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MIDLAND STANDARD ENGINEERING & TESTING, INC.
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November 6, 2019

Mr. Todd Wheeland
McHenry County College
8900 US Highway 14
Crystal Lake, Illinois 60012

Re: **Pavement Rehabilitation**
McHenry County College – Parking Lot C
MSET File No. 19671

Dear Mr. Wheeland:

We have completed the field exploration work and analysis of the pavement materials for the referenced parking lot. This report was prepared for use in the preparation of the project design plans.

Purpose
The purpose of this exploration was to determine the existing pavement sections across the parking lot. To determine the types of soil encountered at the planed subgrade elevation and to determine the presence of problem subgrade materials that may require special treatments.

Scope
The scope of this exploration and analysis included review of available information from previous work conducted in the area, field and laboratory testing, analysis of the data obtained, formulation of our recommendations and preparation of this report. The field exploration included making six (6) pavement cores.

PROJECT LOCATION AND DESCRIPTION

Project Location and Description
The project site is at the McHenry County College, located at 8900 US Highway 14 in Crystal Lake, Illinois. Plans at the site include a pavement rehabilitation program on parking lot C, located on the north side of the building. Rehabilitation is anticipated to include grind and overlay.

FIELD EXPLORATION

General
A field engineer from Midland Standard Engineering & Testing, Inc supervised the pavement cores. The specimens obtained were transported to our laboratory for testing and analysis. Our project engineer has directed all phases of this investigation.

Pavement Sampling Procedures

Pavement cores were made with a 4-inch diameter core barrel/electric drill setup to sample all pavement components. A sample of the granular base and underlying subgrade soils were obtained using hand auger equipment.

Strength Tests

Strength measurements of the subgrade soils were determined in the field using a dynamic cone penetrometer (DCP) to a depth of 18 inches below the bottom of the existing pavement section. Strength testing in the field was performed in accordance with the Illinois Test Procedure 501 of the IDOT Manual of Test Procedures for Materials.

LABORATORY TESTING

Scope

A supplemental testing program was conducted to ascertain additional pertinent engineering characteristics of the subgrade materials. The soils laboratory work was performed in accordance with applicable ASTM standards. The laboratory-testing program included: visual classification of the pavement materials. The results of testing are presented on the attached Pavement Core Measurement Logs.

SURFACE AND SUBSURFACE CONDITIONS

Pavement Conditions

The pavement section encountered at the core locations consisted of 4 to 5-1/2 inches Bituminous Concrete over 3-3/4 to 25 inches Granular Base Course for a total pavement section of 8-1/2 to 30 inches. The bituminous section is comprised of a top lift of 1-1/2 to 2-1/2 inches Bituminous Surface. Below the top surface lift **Crack Control Fabric** was noted over additional lifts of Bituminous Surface and Bituminous Binder mixes.

Granular base course materials were comprised of brown SAND and Gravel (SP-GP). Granular materials were thinner along the west side of the lot (C-1 and C-4) extending to depths of 8-1/2 to 13-1/2 inches (layer thickness 3-3/4 to 8 inches) below the top of existing pavement. The granular base course materials were thicker extending to auger refusal.

A structural number (SN) was estimated for the pavement materials utilizing coefficients presented in Figure 46-4F 'Coefficients for HMA Overlay on Flexible Pavement or Recycled Base' as part of the modified AASHTO Design criteria in IDOT Bureau of Local Roads Chapter 46 Pavement Rehabilitation Manual. The structural number (SN) for the existing pavement section was estimated at **1.57** to **3.77**.

Subgrade Conditions

Subgrade soils comprised of brownish-grey to grey Lean CLAY (CL) were encountered along the west side of the parking lot at cores C-1 and C-4. The immediate bearing value (IBV) of the subgrade soils were determined in the field using a dynamic cone penetrometer (DCP). The clay subgrade was found to have an IBV of 7.2 to 13, which translates to an unconfined compressive strength (Qu) of 2.3 to 4.1 tons per square foot. Moisture contents were measured at 18 to 26 percent.

Towards the east side of the parking lot, granular subgrade/base course materials were encountered to auger refusal at depths of 20 to 30 inches. Granular materials were comprised of brown SAND with Gravel (SP-GP).

REHABILITATION RECOMMENDATIONS

Rehabilitation Discussion

The appropriate rehabilitation program for the alignments depends on multiple factors including but not limited to the condition of the existing pavement materials, current and future traffic loading and the pavement design life. Rehabilitation of the planned alignments is anticipated to include Grind and Overlay.

Grind and Overlay

The rehabilitation program for the alignments is anticipated to include grinding the existing pavement to a nominal depth and overlaying it with a new surface course. A grinding depth should be selected that allows alignment to maintain enough thickness to provide a stable base section for construction of the overlying pavement. A minimum remaining sound bituminous pavement section of three (3) inches is suggested.

The pavement section encountered across the planned alignments have a bituminous section of 4 to 5-1/2 inches (average 5 inches), which is generally considered sufficient to support a grind and overlay rehabilitation program. If grind and overlay is selected, the condition of the pavement materials should be taken into consideration. Full depth patching in areas where excessive cracking and deterioration is encountered may be necessary to extend the life of the overlay.

Alternative Rehabilitation

Alternative to grind and overlay, remove and replace would include removing the existing bituminous materials to the depth encountered saving the existing base course materials. The existing base course would then be graded, compacted and inspected by proof rolling. Where required, unstable base areas should be repaired or replaced with new materials. Once the base is approved, a section of Hot Mix Asphalt (HMA) can be placed.

Thinner sections of base course materials were noted on the west side of the parking lot (C-1 and C-4). If the improved section requires a thicker granular base to meet a minimum structural number, the existing base course materials can be stockpiled and reused after regrading is complete. Additionally, recycled asphalt (RAP) generated during the milling process may be reused as base course materials.

Closure

Thank you for the opportunity to be of service. Please contact us if you have any questions regarding the information contained in this report.

Very truly yours,
MIDLAND STANDARD ENGINEERING & TESTING, INC.

Michael H. Prigge, P.E.
Project Engineer

Attachments: Core Location Map
Pavement Core Measurement Log
Pavement Core Pictures
DCP Data Sheet


Core Location Map
McHenry County College - Parking Lot C
Crystal Lake, Illinois
MSET File No. 19671
Legend
Pavement Core
Tartan Dr
C-1
C-2
C-3
C-4
C-5
C-6
McHenry County College
14
Google Earth
© 2018 Google
N
500 ft

PAVEMENT CORE MEASUREMENT LOG
McHENRY COUNTY COLLEGE - PARKING LOT C
CRYSTAL LAKE, ILLINOIS

Core No. C-1						
Location	Parking Lot C - 974527E, 2037472N					
Material	**Depth (in.)**		**Thickness (in.)**	**Remarks/Condition**	**coeff**	**sn**
Bituminous Surface	0 to 2- 1/2		2- 1/2		0.30	0.75
Crack Control Fabric					0.00	0.00
Bituminous Surface	2- 1/2 to 4		1- 1/2		0.23	0.35
Bituminous Binder	4 to 5- 1/2		1- 1/2		0.20	0.30
Granular Base Course	5- 1/2 to 13- 1/2		8	Brown SAND and Gravel	0.10	0.80
Subgrade	13- 1/2			Brownish-Grey Lean CLAY, CL		**2.20**
				Mc=26%, IBV=13, Qu=4.1 tsf		
Core No. C-2						
Location	Parking Lot C - 974748E, 2037496N					
Material	**Depth (in)**		**Thickness (in.)**	**Remarks/ Condition**	**coeff**	**sn**
Bituminous Surface	0 to 1- 3/4		1- 3/4		0.30	0.53
Crack Control Fabric					0.00	0.00
Bituminous Surface	1- 3/4 to 3		1- 1/4		0.23	0.29
Bituminous Binder	3 to 4		1		0.20	0.20
Granular Base Course	4 to 10		6	Brown SAND and Gravel	0.10	0.60
Granular Base Course	10 to 14- 1/2		4- 1/2	Brown Clayey SAND and Gravel, SC	0.00	0.00
Granular Base Course	14- 1/2 to 20		5- 1/2	Brown SAND and Gravel, some Cobbles	0.10	0.55
Auger Refusal at 20"						**2.16**
Core No. C-3						
Location	Parking Lot C - 974892E, 2037381N					
Material	**Depth (in.)**		**Thickness (in.)**	**Remarks/Condition**	**coeff**	**sn**
Bituminous Surface	0 to 2- 1/2		2- 1/2		0.30	0.75
Crack Control Fabric					0.00	0.00
Bituminous Surface	2- 1/2 to 3- 3/4		1- 1/4		0.23	0.29
Bituminous Binder	3- 3/4 to 5- 1/2		1- 3/4		0.20	0.35
Granular Base Course	5- 1/2 to 20		14- 1/2	Brown SAND and Gravel, some Cobbles	0.10	1.45
Auger Refusal at 20"						**2.84**
Core No. C-4						
Location	Parking Lot C - 974594E, 2037369N					
Material	**Depth (in.)**		**Thickness (in.)**	**Remarks/Condition**	**coeff**	**sn**
Bituminous Surface	0 to 2		2		0.30	0.60
Crack Control Fabric					0.00	0.00
Bituminous Surface	2 to 3- 1/2		1- 1/2		0.23	0.35
Bituminous Binder	3- 1/2 to 4- 3/4		1- 1/4		0.20	0.25
Granular Base Course	4- 3/4 to 8- 1/2		3- 3/4	Brown SAND and Gravel	0.10	0.38
Subgrade	8- 1/2			Grey, some Brown Lean CLAY, CL		**1.57**
				Mc=18%, IBV=7.2, Qu=2.3 tsf		

PAVEMENT CORE MEASUREMENT LOG

McHENRY COUNTY COLLEGE - PARKING LOT C

CRYSTAL LAKE, ILLINOIS

Core No. C-5

Location Parking Lot C - 974721E, 2037411N

Material	**Depth (in.)**			**Thickness (in.)**	**Remarks/Condition**	**coeff**	**sn**
Bituminous Surface	0	to	2- 1/2	2- 1/2		0.30	0.75
Crack Control Fabric						0.00	0.00
Bituminous Surface	2- 1/2	to	3- 1/4	3/4		0.23	0.17
Bituminous Binder	3- 1/4	to	5	1- 3/4		0.20	0.35
Granular Base Course	5	to	30	25	Brown SAND and Gravel, some Cobbles	0.10	2.50
Auger Refusal at 30"							**3.77**

Core No. C-6

Location Parking Lot C - 974824E, 2037254N

Material	**Depth (in)**			**Thickness (in.)**	**Remarks/ Condition**	**coeff**	**sn**
Bituminous Surface	0	to	1- 1/2	1- 1/2		0.30	0.45
Crack Control Fabric						0.00	0.00
Bituminous Surface	1- 1/2	to	2- 3/4	1- 1/4		0.23	0.29
Bituminous Binder	2- 3/4	to	4- 3/4	2		0.20	0.40
Granular Base Course	4- 3/4	to	24	19- 1/4	Brown SAND and Gravel, some Cobbles	0.10	1.93
Auger Refusal at 24"							**3.06**


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-1


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-2


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-3


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-4


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-5


McHENRY COUNTY COLLEGE - LOT C
CRYSTAL LAKE, ILLINOIS
MSET File No. 19671
NOVEMBER 2019
C-6

MIDLAND STANDARD ENGINEERING & TESTING, INC.

410 NOLEN DRIVE, SOUTH ELGIN, ILLINOIS 60177

DYNAMIC CONE PENETRATION TEST

MSET NO. 19671 DATE TESTED 11/1/19

PROJ. NAME MCC Parking Lot C WEATHER Overcast

PROJ. LOC Crystal Lake, Illinois 1 - Double Mass, 2 - Single Mass: 2

CLIENT McHenry County College INSPECTOR T. Scheflow

SUBGRADE [X] FOUNDATION [ ]

TEST LOCATION AND REMARKS	INITIAL DEPTH							
C-1: Brownish-Grey Lean CLAY, CL (Mc=26%)	13.5"	DEPTH	19.5	25.5	31.5			AVG
		BLOWS	13	21	25			59
		RATE	0.9	0.6	0.5			**0.6**
		IBV	7.7	14.0	17.4			12.9
		QU	2.4	4.5	5.6			**4.1**
C-4: Grey, some Brown Lean CLAY, CL (Mc=18%)	8.5"	DEPTH	14.5	20.5	26.5			AVG
		BLOWS	12	9	16			37
		RATE	1.0	1.3	0.8			**1.0**
		IBV	6.9	4.8	9.9			7.2
		QU	2.2	1.5	3.2			**2.3**
		DEPTH						
		BLOWS						
		RATE						
		IBV						
		QU						
		DEPTH						
		BLOWS						
		RATE						
		IBV						
		QU						
		DEPTH						
		BLOWS						
		RATE						
		IBV						
		QU						

NOTE: Rate is inches of penetration per blow.

CALCULATIONS

IBV = 10^[0.84-1.26 x LOG(RATE)]

QU(tsf) = 0.32 x IBV

RATE	IBV	QU	RATE	IBV	QU
0.5	17	5.4	1.3	5	1.6
0.6	13	4.2	1.5	4	1.3
0.7	11	3.5	2.0	3	1.0
0.8	9	2.9	2.6	2	0.6
0.9	8	2.6	3.0	1.7	0.5
1.0	7	2.2	3.3	1.5	0.5
1.1	6	1.9	4.6	1	0.3
1.2	5.5	1.8	>4.6	<1	<0.3