITION INDEX	
PCI	
	88-100
	71-85
	56-70
	41-55
	26-40
	11-25
	0-10

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AGENCY: Iowa Department of Transportation Office of Aviation			
LOCATION: Maquoketa Municipal Airport Maquoketa, Iowa			
PAGE TITLE: 2017 Pavement Condition Index Map			
PROJECT DATE: SEP. 2017	CREATION DATE: SEP. 2017	PROJECT MANAGER: LJR	JOB NUMBER: 2017-020-AM01
DRAWING SCALE: 1"=300'	LAST MODIFIED DATE: MAY 2018	REVISED BY: ABF	DRAWN BY: ABF
FILENAME: Maquoketa.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 8

Table 1. 2017 pavement evaluation results.

Branch <sup>1</sup>	Section <sup>1</sup>	Surface Type <sup>2</sup>	Section Area (sf)	LCD <sup>3</sup>	2017 PCI	% Distress due to Load <sup>4</sup>	% Distress due to Climate/Durability <sup>5</sup>	% Distress due to Other <sup>6</sup>	Type of Distresses <sup>7</sup>
A01MQ	01	PCC	28,682	6/1/1986	84	21	59	20	Corner Break, Faulting, Joint Seal Damage, Joint Spalling, LTD Cracking, Shrinkage Cracking
A01MQ	02	PCC	14,000	6/2/2005	85	0	78	22	Corner Spalling, Joint Seal Damage, Joint Spalling
R15MQ	01	PCC	198,248	10/15/2006	90	0	82	18	Joint Seal Damage, Joint Spalling, Small Patch
T01MQ	01	PCC	12,603	10/1/2006	91	0	97	3	Corner Spalling, Joint Seal Damage
T02MQ	01	AAC	5,200	6/1/1982	10	83	15	2	Alligator Cracking, Raveling, Swelling
T02MQ	02	AAC	2,748	10/1/2006	62	16	84	0	Alligator Cracking, L&T Cracking, Weathering
T03MQ	01	AAC	1,592	10/1/2006	71	0	100	0	L&T Cracking, Weathering
T04MQ	01	PCC	9,948	6/2/2005	81	35	55	10	Corner Break, Corner Spalling, Joint Seal Damage, Joint Spalling, LTD Cracking, Shattered Slab
T04MQ	02	PCC	12,787	10/1/2006	85	0	69	31	Joint Seal Damage, Joint Spalling
TH01MQ	01	AC	1,604	3/1/1984	6	71	29	0	Alligator Cracking, Raveling, Weathering
TH01MQ	02	PCC	7,718	6/1/2000	60	71	21	8	Corner Break, Joint Seal Damage, Joint Spalling, LTD Cracking, Shattered Slab, Shrinkage Cracking
TH01MQ	03	PCC	7,951	1/1/1999	64	67	22	11	Corner Break, Joint Seal Damage, Joint Spalling, LTD Cracking, Shattered Slab

Table 1. 2017 pavement evaluation results (continued).

<sup>1</sup>See Figure 3 for the location of the branch and section.

<sup>2</sup>AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.

<sup>3</sup>LCD = last construction date.

<sup>4</sup>Distress due to load includes those distresses attributed to a structural deficiency in the pavement, such as alligator cracking or rutting on AC-surfaced pavements or shattered slabs on a PCC pavement.

<sup>5</sup>Distress due to climate or durability includes those distresses attributed to either the aging of the pavement and the effects of the environment (such as weathering, raveling, or block cracking in AC-surfaced pavements) or to a materials-related problem (such as durability cracking or alkali-silica reaction [ASR] in a PCC pavement). If materials-related distresses were recorded during the inspection, further laboratory testing is required to definitively determine the type present.

<sup>6</sup>Other refers to distresses not attributed to one factor but rather may be caused by a combination of factors.

<sup>7</sup>Distress types are defined by ASTM D5340-12. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

## Inspection Comments

Maquoketa Municipal Airport was inspected on December 12, 2017. There were twelve pavement sections defined during the inspection.

### Runway

Runway 15-33 was defined by one section. Medium- and high-severity joint seal damage, low- and medium-severity joint spalling, and all severities of small patching were observed in Section 01.

### Taxiways

Taxiway 01 consisted of one section and was located at the Runway 33 approach. Medium- and high-severity joint seal damage were identified throughout Section 01 along with an isolated amount of low-severity corner spalling.

Taxiway 02 contained two sections. Section 01 was in poor condition with medium-severity alligator cracking and low-severity swelling. Additionally, high-severity raveling was observed in areas where the applied surface treatment has become dislodged. Unsealed, low-severity longitudinal and transverse (L&T) cracking was recorded in Section 02 along with medium-severity L&T cracking that was due to either unsealed crack widths greater than ¼ inch or the development of secondary cracking. Medium-severity weathering was also identified throughout the majority of the section where an oxidized pavement surface and missing fine material were observed. A small amount of medium-severity alligator cracking was also noted.

Taxiway 03 consisted of one section with medium-severity L&T cracking due to either the development of secondary cracking or unsealed crack widths greater than ¼ inch recorded. Medium-severity weathering was also observed.

Taxiway 04 was defined by two sections. High-severity joint seal damage was recorded throughout Section 01. Isolated amounts of low-severity corner breaking; corner spalling; joint spalling; shattered slab; and longitudinal, transverse, and diagonal (LTD) cracking were also identified. Section 02, located adjacent to the Runway 15 approach, was observed with high-severity joint seal damage and low-, medium-, and high-severity joint spalling.

### Apron

The apron area consisted of two sections. High-severity joint seal damage was recorded throughout Section 01 along with isolated amounts of low-severity corner breaking; low- and medium-severity faulting, LTD cracking, and joint spalling; and shrinkage cracking. Section 02 was observed with high-severity joint seal damage and low- and medium-severity joint spalling and corner spalling.

### T-Hangar

The T-Hangar area was defined by three sections. Section 01 was in poor condition with medium-severity alligator cracking identified throughout. High-severity raveling was recorded in areas where the applied surface treatment has become dislodged, producing foreign object debris (FOD) potential. High-severity weathering was observed where the applied surface treatment had worn away. Section 02 was identified with low-severity corner breaking and shattered slab, high-severity joint seal damage, low- and medium-severity joint spalling and LTD

cracking, and shrinkage cracking. Section 03 was recorded with low-severity corner breaking, low- and medium-severity joint spalling and LTD cracking, and low-severity shattered slab. High-severity joint seal damage was also observed throughout the entire section.

## 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 Maquoketa 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 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 maintenance policies and unit costs may require adjustment to reflect specific conditions at Maquoketa 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 more accurately estimate the cost of such work.

#### Budget and Inflation Rate

An unlimited budget with a start date of July 1, 2018 and an inflation rate of 2 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 (2018) 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 2019 or 2020, then localized maintenance was not recommended for 2018. While localized preventive maintenance should be an annual undertaking at Maquoketa 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 2018 localized

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

## Analysis Results

A summary of the M&R program for Maquoketa Municipal Airport is presented in Table 2. Detailed information on the recommended localized preventive maintenance plan for 2018 is contained in Appendix F.

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

Year	Branch <sup>1</sup>	Section <sup>1</sup>	Surface Type <sup>2</sup>	Type of Repair <sup>3</sup>	Estimated Cost <sup>4</sup>
2018	A01MQ	01	PCC	Localized Maintenance	\$16,252
2018	A01MQ	02	PCC	Localized Maintenance	\$8,393
2018	R15MQ	01	PCC	Localized Maintenance	\$98,847
2018	T01MQ	01	PCC	Localized Maintenance	\$3,423
2018	T02MQ	01	AAC	Major Rehabilitation	\$50,440
2018	T03MQ	01	AAC	Localized Maintenance	\$161
2018	T04MQ	01	PCC	Localized Maintenance	\$3,285
2018	T04MQ	02	PCC	Localized Maintenance	\$2,857
2018	TH01MQ	01	AC	Major Rehabilitation	\$15,559
2018	TH01MQ	02	PCC	Major Rehabilitation	\$59,043
2018	TH01MQ	03	PCC	Localized Maintenance	\$4,766
2019	T02MQ	02	AAC	Major Rehabilitation	\$12,866
2022	TH01MQ	03	PCC	Major Rehabilitation	\$65,839

**Total Estimated Cost: \$342,000**

<sup>1</sup>See Figure 3 for the location of the branch and section.

<sup>2</sup>AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.

<sup>3</sup>Major Rehabilitation: such as pavement reconstruction or an overlay. Localized Preventive Maintenance: such as crack sealing or patching.

<sup>4</sup>The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at the airport.

The recommendations made in this report are based on a broad network-level analysis and are meant to provide Maquoketa 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 Maquoketa 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 take into account economic and/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, Maquoketa 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 are 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 is important because 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/or mowing programs of the safety areas. Vegetation growth in pavement cracks is very 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)**

Since Maquoketa 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, Maquoketa Municipal Airport will also need to undertake monthly drive-by inspections of pavement conditions and track pavement-related maintenance activities.

FAA AC 150/5380-7B provide detailed guidance pertaining to the requirements for an acceptable pavement management program (PMP). Appendix A of FAA AC 150/5380-7B

outlines what needs to be included in a PMP to remain in compliance with this law and Grant Assurance #11. 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 AC.**

**FAA AC 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 Maquoketa Municipal Airport. If any new pavements are constructed or any pavement areas are permanently closed, this map must be updated. Maps can be updated by submitting the project plans 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 the 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 Maquoketa 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 a monthly drive-by inspection. 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: \_\_\_\_\_

<b>Branch<sup>1</sup></b>	<b>Section<sup>1</sup></b>	<b>Distress Description/Dimensions/Severity/ Recommended Action</b>	<b>Description of Repair</b>	<b>Date Performed</b>	<b>Cost</b>	<b>Funding Source</b>
A01MQ	01					
A01MQ	02					
R15MQ	01					
T01MQ	01					
T02MQ	01					
T02MQ	02					

Table 3. Pavement inspection report (continued).

Inspected By: \_\_\_\_\_  
 Date Inspected: \_\_\_\_\_

<b>Branch<sup>1</sup></b>	<b>Section<sup>1</sup></b>	<b>Distress Description/Dimensions/Severity/ Recommended Action</b>	<b>Description of Repair</b>	<b>Date Performed</b>	<b>Cost</b>	<b>Funding Source</b>
T03MQ	01					
T04MQ	01					
T04MQ	02					
TH01MQ	01					
TH01MQ	02					
TH01MQ	03					

<sup>1</sup>See Figure 3 for the location of the branch and section.

## SUMMARY

This report documents the results of the pavement evaluation conducted at Maquoketa Municipal Airport. During a visual inspection of the pavements in 2017, it was found that the overall condition of the pavement network is a PCI of 85. A 5-year pavement repair program, shown in Table 2, was generated for Maquoketa Municipal Airport, which revealed that approximately \$342,000 needs to be expended on M&R. Maquoketa 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.

<b>Distress Type</b>	<b>Probable Cause of Distress</b>
Alligator Cracking	Fatigue failure of the AC surface under repeated traffic loading.
Bleeding	Excessive amounts of AC cement or tars in the mix and/or low air void content.
Block Cracking	Shrinkage of the AC 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 AC 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 AC surface due to low temperatures or hardening of the AC, 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	AC 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 AC 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	AC binder and/or fine aggregate may wear away as the pavement ages and hardens.

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

<b>Distress Type</b>	<b>Probable Cause of Distress</b>
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.
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.
Settlement	Upheaval or consolidation.
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**

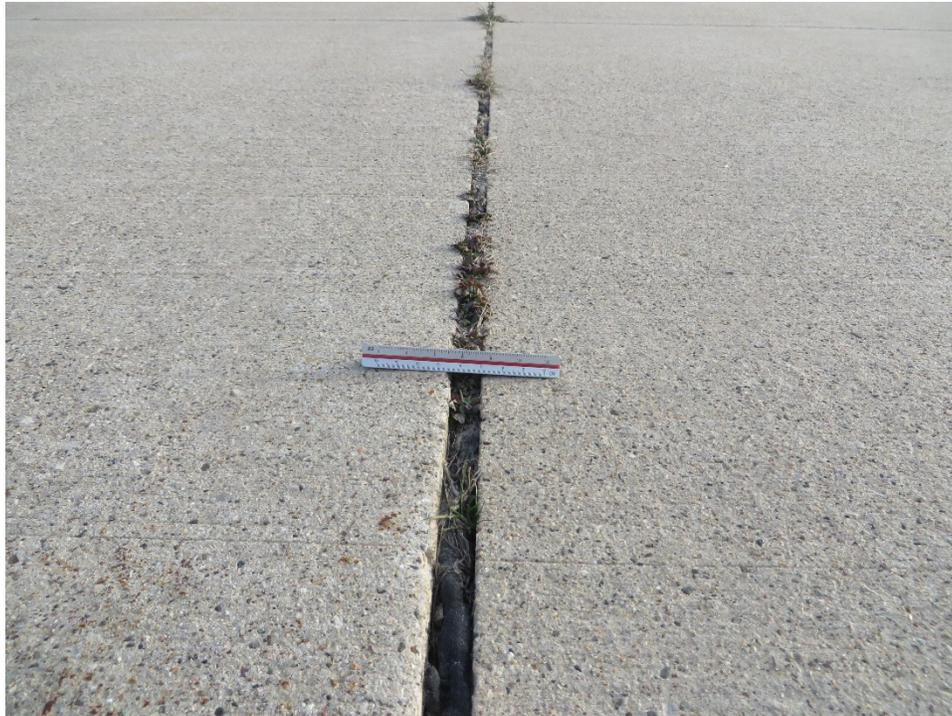
A01MQ-01. Overview.



A01MQ-01. Faulting (Sample Unit No. 03).



A01MQ-01. Joint Seal Damage (Sample Unit No. 01).



A01MQ-01. LTD Cracking (Sample Unit No. 01).



A01MQ-02. Overview.



A01MQ-02. Corner Spalling (Sample Unit No. 02).



A01MQ-02. Joint Seal Damage (Sample Unit No. 02).



R15MQ-01. Overview.



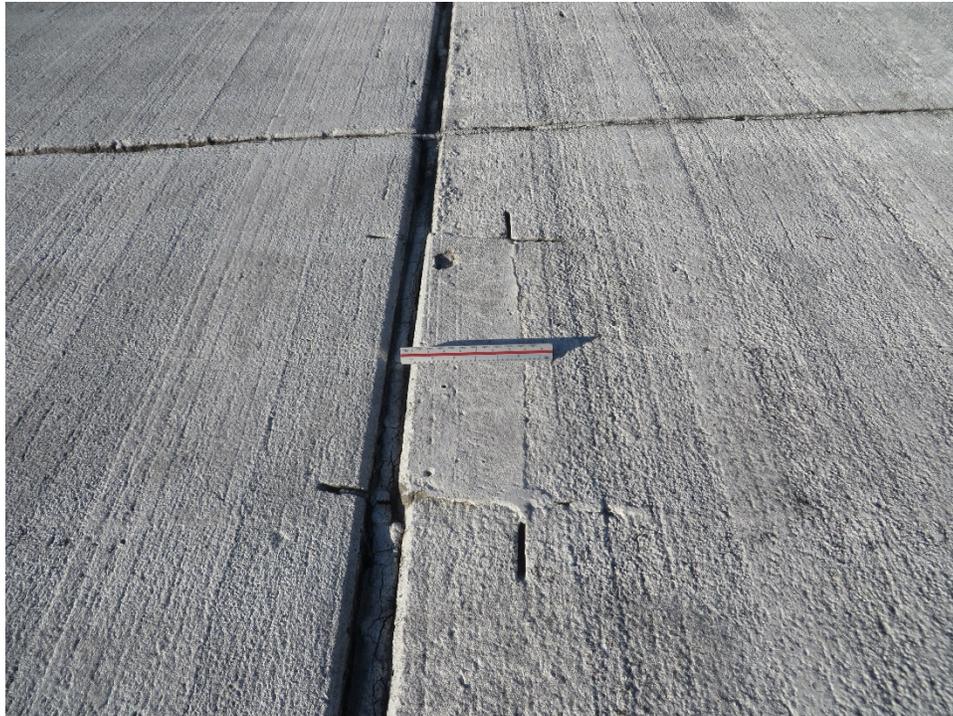
R15MQ-01. Joint Seal Damage (Sample Unit No. 75).



R15MQ-01. Joint Spalling (Sample Unit No. 24).



R15MQ-01. Small Patching (Sample Unit No. 06).



R15MQ-01. Small Patching (Sample Unit No. 60).



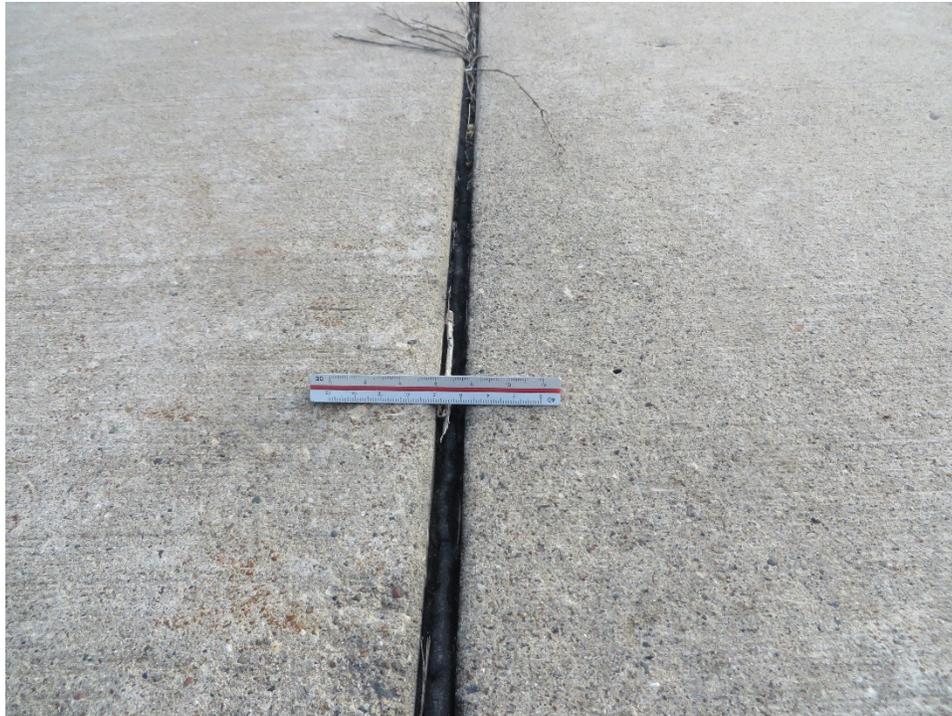
T01MQ-01. Overview.



T01MQ-01. Corner Spalling (Sample Unit No. 05).



T01MQ-01. Joint Seal Damage (Sample Unit No. 05).



T02MQ-01. Overview.



T02MQ-01. Alligator Cracking (Sample Unit No. 01) (1).



T02MQ-01. Alligator Cracking (Sample Unit No. 01) (2).



T02MQ-01. Raveling (Sample Unit No. 01).



T02MQ-02. Overview.



T02MQ-02. L&T Cracking (Sample Unit No. 01).



T02MQ-02. Weathering (Sample Unit No. 01).



T03MQ-01. Overview.



T03MQ-01. L&T Cracking (Sample Unit No. 01).



T03MQ-01. Weathering (Sample Unit No. 01).



T04MQ-01. Overview.



T04MQ-01. Joint Seal Damage (Sample Unit No. 01).



T04MQ-01. Shattered Slab (Sample Unit No. 01).



T04MQ-02. Overview.



T04MQ-02. Joint Seal Damage (Sample Unit No. 03).



T04MQ-02. Joint Spalling (Sample Unit No. 05).



TH01MQ-01. Overview.



TH01MQ-01. Alligator Cracking (Sample Unit No. 01).



TH01MQ-01. Weathering (Sample Unit No. 01).



TH01MQ-02. Overview.



TH01MQ-02. Corner Break (Sample Unit No. 03).



TH01MQ-02. LTD Cracking (Sample Unit No. 03).



TH01MQ-03. Overview.



TH01MQ-03. Corner Break (Sample Unit No. 01).



TH01MQ-03. Joint Seal Damage (Sample Unit No. 01).



TH01MQ-03. LTD Cracking (Sample Unit No. 01).



TH01MQ-03. Shattered Slab (Sample Unit No. 01).



**APPENDIX C**  
**INSPECTION REPORT**

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: A01MQ Name: APRON AT MAQUOKETA Use: APRON Area: 42,682.00SqFt

Section: 01 of 2 From: BUILDING To: TAXIWAY 01 SECT 01 Last Const.: 06/01/1986  
Surface: PCC Family: IowaPCCAPNCE Zone: Category: Rank: P  
Area: 28,682.00SqFt Length: 185.00Ft Width: 160.00Ft  
Slabs: 301 Slab Width: 10.00Ft Slab Length: 10.00Ft Joint Length: 5,575.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 12 Surveyed: 6

Conditions: PCI : 84

Inspection Comments:

Sample Number: 01 Type: R Area: 24.00Slabs PCI = 82

Sample Comments:

74 JOINT SPALLING L 1.00 Slabs Comments:  
63 LINEAR CRACKING M 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:

Sample Number: 03 Type: R Area: 24.00Slabs PCI = 75

Sample Comments:

71 FAULTING L 1.00 Slabs Comments:  
63 LINEAR CRACKING L 1.00 Slabs Comments:LU  
71 FAULTING M 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:

Sample Number: 05 Type: R Area: 24.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:

Sample Number: 07 Type: R Area: 24.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:

Sample Number: 09 Type: R Area: 24.00Slabs PCI = 81

Sample Comments:

65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:  
62 CORNER BREAK L 1.00 Slabs Comments:  
74 JOINT SPALLING M 1.00 Slabs Comments:

Sample Number: 11 Type: R Area: 24.00Slabs PCI = 87

Sample Comments:

65 JOINT SEAL DAMAGE H 24.00 Slabs Comments:  
73 SHRINKAGE CRACKING N 1.00 Slabs Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: A01MQ Name: APRON AT MAQUOKETA Use: APRON Area: 42,682.00SqFt

Section: 02 of 2 From: AUXILIARY ROAD To: APRON 01 SECT 01 Last Const.: 06/02/2005  
Surface: PCC Family: IowaPCCAPNCE Zone: Category: Rank: P  
Area: 14,000.00SqFt Length: 150.00Ft Width: 95.00Ft  
Slabs: 150 Slab Width: 9.50Ft Slab Length: 10.00Ft Joint Length: 2,680.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 8 Surveyed: 5

Conditions: PCI : 85

Inspection Comments:

Sample Number: 02 Type: R Area: 20.00Slabs PCI = 80

Sample Comments:

75 CORNER SPALLING L 1.00 Slabs Comments:  
74 JOINT SPALLING L 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 20.00 Slabs Comments:  
74 JOINT SPALLING M 1.00 Slabs Comments:

Sample Number: 03 Type: R Area: 20.00Slabs PCI = 84

Sample Comments:

65 JOINT SEAL DAMAGE H 20.00 Slabs Comments:  
75 CORNER SPALLING M 1.00 Slabs Comments:

Sample Number: 04 Type: R Area: 20.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE H 20.00 Slabs Comments:

Sample Number: 05 Type: R Area: 20.00Slabs PCI = 84

Sample Comments:

65 JOINT SEAL DAMAGE H 20.00 Slabs Comments:  
74 JOINT SPALLING M 1.00 Slabs Comments:

Sample Number: 07 Type: R Area: 15.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE H 15.00 Slabs Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: R15MQ Name: RUNWAY 15/33 AT MAQUOKETA Use: RUNWAY Area: 198,248.00SqFt

Section: 01 of 1 From: RUNWAY 15 SEC. 02 To: RUNWAY END 33 Last Const.: 10/15/2006  
Surface: PCC Family: IowaPCCRWNCE Zone: Category: Rank: P  
Area: 198,248.00SqFt Length: 3,278.00Ft Width: 60.00Ft  
Slabs: 1,788 Slab Width: 10.00Ft Slab Length: 11.00Ft Joint Length: 34,210.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 75 Surveyed: 9

Conditions: PCI : 90

Inspection Comments:

Sample Number: 06 Type: R Area: 24.00Slabs PCI = 92

Sample Comments:

66 SMALL PATCH L 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:

Sample Number: 15 Type: R Area: 24.00Slabs PCI = 93

Sample Comments:

65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:

Sample Number: 24 Type: R Area: 24.00Slabs PCI = 90

Sample Comments:

66 SMALL PATCH L 2.00 Slabs Comments:  
74 JOINT SPALLING L 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:

Sample Number: 33 Type: R Area: 24.00Slabs PCI = 90

Sample Comments:

74 JOINT SPALLING M 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:

Sample Number: 42 Type: R Area: 24.00Slabs PCI = 92

Sample Comments:

65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:  
74 JOINT SPALLING L 1.00 Slabs Comments:

Sample Number: 51 Type: R Area: 24.00Slabs PCI = 92

Sample Comments:

65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:  
74 JOINT SPALLING L 1.00 Slabs Comments:

Sample Number: 60 Type: R Area: 24.00Slabs PCI = 86

Sample Comments:

66 SMALL PATCH L 2.00 Slabs Comments:  
66 SMALL PATCH H 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE M 24.00 Slabs Comments:

Sample Number: 69 Type: R Area: 24.00Slabs PCI = 84

Sample Comments:

66 SMALL PATCH M 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 24.00 Slabs Comments: INTENTIONALLY HIGH S  
66 SMALL PATCH L 2.00 Slabs Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

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Sample Number:	75	Type:	R	Area:	12.00Slabs	PCI =	88
Sample Comments:	65 JOINT SEAL DAMAGE						
				H	12.00 Slabs	Comments:	

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: T01MQ Name: TAXIWAY 01 AT MAQUOKETA Use: TAXIWAY Area: 12,603.00SqFt

Section: 01 of 1 From: APRON 01 SECT 01 To: RUNWAY 15/33 Last Const.: 10/01/2006  
Surface: PCC Family: IowaPCCTWNCE Zone: Category: Rank: P  
Area: 12,603.00SqFt Length: 264.00Ft Width: 30.00Ft  
Slabs: 88 Slab Width: 10.00Ft Slab Length: 11.00Ft Joint Length: 1,218.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 5 Surveyed: 4

Conditions: PCI : 91

Inspection Comments:

Sample Number: 02 Type: R Area: 20.00Slabs PCI = 93  
Sample Comments:  
65 JOINT SEAL DAMAGE M 20.00 Slabs Comments:

Sample Number: 03 Type: R Area: 12.00Slabs PCI = 93  
Sample Comments:  
65 JOINT SEAL DAMAGE M 12.00 Slabs Comments:

Sample Number: 04 Type: R Area: 16.00Slabs PCI = 93  
Sample Comments:  
65 JOINT SEAL DAMAGE M 16.00 Slabs Comments:

Sample Number: 05 Type: R Area: 21.00Slabs PCI = 86  
Sample Comments:  
75 CORNER SPALLING L 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 21.00 Slabs Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

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Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

---

Branch: T02MQ Name: TAXIWAY 02 AT MAQUOKETA Use: TAXIWAY Area: 7,948.00SqFt

---

Section: 01 of 2 From: APRON To: SECTION 02 Last Const.: 06/01/1982  
Surface: AAC Family: IowaAACTWNCE Zone: Category: Rank: P  
Area: 5,200.00SqFt Length: 140.00Ft Width: 30.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

---

Last Insp. Date: 12/12/2017 Total Samples: 1 Surveyed: 1

Conditions: PCI: 10

Inspection Comments:

---

Sample Number: 01 Type: R Area: 5,200.00SqFt PCI = 10

Sample Comments:

52 RAVELING	H	43.00 SqFt	Comments:ST
41 ALLIGATOR CRACKING	M	5,200.00 SqFt	Comments:
56 SWELLING	L	40.00 SqFt	Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: T02MQ Name: TAXIWAY 02 AT MAQUOKETA Use: TAXIWAY Area: 7,948.00SqFt

Section: 02 of 2 From: SECTION 01 To: RUNWAY Last Const.: 10/01/2006  
Surface: AAC Family: IowaAACTWNCE Zone: Category: Rank: P  
Area: 2,748.00SqFt Length: 60.00Ft Width: 30.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 1 Surveyed: 1

Conditions: PCI : 62

Inspection Comments:

Sample Number: 01 Type: R Area: 2,748.00SqFt PCI = 62

Sample Comments:

48	LONGITUDINAL/TRANSVERSE CRACKING	L	76.00 Ft	Comments:LU
48	LONGITUDINAL/TRANSVERSE CRACKING	M	85.00 Ft	Comments:W
41	ALLIGATOR CRACKING	M	2.00 SqFt	Comments:
48	LONGITUDINAL/TRANSVERSE CRACKING	M	28.00 Ft	Comments:W; 2NDY; @ BREAK
57	WEATHERING	M	2,748.00 SqFt	Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

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Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

---

Branch: T03MQ Name: TAXIWAY 03 AT MAQUOKETA Use: TAXIWAY Area: 1,592.00SqFt

---

Section: 01 of 1 From: RUNWAY 15/33 To: RUNWAY END 15 Last Const.: 10/01/2006

Surface: AAC Family: IowaAACTWNCE Zone: Category: Rank: P

Area: 1,592.00SqFt Length: 82.00Ft Width: 25.00Ft

Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments: Majority of this section has been removed

---

Last Insp. Date: 12/12/2017 Total Samples: 1 Surveyed: 1

Conditions: PCI: 71

Inspection Comments:

---

Sample Number: 01 Type: R Area: 1,592.00SqFt PCI = 71

Sample Comments:

48 LONGITUDINAL/TRANSVERSE CRACKING

M 46.00 Ft

Comments:W

48 LONGITUDINAL/TRANSVERSE CRACKING

M 23.00 Ft

Comments:W; 2NDY; @BREAK

57 WEATHERING

M 1,592.00 SqFt

Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: T04MQ Name: TAXIWAY 04 AT MAQUOKETA Use: TAXIWAY Area: 22,735.00SqFt

Section: 01 of 2 From: T03MQ-01 To: APRON 01 SECT 01 Last Const.: 06/02/2005  
Surface: PCC Family: IowaPCCTWNCE Zone: Category: Rank: P  
Area: 9,948.00SqFt Length: 387.00Ft Width: 25.00Ft  
Slabs: 65 Slab Width: 12.50Ft Slab Length: 12.50Ft Joint Length: 1,136.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments: Old pavement was removed. Pvmnt is now PCC.

Last Insp. Date: 12/12/2017 Total Samples: 3 Surveyed: 3

Conditions: PCI : 81

Inspection Comments:

Sample Number: 01 Type: R Area: 25.00Slabs PCI = 69

Sample Comments:

65 JOINT SEAL DAMAGE	H	25.00 Slabs	Comments:
62 CORNER BREAK	L	1.00 Slabs	Comments:
63 LINEAR CRACKING	L	2.00 Slabs	Comments:
72 SHATTERED SLAB	L	1.00 Slabs	Comments:
74 JOINT SPALLING	L	3.00 Slabs	Comments:
75 CORNER SPALLING	L	1.00 Slabs	Comments:

Sample Number: 02 Type: R Area: 20.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE	H	20.00 Slabs	Comments:
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Sample Number: 03 Type: R Area: 20.00Slabs PCI = 88

Sample Comments:

65 JOINT SEAL DAMAGE	H	20.00 Slabs	Comments:
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# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: T04MQ Name: TAXIWAY 04 AT MAQUOKETA Use: TAXIWAY Area: 22,735.00SqFt

Section: 02 of 2 From: SEE MAP To: SEE MAP Last Const.: 10/01/2006  
Surface: PCC Family: IowaPCCTWNCE Zone: Category: Rank: P  
Area: 12,787.00SqFt Length: 287.00Ft Width: 25.00Ft  
Slabs: 76 Slab Width: 12.50Ft Slab Length: 12.50Ft Joint Length: 836.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 5 Surveyed: 4

Conditions: PCI : 85

Inspection Comments:

Sample Number: 02 Type: R Area: 21.00Slabs PCI = 88  
Sample Comments:  
65 JOINT SEAL DAMAGE H 21.00 Slabs Comments:

Sample Number: 03 Type: R Area: 21.00Slabs PCI = 88  
Sample Comments:  
65 JOINT SEAL DAMAGE H 21.00 Slabs Comments:

Sample Number: 04 Type: R Area: 18.00Slabs PCI = 86  
Sample Comments:  
65 JOINT SEAL DAMAGE H 18.00 Slabs Comments:  
74 JOINT SPALLING L 1.00 Slabs Comments:

Sample Number: 05 Type: R Area: 16.00Slabs PCI = 74  
Sample Comments:  
74 JOINT SPALLING M 1.00 Slabs Comments:  
74 JOINT SPALLING H 1.00 Slabs Comments:  
65 JOINT SEAL DAMAGE H 16.00 Slabs Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

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Network: OQW      Name: MAQUOKETA MUNICIPAL AIRPORT

---

Branch: TH01MQ      Name: T-Hangar 01      Use: T-HANGAR      Area: 17,273.00SqFt

---

Section: 01      of 3      From: TAXIWAY 03      To: SECTION 02      Last Const.: 03/01/1984  
Surface: AC      Family: IowaASPHALTHH      Zone:      Category:      Rank: P  
Area: 1,604.00SqFt      Length: 60.00Ft      Width: 25.00Ft  
Shoulder:      Street Type:      Grade: 0.00      Lanes: 0

Section Comments:

---

Last Insp. Date: 12/12/2017 Total Samples: 1      Surveyed: 1

Conditions: PCI : 6

Inspection Comments:

---

Sample Number: 01      Type: R      Area: 1,604.00SqFt      PCI = 6

Sample Comments:

52 RAVELING	H	16.00 SqFt	Comments:ST
57 WEATHERING	H	105.00 SqFt	Comments:ST
41 ALLIGATOR CRACKING	M	1,604.00 SqFt	Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: TH01MQ Name: T-Hangar 01 Use: T-HANGAR Area: 17,273.00SqFt

Section: 02 of 3 From: SEE MAP To: SEE MAP Last Const.: 06/01/2000  
Surface: PCC Family: IowaPCCTH Zone: Category: Rank: P  
Area: 7,718.00SqFt Length: 225.00Ft Width: 35.00Ft  
Slabs: 45 Slab Width: 10.00Ft Slab Length: 10.00Ft Joint Length: 1,315.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 3 Surveyed: 3

Conditions: PCI : 60

Inspection Comments:

Sample Number: 01 Type: R Area: 15.00Slabs PCI = 60

Sample Comments:

63 LINEAR CRACKING	L	6.00 Slabs	Comments:
72 SHATTERED SLAB	L	1.00 Slabs	Comments:
62 CORNER BREAK	L	2.00 Slabs	Comments:
74 JOINT SPALLING	L	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	H	15.00 Slabs	Comments:

Sample Number: 02 Type: R Area: 15.00Slabs PCI = 58

Sample Comments:

62 CORNER BREAK	L	1.00 Slabs	Comments:
63 LINEAR CRACKING	M	1.00 Slabs	Comments:W
74 JOINT SPALLING	M	1.00 Slabs	Comments:
63 LINEAR CRACKING	L	7.00 Slabs	Comments:LU
65 JOINT SEAL DAMAGE	H	15.00 Slabs	Comments:

Sample Number: 03 Type: R Area: 15.00Slabs PCI = 62

Sample Comments:

65 JOINT SEAL DAMAGE	H	15.00 Slabs	Comments:
62 CORNER BREAK	L	3.00 Slabs	Comments:
63 LINEAR CRACKING	L	6.00 Slabs	Comments:LU
74 JOINT SPALLING	L	2.00 Slabs	Comments:
73 SHRINKAGE CRACKING	N	1.00 Slabs	Comments:

# Re-inspection Report

Iowa2017\_All

Report Generated Date: May 23, 2018

Network: OQW Name: MAQUOKETA MUNICIPAL AIRPORT

Branch: TH01MQ Name: T-Hangar 01 Use: T-HANGAR Area: 17,273.00SqFt

Section: 03 of 3 From: SEE MAP To: SEE MAP Last Const.: 01/01/1999  
Surface: PCC Family: IowaPCCTH Zone: Category: Rank: P  
Area: 7,951.00SqFt Length: 415.00Ft Width: 20.00Ft  
Slabs: 85 Slab Width: 10.00Ft Slab Length: 10.00Ft Joint Length: 1,225.00Ft  
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 12/12/2017 Total Samples: 4 Surveyed: 3

Conditions: PCI : 64

Inspection Comments:

Sample Number: 01 Type: R Area: 23.00Slabs PCI = 58

Sample Comments:

62 CORNER BREAK	L	4.00 Slabs	Comments:
63 LINEAR CRACKING	L	2.00 Slabs	Comments:
63 LINEAR CRACKING	M	2.00 Slabs	Comments:
74 JOINT SPALLING	L	2.00 Slabs	Comments:
72 SHATTERED SLAB	L	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	H	23.00 Slabs	Comments:

Sample Number: 02 Type: R Area: 22.00Slabs PCI = 74

Sample Comments:

74 JOINT SPALLING	L	3.00 Slabs	Comments:
63 LINEAR CRACKING	L	1.00 Slabs	Comments:
63 LINEAR CRACKING	M	1.00 Slabs	Comments:
65 JOINT SEAL DAMAGE	H	22.00 Slabs	Comments:

Sample Number: 03 Type: R Area: 20.00Slabs PCI = 60

Sample Comments:

65 JOINT SEAL DAMAGE	H	20.00 Slabs	Comments:
63 LINEAR CRACKING	L	7.00 Slabs	Comments:
72 SHATTERED SLAB	L	1.00 Slabs	Comments:
62 CORNER BREAK	L	2.00 Slabs	Comments:
74 JOINT SPALLING	M	3.00 Slabs	Comments:

**APPENDIX D**

**WORK HISTORY REPORT**

Date:05/02/2018

**Work History Report**

1 of 3

Pavement Database:IOWA2017\_ALL

**Network:** OQW      **Branch:** A01MQ      (APRON AT MAQUOKETA)      **Section:** 01      **Surface:** PCC  
**L.C.D.:** 06/01/1986      **Use:** APRON      **Rank P Length:** 185.00 Ft      **Width:** 160.00 Ft      **True Area:** 28,682.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/1986	NC-PC	New Construction - PCC	\$0	0.00	True	-

**Network:** OQW      **Branch:** A01MQ      (APRON AT MAQUOKETA)      **Section:** 02      **Surface:** PCC  
**L.C.D.:** 06/02/2005      **Use:** APRON      **Rank P Length:** 150.00 Ft      **Width:** 95.00 Ft      **True Area:** 14,000.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/02/2005	NC-PC	New Construction - PCC	\$0	5.00	True	5" P-505
06/01/2005	BA-AG	Base Course - Aggregate	\$0	12.00	False	12" P-154/RAP
10/01/1998	SS-FS	Surface Seal - Fog Seal (Glob:	-	-	False	-
06/01/1972	NC-AC	New Construction - AC	-	-	True	-

**Network:** OQW      **Branch:** R15MQ      (RUNWAY 15/33 AT MAQUOKETA)      **Section:** 01      **Surface:** PCC  
**L.C.D.:** 10/15/2006      **Use:** RUNWAY      **Rank P Length:** 3,278.00 Ft      **Width:** 60.00 Ft      **True Area:** 198,248.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
01/01/2016	PA-PP	Patching - PCC Partial Depth	\$0	0.00	False	FIELD ESTIMATE
10/15/2006	SU-PC	Surface Course - PCC	\$0	0.00	True	-
10/01/1998	SS-FS	Surface Seal - Fog Seal (Glob:	-	-	False	-
06/01/1982	NC-AC	New Construction - AC	-	-	True	-

**Network:** OQW      **Branch:** T01MQ      (TAXIWAY 01 AT MAQUOKETA)      **Section:** 01      **Surface:** PCC  
**L.C.D.:** 10/01/2006      **Use:** TAXIWAY      **Rank P Length:** 264.00 Ft      **Width:** 30.00 Ft      **True Area:** 12,603.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
10/01/2006	CR-PC	Complete Reconstruction - PC	\$0	0.00	True	-
10/01/1998	SS-FS	Surface Seal - Fog Seal	-	-	False	-
06/01/1982	OL-AS	Overlay - AC Structural	-	-	True	-

**Network:** OQW      **Branch:** T02MQ      (TAXIWAY 02 AT MAQUOKETA)      **Section:** 01      **Surface:** AAC  
**L.C.D.:** 06/01/1982      **Use:** TAXIWAY      **Rank P Length:** 140.00 Ft      **Width:** 30.00 Ft      **True Area:** 5,200.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
10/01/1998	ST-SS	Surface Treatment - Slurry Se:	-	-	False	-
06/01/1982	SU-AC	Surface Course - AC	\$0	0.00	True	-

**Network:** OQW      **Branch:** T02MQ      (TAXIWAY 02 AT MAQUOKETA)      **Section:** 02      **Surface:** AAC  
**L.C.D.:** 10/01/2006      **Use:** TAXIWAY      **Rank P Length:** 60.00 Ft      **Width:** 30.00 Ft      **True Area:** 2,748.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
10/01/2006	NU-IN	New Construction - Initial	\$0	0.00	True	-

**Network:** OQW      **Branch:** T03MQ      (TAXIWAY 03 AT MAQUOKETA)      **Section:** 01      **Surface:** AAC  
**L.C.D.:** 10/01/2006      **Use:** TAXIWAY      **Rank P Length:** 82.00 Ft      **Width:** 25.00 Ft      **True Area:** 1,592.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
10/01/2006	OL-AS	Overlay - AC Structural	\$0	0.00	True	-
10/01/1998	ST-SS	Surface Treatment - Slurry Se:	-	-	False	-
06/01/1982	SU-AC	Surface Course - AC	-	-	True	-

Date:05/02/2018

**Work History Report**

2 of 3

Pavement Database:IOWA2017\_ALL

**Network:** OQW      **Branch:** T04MQ      (TAXIWAY 04 AT MAQUOKETA)      **Section:** 01      **Surface:** PCC  
**L.C.D.:** 06/02/2005   **Use:** TAXIWAY      **Rank P Length:** 387.00 Ft      **Width:** 25.00 Ft      **True Area:** 9,948.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/02/2005	CR-PC	Complete Reconstruction - PC	\$0	5.00	True	5" P-505
06/01/2005	BA-AG	Base Course - Aggregate	\$0	12.00	False	12" P-154/RAP
10/01/1998	SS-FS	Surface Seal - Fog Seal (Globa	-	-	False	-
06/01/1982	NC-AC	New Construction - AC	-	-	True	-

**Network:** OQW      **Branch:** T04MQ      (TAXIWAY 04 AT MAQUOKETA)      **Section:** 02      **Surface:** PCC  
**L.C.D.:** 10/01/2006   **Use:** TAXIWAY      **Rank P Length:** 287.00 Ft      **Width:** 25.00 Ft      **True Area:** 12,787.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
10/01/2006	NU-IN	New Construction - Initial	\$0	0.00	True	ESTIMATED DATE

**Network:** OQW      **Branch:** TH01MQ      (T-Hangar 01)      **Section:** 01      **Surface:** AC  
**L.C.D.:** 03/01/1984   **Use:** T-HANGAR      **Rank P Length:** 60.00 Ft      **Width:** 25.00 Ft      **True Area:** 1,604.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/1998	ST-SS	Surface Treatment - Slurry Sea	\$0	0.00	False	-
03/01/1984	BCALC	Back-calculated Construction	\$0	0.00	True	UNKNOWN; CONSTRUCTED PRIOR TO 1994 PER GOOGLE EARTH

**Network:** OQW      **Branch:** TH01MQ      (T-Hangar 01)      **Section:** 02      **Surface:** PCC  
**L.C.D.:** 06/01/2000   **Use:** T-HANGAR      **Rank P Length:** 225.00 Ft      **Width:** 35.00 Ft      **True Area:** 7,718.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2000	NC-PC	New Construction - PCC	\$0	0.00	True	ESTIMATED VIA AERIAL, BETWEEN 1994-2000

**Network:** OQW      **Branch:** TH01MQ      (T-Hangar 01)      **Section:** 03      **Surface:** PCC  
**L.C.D.:** 01/01/1999   **Use:** T-HANGAR      **Rank P Length:** 415.00 Ft      **Width:** 20.00 Ft      **True Area:** 7,951.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
01/01/1999	NC-PC	New Construction - PCC	\$0	0.00	True	EST. VIA GOOGLE EARTH; CONSTRUCTED BETWEEN 1994-2004

**Summary:**

<b>Work Description</b>	<b>Section Count</b>	<b>Area Total (SqFt)</b>	<b>Thickness Avg (in)</b>	<b>Thickness STD (in)</b>
Back-calculated Construction	1	1,604.00	.00	-
Base Course - Aggregate	2	23,948.00	12.00	.00
Complete Reconstruction - PCC	2	22,551.00	2.50	3.54
New Construction - AC	3	222,196.00	-	-
New Construction - Initial	2	15,535.00	.00	.00
New Construction - PCC	4	58,351.00	1.25	2.50
Overlay - AC Structural	2	14,195.00	.00	-
Patching - PCC Partial Depth	1	198,248.00	.00	-
Surface Course - AC	2	6,792.00	.00	-
Surface Course - PCC	1	198,248.00	.00	-
Surface Seal - Fog Seal	1	12,603.00	-	-
Surface Seal - Fog Seal (Global)	3	222,196.00	-	-
Surface Treatment - Slurry Seal	3	8,396.00	.00	-

## **APPENDIX E**

# **LOCALIZED PREVENTIVE MAINTENANCE POLICIES AND UNIT COST TABLES**

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

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

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

<b>Distress Type</b>	<b>Severity Level</b>	<b>Maintenance Action</b>
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
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
Settlement	Low	Monitor
Settlement	Medium	Grinding
Settlement	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. 2018 unit costs for preventive maintenance actions.

Maintenance Action	Unit Cost
AC Patch – AC-Surfaced Pavement	\$13.66/sf
Crack Sealing – AC-Surfaced Pavement	\$2.34/lf
Partial Depth PCC Patch – PCC Pavement	\$34.97/sf
Full Depth PCC Patch – PCC Pavement	\$15.62/sf
Crack Sealing – PCC Pavement	\$2.81/lf
Joint Sealing – PCC Pavement	\$2.81/lf
Grinding – PCC Pavement	\$0.34/sf
Slab Replacement – PCC Pavement	\$15.62/sf

Table E-4. 2018 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	\$9.70	\$4.59	\$4.59	\$4.59	\$0.00	\$0.00	\$0.00
PCC	\$16.19	\$7.65	\$7.65	\$7.65	\$0.00	\$0.00	\$0.00

## **APPENDIX F**

# **YEAR 2018 LOCALIZED PREVENTIVE MAINTENANCE DETAILS**

Table F-1. Year 2018 localized preventive maintenance details.

Branch <sup>1</sup>	Section <sup>1</sup>	Distress Type <sup>2</sup>	Severity	Distress Quantity	Distress Unit	Maintenance Action	Unit Cost <sup>3</sup>	2018 Estimated Cost <sup>3</sup>
A01MQ	01	Corner Break	Low	2	Slabs	Crack Sealing - PCC	\$2.81	\$48
A01MQ	01	Faulting	Medium	2	Slabs	Grinding (Localized)	\$0.34	\$7
A01MQ	01	Joint Seal Damage	High	301	Slabs	Joint Seal (Localized)	\$2.81	\$15,666
A01MQ	01	Joint Spalling	Medium	2	Slabs	Patching - PCC Partial Depth	\$34.97	\$472
A01MQ	01	LTD Cracking	Medium	2	Slabs	Crack Sealing - PCC	\$2.81	\$59
A01MQ	02	Corner Spalling	Medium	2	Slabs	Patching - PCC Partial Depth	\$34.97	\$149
A01MQ	02	Joint Seal Damage	High	150	Slabs	Joint Seal (Localized)	\$2.81	\$7,531
A01MQ	02	Joint Spalling	Medium	3	Slabs	Patching - PCC Partial Depth	\$34.97	\$713
R15MQ	01	Joint Seal Damage	Medium	1,473	Slabs	Joint Seal (Localized)	\$2.81	\$79,166
R15MQ	01	Joint Seal Damage	High	316	Slabs	Joint Seal (Localized)	\$2.81	\$16,964
R15MQ	01	Joint Spalling	Medium	9	Slabs	Patching - PCC Partial Depth	\$34.97	\$1,979
R15MQ	01	Small Patch	Medium	9	Slabs	Patching - PCC Full Depth	\$15.62	\$368
R15MQ	01	Small Patch	High	9	Slabs	Patching - PCC Full Depth	\$15.62	\$368
T01MQ	01	Joint Seal Damage	Medium	61	Slabs	Joint Seal (Localized)	\$2.81	\$2,381
T01MQ	01	Joint Seal Damage	High	27	Slabs	Joint Seal (Localized)	\$2.81	\$1,042
T03MQ	01	L&T Cracking	Medium	69	Ft	Crack Sealing - AC	\$2.34	\$161
T04MQ	01	Corner Break	Low	1	Slabs	Crack Sealing - PCC	\$2.81	\$23
T04MQ	01	Joint Seal Damage	High	65	Slabs	Joint Seal (Localized)	\$2.81	\$3,192
T04MQ	01	Shattered Slab	Low	1	Slabs	Crack Sealing - PCC	\$2.81	\$70
T04MQ	02	Joint Seal Damage	High	76	Slabs	Joint Seal (Localized)	\$2.81	\$2,349
T04MQ	02	Joint Spalling	Medium	1	Slabs	Patching - PCC Partial Depth	\$34.97	\$226

Table F-1. Year 2018 localized preventive maintenance details (continued).

<b>Branch<sup>1</sup></b>	<b>Section<sup>1</sup></b>	<b>Distress Type<sup>2</sup></b>	<b>Severity</b>	<b>Distress Quantity</b>	<b>Distress Unit</b>	<b>Maintenance Action</b>	<b>Unit Cost<sup>3</sup></b>	<b>2018 Estimated Cost<sup>3</sup></b>
T04MQ	02	Joint Spalling	High	1	Slabs	Patching - PCC Partial Depth	\$34.97	\$282
TH01MQ	03	Corner Break	Low	8	Slabs	Crack Sealing - PCC	\$2.81	\$181
TH01MQ	03	Joint Seal Damage	High	85	Slabs	Joint Seal (Localized)	\$2.81	\$3,442
TH01MQ	03	Joint Spalling	Medium	4	Slabs	Patching - PCC Partial Depth	\$34.97	\$886
TH01MQ	03	LTD Cracking	Medium	4	Slabs	Crack Sealing - PCC	\$2.81	\$110
TH01MQ	03	Shattered Slab	Low	3	Slabs	Crack Sealing - PCC	\$2.81	\$147

<sup>1</sup>See Figure 3 for the location of the branch and section.

<sup>2</sup>L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

<sup>3</sup>The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at the airport.



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