

**ADAMS COUNTY HIGHWAY DEPARTMENT COMMITTEE**

**THURSDAY, OCTOBER 10, 2013 AT 9:00 A.M.  
HIGHWAY DEPARTMENT CONFERENCE ROOM  
1342 COUNTY ROAD "F", ADAMS, WI**

**MEMBERS PRESENT:** Larry Babcock, Chairperson  
Dean Morgan, Vice-Chairperson  
Florence Johnson  
Patrick Gatterman  
James Bays

**OTHERS PRESENT:** Patrick Kotlowski ~ Highway Commissioner, Dan Rossiter,  
Barbara Morgan and Everett Johnson

**CALL MEETING TO ORDER:** The Meeting of the Adams County Highway Department Committee was called to order by Chairperson – Larry Babcock at 9:00 A.M., on Thursday, October 10, 2013.

**WAS THE MEETING PROPERLY ANNOUNCED? YES**

**ROLL CALL:** BABCOCK, JOHNSON, GATTERMAN, MORGAN AND BAYS.  
ALL MEMBERS PRESENT.

**APPROVAL OF AGENDA:** *Motion by Bays to approve the Agenda as presented, second by Gatterman. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.*

**APPROVAL OF MINUTES OF LAST MEETING (SEPTEMBER 12, 2013):**  
*Motion by Johnson to approve the Minutes as printed of the Adams County Highway Department Committee Meeting for September 12, 2013 Regular Monthly Meeting, second by Morgan. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.*

**PUBLIC PARTICIPATION ON AGENDA ITEMS:** Public participation was requested for the following agenda items:

- County Road G / County Road O Drainage
- County Road B (STH 82 – CTH E) Overlay Project

**COUNTY ROAD E ~ SEIS DRIVEWAY ACCESS:** Joe Seis was not able to attend this meeting due to harvesting crops. Driveway application was denied because this parcel already has one access on County Road E. *Motion by Bays to grant an exception for the Joe Seis additional driveway access on County Road E, as there are no safety concerns in this area, second by Gatterman. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.*

**COUNTY ROAD G / COUNTY ROAD O DRAINAGE:** Dan Rossiter representing AECOM was present and discussed and reviewed with the Highway Committee and Commissioner the draft proposal for County Road G / County Road O drainage plans. No action taken on this agenda item; will be placed on the November 2014 agenda for a final plan approval.

**ADAMS COUNTY HIGHWAY DEPARTMENT COMMITTEE MEETING  
OCTOBER 10, 2013 ~ 9:00 A.M.**

**COUNTY ROAD B (STH 82 – CTH E) OVERLAY PROJECT:** Dan Rossiter representing AECOM was present and discussed and reviewed with the Highway Committee and Commissioner a report that was created by their company (AECOM) reference the County Road B (STH 82 – CTH E) overlay project. A copy of this report is attached to minutes and will be forwarded to D.L. Gasser Construction.

**COUNTY ROAD G CONSTRUCTION UPDATE:** Highway Commissioner updated the Highway Committee on the progress of the County Road G Construction project: all work has been completed except for paving, centerlining, rumble strips, ditch work and shoulder gravel; this project should be completed within the next couple of weeks.

**COUNTY ROAD P BONDING / FUNDING:** Ehlers prepared a draft bonding proposal which was forwarded to the Highway and Admin/Finance Committees to review. Highway Commissioner met with Admin/Finance Committee on October 4 and discussed the draft bonding proposal. No action taken on this agenda item, waiting for more information from Ehlers.

**REVIEW & ACT ON RESOLUTION TO AUTHORIZE ADAMS COUNTY HIGHWAY DEPARTMENT TO APPLY FOR A \$247,000.00 C.H.I.-D (COUNTY HIGHWAY IMPROVEMENT DISCRETIONARY) AND A \$94,000 C.H.I. (COUNTY HIGHWAY IMPROVEMENT) GRANT FROM THE WISCONSIN DEPARTMENT OF TRANSPORTATION TO FUND THE RECONSTRUCTION OF CTH G FROM APACHE LANE TO BADGER DRIVE:** The Highway Committee reviewed the resolution to authorize the Adams County Highway Department to apply for C.H.I. & C.H.I.-D grants. *Motion by Bays to approve and forward to County Board a Resolution to authorize Adams County Highway Department to apply for a \$247,000.00 C.H.I.-D (County Highway Improvement Discretionary) and a \$94,000 C.H.I. (County Highway Improvement) Grant from the Wisconsin Department of Transportation to fund the Reconstruction of CTH G from Apache Lane to Badger Drive, second by Gatterman. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.*

**2014 HIGHWAY BUDGET:** Highway Department received notice that the Highway Aids may be reduced by \$130,468, this is a preliminary calculation and final totals will be released in December. Administrator Coordinator Director of Finance and Admin/Finance Committee was informed of this notice at the Admin/Finance Meeting on October 4, 2013.

**REPORT ON HIGHWAY DEPARTMENT OPERATIONS:**

- Mowing
- Hauling gravel & hot mix with contractor on CTH G project
- Centerlining / Painting: season winding down
- New Equipment on site: Freightliner & Pickup

**FINANCIAL REPORTS:** *Motion by Gatterman to approve the September 2013 Financial Report as audited, second by Morgan. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.*

**ADAMS COUNTY HIGHWAY DEPARTMENT COMMITTEE MEETING  
OCTOBER 10, 2013 ~ 9:00 A.M.**

**VOUCHERS:** The Highway Department monthly check summary report was presented to the Committee for review. Committee members reviewed the October 7, 2013, Monthly Check Summary Report that is provided to the Highway Committee by the Administrator Coordinator / Director of Finance Department. ***Motion by Bays to approve the Monthly Check Summary report as presented, second by Gatterman. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.***

**IDENTIFY POSSIBLE UPCOMING AGENDA ITEMS**

- COUNTY ROAD G / COUNTY ROAD O DRAINAGE

**SET NEXT MEETING DATE AND ADJOURN:** ***Motion by Bays, second by Gatterman, to adjourn until the next scheduled meeting for the Highway Department on, Thursday, November 14, 2013 at 9:00 A.M. at the Highway Department. VOICE VOTE, ALL IN FAVOR. MOTION CARRIED.***

Meeting adjourned at 11:30 A.M.

Respectfully submitted,

Patrick Kotlowski, Recording Secretary

**THESE MINUTES HAVE NOT BEEN APPROVED BY THE COMMITTEE**

# Final Report

## Pavement Investigation County Trunk Highway B from State Trunk Highway 82 to CTH E



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## 1.0 Background

Adams County has experienced premature pavement distress on County Truck Highway (CTH) B between CTH E in the north and State Trunk Highway (STH) 82 in the south. Surface cracks were noticed within a week of paving. A visual review of the pavement in early June 2013 showed longitudinal and transverse cracking exists throughout the 7.8 mile long project. The intersection of CTH A roughly divides the project into a northern and southern section. In general, cracking is more frequent in the southern section than the northern section. Transverse cracks in the southern section occur at about 20-foot intervals with some more closely spaced. Both transverse and longitudinal cracks in the southern section apparently experienced an uplift which resulted in snow plow abrasion over the winter. While the uplift currently appears to have a minor affect on ride quality, the surface scraping by snow plowing clearly highlights the cracks. Transverse cracks in the northern section are generally more widely spaced at about 100-foot intervals and also exhibited uplift. In both sections, there are areas of a few hundred feet where no transverse cracking is visible.

The construction history of this portion of CTH B consists of two recent paving projects. In 1999, the existing pavement was narrower than the current pavement. The pavement was pulverized and new aggregate was added to create a base layer. A new asphalt surface, understood to be three inches thick, was then placed creating a new roadway at the current width of 24 feet, according to Wisconsin Information System for Local Roads (WISLR). In 2012, the road received an asphalt overlay consisting of one 2-inch thick lift. Paving occurred from October 15, 2012 to November 2, 2012.

Prior to the 2012 overlay project, the Adams County Highway Maintenance staff performed a crack seal operation on all transverse and longitudinal cracks which consisted of:

- ¾" x ¾" crack routing
- Cold air pressure cleaning
- Heat lance application
- Hot rubber sealant placement
- Single-ply paper application during curing

Per the Adams County Highway Department, this crack seal procedure and material were consistent with all other recent county crack seal maintenance operations. The date(s) of the crack seal operation on the subject project was not reported.

### 1.1 Purpose

The purpose of this investigation was to attempt to determine the cause of the premature cracking and associated pavement uplift. It was discussed and understood prior to the investigation that it may not be possible to absolutely establish a cause for this particular pavement failure through a limited testing regime. It was agreed that, even though a cause may not be established, testing may eliminate cause(s) from consideration and therefore this investigation's testing could prove beneficial for future maintenance actions on this paving project or future design/construction considerations on other paving projects.

## 1.2 Procedure

To try to determine the cause of the surface cracking and related uplift (“tenting”), a two-phased coring approach was selected using 4-inch diameter cores. Phase 1 included testing on the subject project and Phase 2 included testing on a comparison project.

The first phase took cores at four different locations in the subject project. Two locations were selected in the southern section, south of CTH A. The other two core locations were taken in the northern section, north of CTH A. At each location in the southern section, three cores were taken, one on a transverse crack, one on a longitudinal crack, and one in a distress-free area. In the northern section, two cores were taken at each location. At the first location, one longitudinal crack and one distress-free area were cored. At the other location, cores were taken at one transverse crack and one distress-free area. In total 3 transverse cracks, 3 longitudinal cracks, and 4 distress free cores were taken within the CTH B limits of STH 82 and CTH E.

The second phase consisted of coring on another asphalt overlay paving project of similar vintage and pavement specification for comparison. CTH B south of STH 82 to CTH I was selected as the similar comparison project. This section of CTH B was overlaid in 2011 and was reported to have had the same crack seal operation prior to the asphalt overlay. Prior to coring, the Adams County Highway Department informed AECOM that that this project consisted of the same asphalt overlay mix and was constructed by the same contractor. In this comparison project, there were fewer transverse surface cracks and the spacing between the transverse cracks was much greater than the transverse crack spacing in the subject project. A total of four cores were taken on CTH B south of STH 82, two cores each at two different locations. At each location, cores were taken on a transverse crack and in a distress-free area. No visible longitudinal cracks were seen in the comparison project so no cores were taken on longitudinal cracks.

Attachment A represents the coring pattern used on this investigation with core locations noted.

## 1.3 Core Analysis

Three visual characteristics of the pavement cores were analyzed – cracks, debonding of asphalt layers, and pavement thickness. Cores taken through transverse or longitudinal cracks were evaluated to determine if the cracks existed only in the asphalt overlay or if they were reflections from the underlying asphalt pavement. The condition of the bond between asphalt layers was reviewed in each core and in the core hole sidewall to determine if debonding might be a contributor to cracking or uplift. Pavement thickness of both the overlay and underlying asphalt was measured to see if a correlation existed between cracked and distress-free areas.

Cores in distress-free areas were evaluated by laboratory testing for asphalt content and aggregate gradation. The laboratory testing was only performed on the asphalt overlay to determine if the material in place met the project’s mix design.

## 2.0 Results

Core location pictures showing placement of each core are in Attachment B. Detailed core logs are presented in Attachment C.

### Reflective Cracking

All eight cores taken on transverse or longitudinal cracks within both projects had a crack present in the underlying asphalt pavement. This indicates that the surface cracks are reflection cracks from the underlying asphalt pavement. In each of the cores, the crack sealing material was seen that the Adams County Maintenance crew placed prior to the overlay, which confirms that these cracks were present before the asphalt overlay was placed.

### Asphalt Layer Debonding

An initial concern was whether debonding of the asphalt layers was a contributing factor to early crack formation and tenting. No debonding was seen in any of the six cores taken on cracks in the subject project. In addition, one of the two cores on cracks in the comparison project exhibited very slight debonding. Finally, none of the distress-free cores from either the subject project or comparison project had any evidence of debonding. Visual observation of the core hole sidewall confirmed the lack of debonding observed in the cores themselves.

### Asphalt Layer Thickness

On the subject project, our understanding is the pavement section consists of a 2-inch overlay on an existing 3-inch asphalt pavement. Cores revealed that the 2012 asphalt overlay ranged from 1 5/8 to 2 inches thick. The underlying 1998 asphalt pavement ranged from 2 1/2 to 4 inches thick. Specific layer thicknesses appear to be reasonable relative to the design thicknesses. The total thickness ranged from 4 to 5 3/4 inches thick. Total pavement thickness appears to be too thin in the cores north of CTH A. The deficiency appears in the underlying asphalt, not the 2012 overlay. However, the area of thinnest total pavement corresponds to the area of least surface cracking.

Cores in distress-free areas were taken within five feet of the cores taken through cracks at a location. Asphalt thickness was relatively constant between the distress-free areas cored and the associated adjacent cores through cracks.

In the comparison project, asphalt overlay thickness ranged from 1 5/8 to 2 inches thick. Underlying asphalt thickness was 1 7/8 inches thick in the two cores nearest to STH 82 and 3 3/8 inches thick in the two cores farthest from STH 82. No correlation was determined for pavement thickness and cracking in the comparison project where cracks were infrequent.

### Laboratory Testing

After the cores were taken, AECOM was informed that the comparison project south of STH 82 on CTH B was constructed by a different contractor using a different asphalt mix design than the subject project. The asphalt content in a mix design can vary depending on different factors such as the

asphalt type specified; the source and gradation of the aggregate used; and the percentage and asphalt content of recycled material specified. Therefore, comparisons between materials from each project may not be valid. However, each project's material could be compared to that project's design specification to determine if the pavement was built as designed. Results of the asphalt core laboratory testing are presented in the following paragraphs.

The job mix formula for the subject project called for 5.1% asphalt content by weight of total mix. The asphalt content of the four cores tested from the subject project was 5.4%, 4.7%, 4.7% and 4.9% with an average asphalt content of 4.9% by weight of total mix. In the subject project core results the aggregate gradation percent passing was slightly higher than the job mix formula. This can be attributed to the core bit cutting through the aggregate thereby reducing the size of the aggregate at the core boundaries. In a 4-inch diameter sample, a marginal reduction in aggregate size may be expected because of the test procedure.

The aggregate gradation in the comparison project cores also had a slightly higher percent passing than the job mix formula called for and, again, it can be attributed to the core bit cutting through the aggregate at the core boundary. The asphalt content of the tested cores from the comparison project was slightly higher than the design mix with results of 5.4% and 5.6% by weight of total mix. The comparison project job mix design called for 5.3% asphalt content by weight of total mix.

The subject project special provisions did not contain asphalt content tolerances for the asphalt pavement but referred to Wisconsin Department of Transportation (WisDOT) standard specifications. Within the WisDOT standard specifications, Section 460.2.8.2.1.5 Control Limits, the job mix formula limits of asphaltic content is +/- 0.4 percent. The warning limits for job mix formula asphaltic content is +/- 0.3 percent. These limits are based on running averages measured during the placement of the asphalt pavement. According to the WisDOT standard specifications, if the warning limits of the asphaltic content are exceeded, adjustments should be made. In this investigation, tests of the asphalt content were taken from cores after the placement of the asphalt overlay using an accepted test method from the American Society for Testing and Materials. These test results from a limited coring program cannot be directly compared to the specification which relies on running averages from plant tests. Therefore, this specification can only be used as general guidance for the test results.

For the comparison project, no special provisions were reviewed under this investigation. It is assumed that a similar referral to WisDOT standards was used on the comparison project.

Core testing results are presented in Attachment D. Attachment E presents the asphalt mix design used on the subject project. The mix design for the comparison project is labeled as confidential by the provider. It is not included in this document because the final distribution list of this document is not known.

## 2.1 Conclusions

The results of this investigation are inconclusive in determining a cause for the premature cracking and uplift of the surface layer of asphalt. However, some conclusions can be drawn from the observations and testing conducted under this investigation.

Surface cracks in the 2012 pavement are reflection cracks from the underlying asphalt layer. Early distress in the surface layer is not caused by debonding of the surface asphalt layers from the underlying asphalt pavement. Pavement layer thicknesses appear consistent with the understood design thicknesses. Early cracking and uplift at cracks does not appear to be related to either specific pavement layer thickness or total asphalt thickness.

The laboratory tests that were performed on the four cores in the subject project reveal that the overlay material in place varies, sometimes at the limits of the job mix design specifications. While the aggregate gradation is within reasonable limits, the asphalt content was found to be relatively low. Two of the four cores tested at the limits of acceptance and a third was low. The fourth was well above the asphalt content design specification. No correlation was evident between the locations of the low asphalt content and the density of surface cracks. The laboratory tests on cores from the comparison project indicate that its asphalt material is reasonable relative to its job mix formula. A conclusion drawn from these tests is that the asphalt pavement was built near the material requirements specified. However, premature distress does not appear to be directly related to material issues, assuming that the material specified was suitable for this project's application. Further conclusions based on the limited testing done are not possible because of the small sample size which was intended to serve as an indicator of cause rather than an absolute determination of pavement distress cause.

### 3.0 Recent Associated Research

Recent research into similar, but not identical, asphalt crack and bump distress in Colorado is documented in Report No. CDOT-2011-10 dated July 2011. This report can be found at the following link:

<http://www.coloradodot.info/programs/research/pdfs/2011/cracksealants2.pdf>

Conclusions of the Colorado report do not support an absolute cause for the early distress found in the subject project but may give guidance for future construction to retard crack/bump formation and future maintenance costs. The main conclusion of the Colorado report relative to cracks and bumps in an asphalt overlay is that the use of steel rollers in vibratory mode for asphalt breakdown compaction is directly related to crack and bump severity.

## 4.0 Recommendations

Further research may determine if the same asphalt mix design that was used on the subject project was also used on other Adams County projects in 2012 by the same contractor. If any other “matching” project(s) can be found, monitoring and comparing the matching project(s) with the subject project may indicate areas for further investigation in order to determine a cause for the premature cracking and tenting found on the subject project.

Further testing or investigation into the material used for crack sealing could be performed, including the length of time between crack seal placement and asphalt overlay. Was the sealant material completely cured prior to overlay? However a clear result still may not be found from this line of investigation.

In response to the Colorado experience referenced in Section 3, it is advisable to monitor the use of steel vibratory rollers versus pneumatic tired rollers.

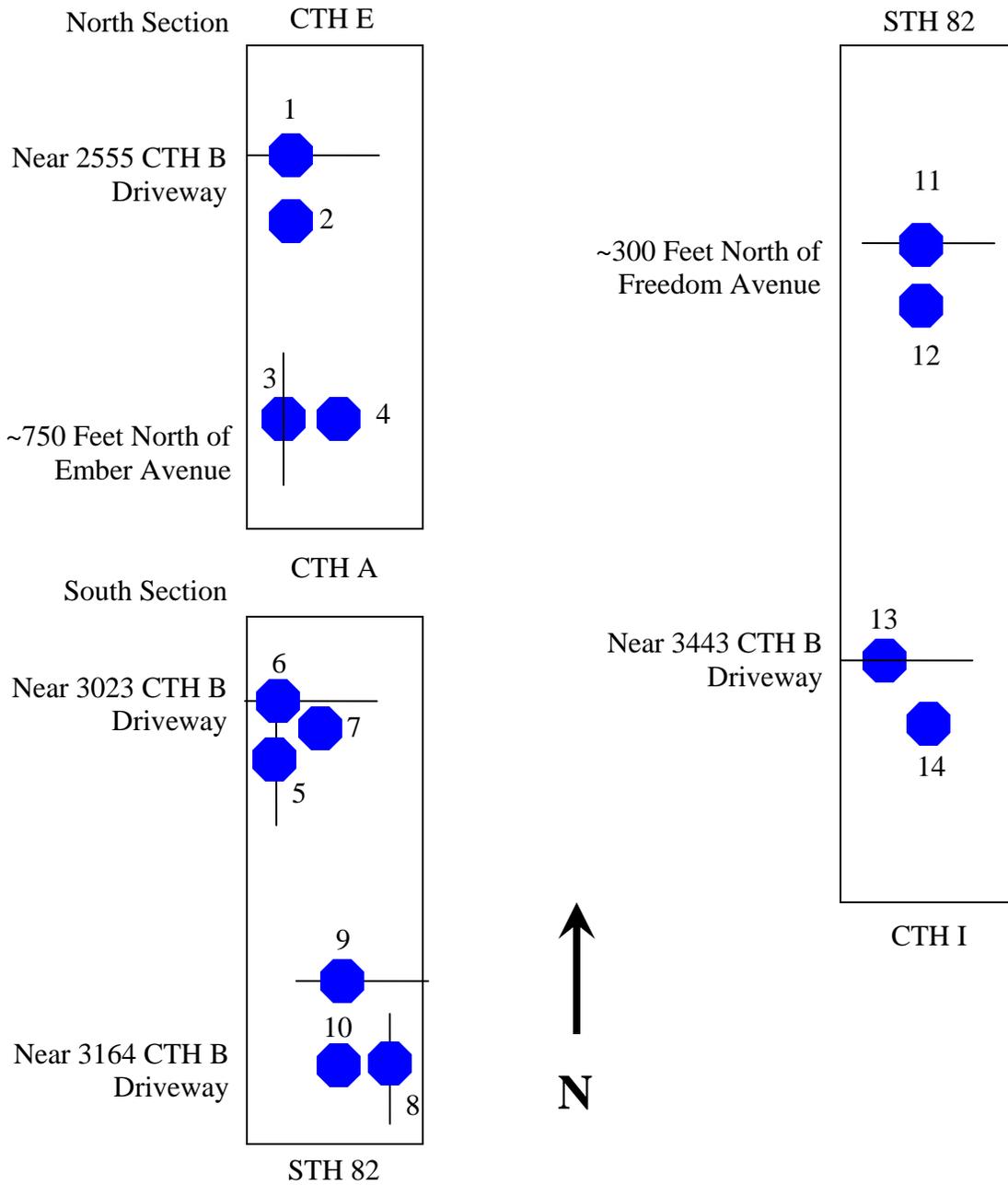
A comprehensive testing and documentation program for asphalt material at the plant and on location should be considered to ensure that the correct material is being manufactured and placed according to specifications. In this way, the pavement design can be given the best opportunity to achieve its design life. Guidance for a robust Quality Management Program (QMP) can be found in the WisDOT FDM-19-21-1 “Use of QMP Provisions” and Standard Spec 460.2.8 for Hot Mix Asphalt.

# **Appendix A**

## **Coring Pattern**

Subject Project  
CTH B – STH 82 to CTH E

Comparison Project  
CTH B – CTH I to STH 82



## **Appendix B**

### **Coring Location and Placement Pictures**

**Core 1 – Transverse Crack**

**51' SOUTH OF ADDRESS 2555 CTH B DRIVEWAY, 5' WEST OF CENTER LINE**



**Core 2**

**56' SOUTH OF ADDRESS 2555 CTH B DRIVEWAY, 5' WEST OF CENTER LINE**



**Core 3 – Longitudinal Crack**

**757' NORTH OF EMBER AVENUE, 9' WEST OF CENTER LINE**



Core 4

757' NORTH OF EMBER AVENUE, 6' WEST OF CENTER LINE



**Core 5 – Longitudinal Crack**

**78' SOUTH OF ADDRESS 3023 CTH B DRIVEWAY, 9' WEST OF CENTER LINE**



**Core 6 – Transverse Crack**

**68' SOUTH OF ADDRESS 3023 CTH B DRIVEWAY, 9' WEST OF CENTER LINE**



**Core 7**

**73' SOUTH OF ADDRESS 3023 CTH B DRIVEWAY, 7' WEST OF CENTER LINE**



**Core 8 – Longitudinal Crack**

**63' NORTH OF ADDRESS 3164 CTH B DRIVEWAY, 10' EAST OF CENTER LINE**



**Core 9 – Transverse Crack**

**67' NORTH OF ADDRESS 3164 CTH B DRIVEWAY, 8' EAST OF CENTER LINE**



**Core 10**

**63' NORTH OF ADDRESS 3164 CTH B DRIVEWAY, 8' EAST OF CENTER LINE**



**Core 11 – Transverse Crack**

**311' NORTH OF FREEDOM AVENUE, 6' WEST OF CENTER LINE**



Core 12

308' NORTH OF FREEDOM AVENUE, 6' WEST OF CENTER LINE



**Core 13 – Transverse Crack**

**98' SOUTH OF ADDRESS 3443 CTH B DRIVEWAY, 8' WEST OF CENTER LINE**



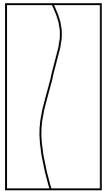
**Core 14**

**105' SOUTH OF ADDRESS 3443 CTH B DRIVEWAY, 4' WEST OF CENTER LINE**

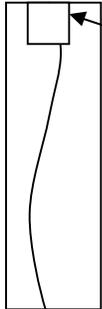


## **Appendix C**

### **Core Logs**



1-3/4" AC  
Overlay



AC/AC bond  
broke during  
core extraction

Joint Sealant

2-1/4" AC

Sandy brown  
crushed stone base

Date: 7/2/2013

Core Number: 1

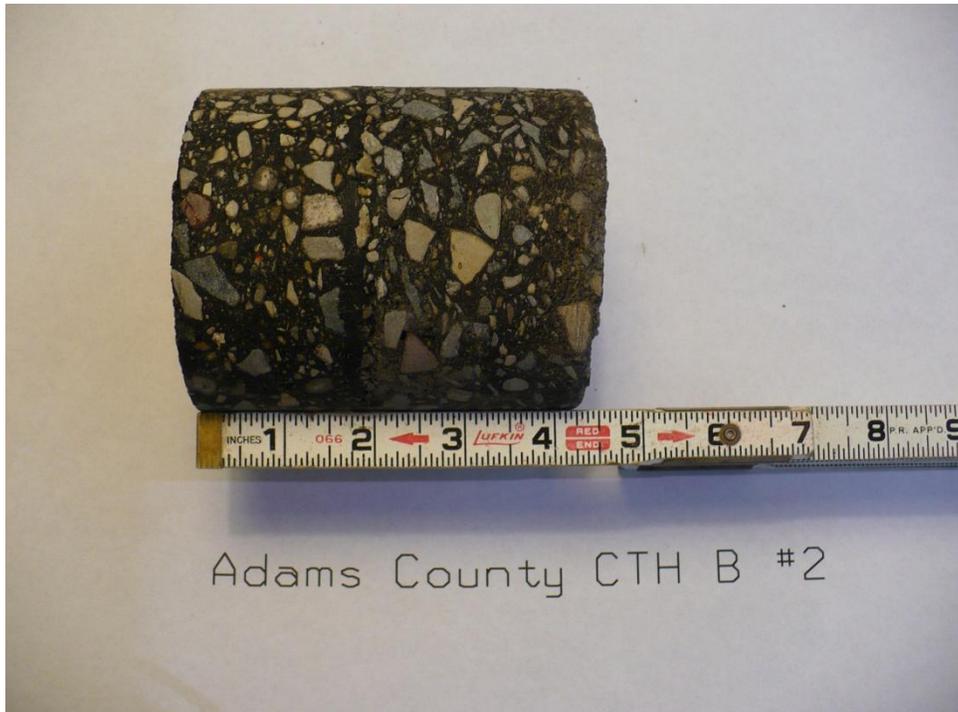
Core Location: 51 Feet South of Address 2555 CTH B Driveway

Offset: 5 Feet West of Center Line

Core Length: 4" Total

Comments: Core taken on transverse reflection crack. Good AC/AC

bond. Core broke during core extraction.



1-3/4" AC  
Overlay

2-1/2" AC

Brown, sandy,  
crushed stone base

Date: 7/2/2013

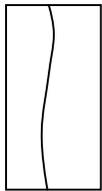
Core Number: 2

Core Location: 56 Feet South of Address 2555 CTH B Driveway

Offset: 5 Feet West of Center Line

Core Length: 4-1/4" Total

Comments: Asphalt testing was performed on this core.



2" AC Overlay

AC/AC bond broke during core extraction



Joint Sealant

2-1/2" AC

Sandy brown crushed stone base

Date: 7/2/2013

Core Number: 3

Core Location: 757 Feet North of Ember Avenue

Offset: 9 Feet West of Center Line

Core Length: 4-1/2" Total

Comments: Core taken on longitudinal reflection crack. Good AC/AC

bond. Core broke during core extraction.



2" AC  
Overlay

2 1/2" AC

Brown, sandy,  
crushed stone base

Date: 7/2/2013

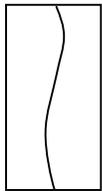
Core Number: 4

Core Location: 757 Feet North of Amber Ave and CTH B Intersection

Offset: 6 Feet West of Center Line

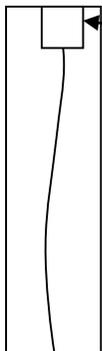
Core Length: 4-1/2" Total

Comments: Asphalt testing was performed on this core.



2" AC Overlay

AC/AC bond broke during core extraction



Joint Sealant

3-1/2" AC

Sandy brown crushed stone base

Date: 7/2/2013

Core Number: 5

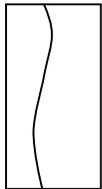
Core Location: 78 Feet South of Address 3023 CTH B Driveway

Offset: 9 Feet West of Center Line

Core Length: 5-1/2" Total

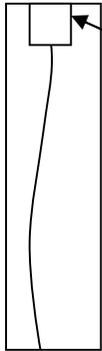
Comments: Core taken on longitudinal reflection crack. Good AC/AC

bond. Core broke during core extraction.



2" AC  
Overlay

AC/AC bond  
broke during  
core extraction



Joint Sealant

3-1/2" AC

Sandy brown  
crushed stone base

Date: 7/2/2013

Core Number: 6

Core Location: 68 Feet South of Address 3023 CTH B Driveway

Offset: 9 Feet West of Center Line

Core Length: 5-1/2" Total

Comments: Core taken on transverse reflection crack. Good AC/AC

bond. Core broke during core extraction.



2" AC  
Overlay

3-1/4" AC

Brown, sandy,  
crushed stone base

Date: 7/2/2013

Core Number: 7

Core Location: 73 Feet South of Address 3023 CTH B Driveway

Offset: 7 Feet West of Center Line

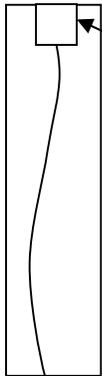
Core Length: 5-1/4" Total

Comments: Asphalt testing was performed on this core.



1-3/4" AC  
Overlay

AC/AC bond  
broke during  
core extraction



Joint Sealant

4" AC

Crushed, round, sandy,  
brown stone base

Date: 7/2/2013

Core Number: 8

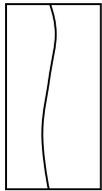
Core Location: 63 Feet North of Address 3164 CTH B Driveway

Offset: 10 Feet East of Center Line

Core Length: 5-3/4" Total

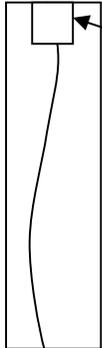
Comments: Core taken on longitudinal reflection crack. Good AC/AC

bond. Core broke during core extraction.



1-5/8" AC  
Overlay

AC/AC bond  
broke during  
core extraction



Joint Sealant  
3-7/8" AC

Crushed, round, sandy,  
brown stone base

Date: 7/2/2013

Core Number: 9

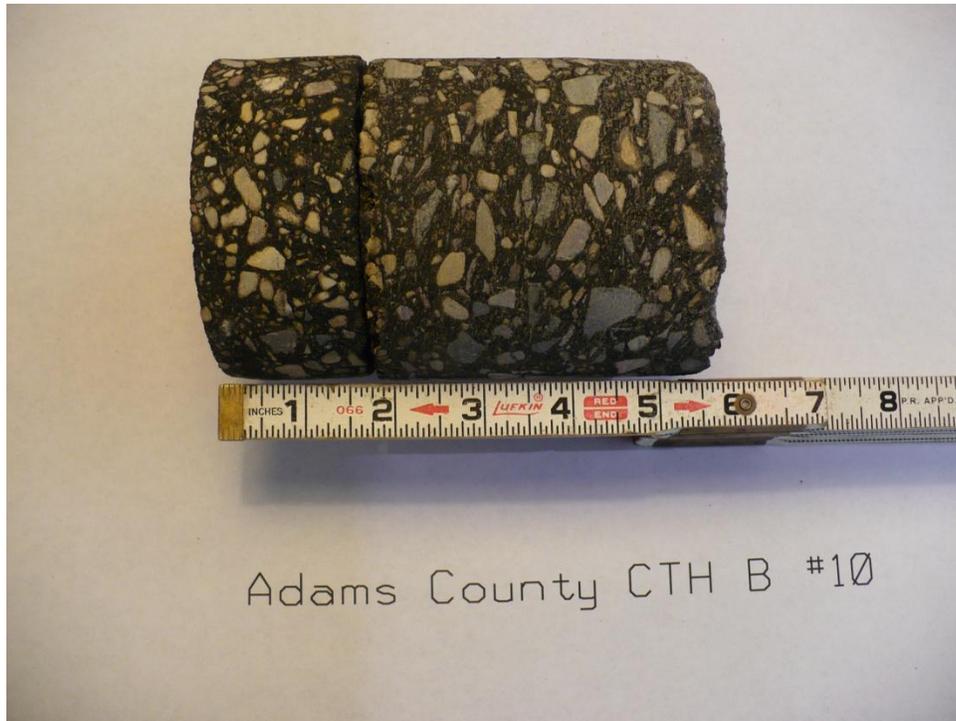
Core Location: 67 Feet North of Address 3164 CTH B Driveway

Offset: 8 Feet East of Center Line

Core Length: 5-1/2" Total

Comments: Core taken on transverse reflection crack. Good AC/AC

bond. Core broke during core extraction.



1-5/8" AC  
Overlay



AC/AC bond  
broke during  
core extraction

3-7/8" AC

Brown, sandy,  
crushed stone base

Date: 7/2/2013

Core Number: 10

Core Location: 63 Feet North of Address 3164 CTH B Driveway

Offset: 8 Feet East of Center Line

Core Length: 5-1/2" Total

Comments: Asphalt testing was performed on this core.

AC/AC bond broke during core extraction.



1-5/8" AC  
Overlay

Debond at  
AC/AC interface



Joint Sealant

1-7/8" AC

Large brown, round  
sandy stone base

Date: 7/2/2013

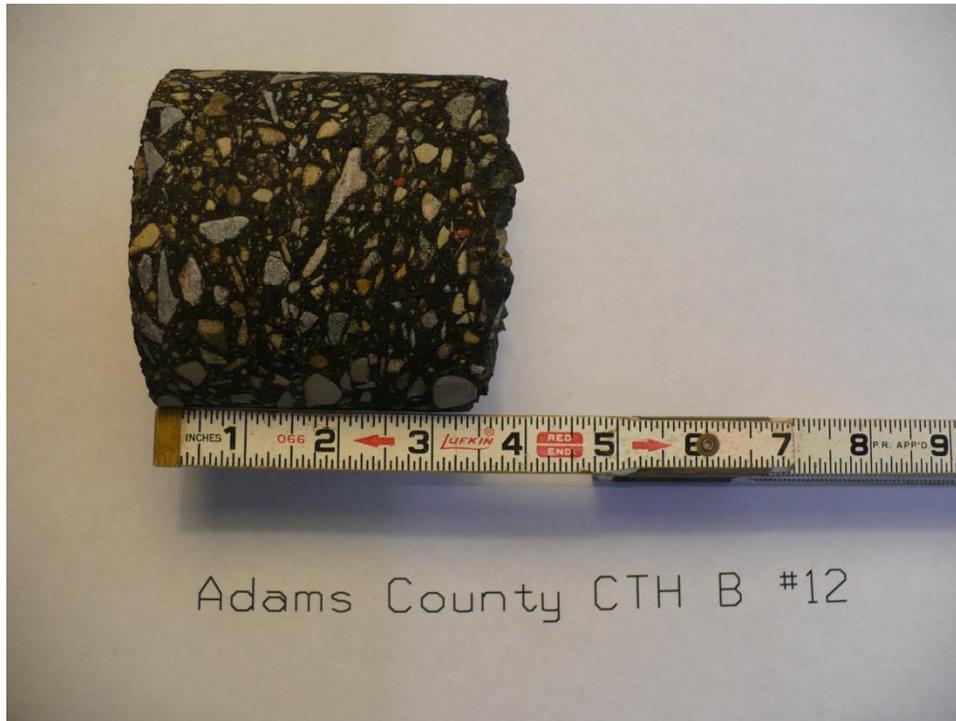
Core Number: 11

Core Location: 311 Feet North of Freedom Ave and CTH B Intersection

Offset: 6 Feet West of Center Line

Core Length: 3-1/2" Total

Comments: Core taken on transverse reflection crack. Slight debond  
at AC/AC interface.




1-5/8" AC  
Overlay

1-7/8" AC

Brown, larger round  
stone, with crushed,  
sandy base

Date: 7/2/2013

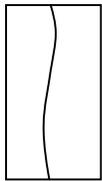
Core Number: 12

Core Location: 308 Feet North of Freedom Ave and CTH B Intersection

Offset: 6 Feet West of Center Line

Core Length: 3-1/2" Total

Comments: Asphalt testing was performed on this core.



2" AC  
Overlay

AC/AC bond  
broke during  
core extraction



Joint Sealant  
3-3/8" AC

Large brown, round  
sandy stone base

Date: 7/2/2013

Core Number: 13

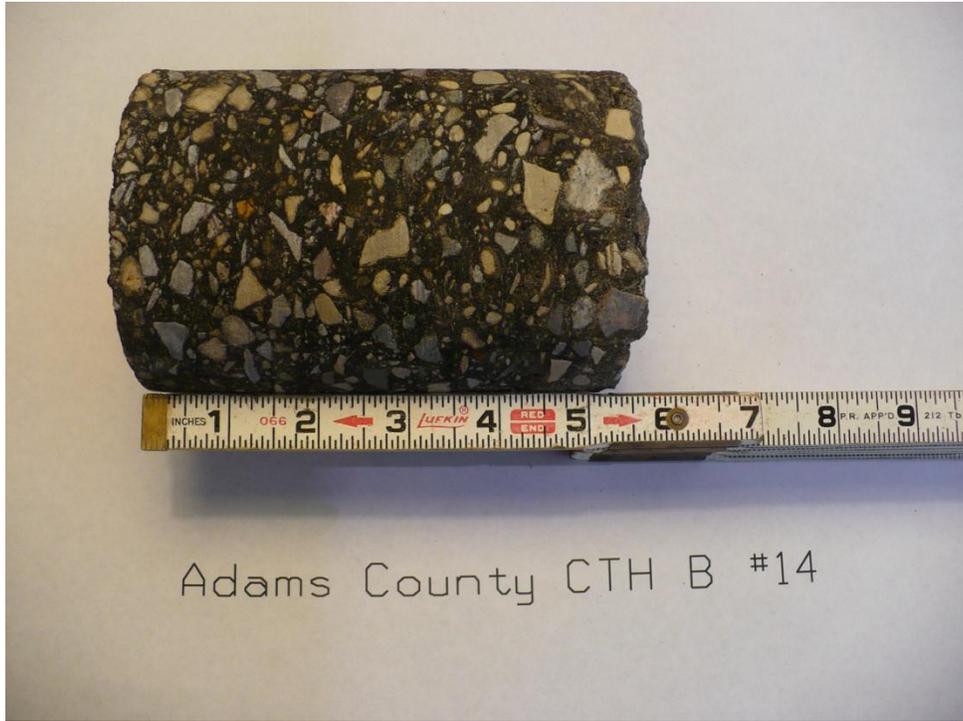
Core Location: 98 Feet South of Address 3443 CTH B Driveway

Offset: 8 Feet West of Center Line

Core Length: 5-3/8" Total

Comments: Core taken on transverse reflection crack. Good AC/AC

bond. Core broke during core extraction.



	2" AC Overlay	Date:	7/2/2013
		Core Number:	14
	3-3/8" AC	Core Location:	105 Feet South of Address 3443 CTH B Driveway
			Offset: 4 Feet West of Center Line
		Core Length:	5-3/8" Total
		Comments:	Asphalt testing was performed on this core.

Brown, larger round stone, with crushed, sandy base

# **Appendix D**

## **Core Testing Results**



Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

AECOM Project No.: 60300501

Project Name: Adams County CTH B Asphalt

Date: 8/12/2013

Bituminous Paving Mixture Analysis

Sample ID: Core #2  
Top 1-3/4" Overlay Tested

Date Sampled: -  
Date Tested: 8/8/2013

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)	Pass/Fail
1-1/2"	0.0	100.0	100.0		
1"	0.0	100.0	100.0		
3/4"	0.0	100.0	99.6		
1/2"	2.1	97.9	93.2		
3/8"	8.0	89.9	82.5		
1/4"	13.3	76.6	-		
#4	6.0	70.6	62.3		
#8	11.2	59.4	50.6		
#16	9.5	49.9	43.6		
#30	10.8	39.1	35.0		
#50	17.9	21.2	19.1		
#100	11.9	9.3	8.0		
#200	3.1	6.1	4.7		
Pan	0.6	5.5	-		

Bitumen, % by wt. of total mix: 5.4 5.1



Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

AECOM Project No.: 60300501

Project Name: Adams County CTH B Asphalt

Date: 7/18/2013

**Bituminous Paving Mixture Analysis**

Sample ID: Core #4  
Top 2" Overlay Tested

Date Sampled: -  
Date Tested: 7/15/2013

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)	Pass/Fail
1-1/2"	0.0	100.0	100.0		
1"	0.0	100.0	100.0		
3/4"	0.0	100.0	99.6		
1/2"	6.7	93.3	93.2		
3/8"	9.4	83.9	82.5		
1/4"	10.8	73.1	-		
#4	5.9	67.2	62.3		
#8	12.0	55.2	50.6		
#16	8.9	46.3	43.6		
#30	9.7	36.6	35.0		
#50	15.6	21.0	19.1		
#100	11.6	9.4	8.0		
#200	3.5	5.9	4.7		
Pan	4.8	1.1	-		

Bitumen, % by wt. of total mix: 4.7 5.1



Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

AECOM Project No.: 60300501

Project Name: Adams County CTH B Asphalt

Date: 8/12/2013

**Bituminous Paving Mixture Analysis**

Sample ID: Core #7  
Top 2" Overlay Tested

Date Sampled: -  
Date Tested: 8/8/2013

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)	Pass/Fail
1-1/2"	0.0	100.0	100.0		
1"	0.0	100.0	100.0		
3/4"	0.0	100.0	99.6		
1/2"	6.1	93.9	93.2		
3/8"	8.6	85.3	82.5		
1/4"	11.6	73.6	-		
#4	7.5	66.2	62.3		
#8	11.5	54.7	50.6		
#16	9.3	45.4	43.6		
#30	10.3	35.0	35.0		
#50	15.6	19.4	19.1		
#100	10.3	9.1	8.0		
#200	3.0	6.1	4.7		
Pan	0.6	5.4	-		

Bitumen, % by wt. of total mix: 4.7 5.1



Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

AECOM Project No.: 60300501

Project Name: Adams County CTH B Asphalt

Date: 7/18/2013

Bituminous Paving Mixture Analysis

Sample ID: Core #10  
Top 1-5/8" Overlay Tested

Date Sampled: -  
Date Tested: 7/15/2013

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)	Pass/Fail
1-1/2"	0.0	100.0	100.0		
1"	0.0	100.0	100.0		
3/4"	0.0	100.0	99.6		
1/2"	6.1	93.9	93.2		
3/8"	7.3	86.6	82.5		
1/4"	12.7	73.9	-		
#4	6.4	67.5	62.3		
#8	12.2	55.3	50.6		
#16	8.9	46.5	43.6		
#30	9.7	36.7	35.0		
#50	15.3	21.4	19.1		
#100	11.5	10.0	8.0		
#200	3.5	6.5	4.7		
Pan	5.1	1.4	-		

Bitumen, % by wt. of total mix: 4.9 5.1



**Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444**

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

**AECOM Project No.: 60300501**

**Project Name: Adams County CTH B Asphalt**

**Date: 8/14/2013**

**Bituminous Paving Mixture Analysis**

Sample ID: Core #12  
Top 2" Overlay Tested

Date Sampled: -  
Date Tested: 7/15/2013

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)		Pass/Fail
				Min	Max	
1-1/2"	0.0	100.0	-			
1"	0.0	100.0	100.0	100		Pass
3/4"	0.0	100.0	100.0	100		Pass
1/2"	3.4	96.6	96.5	90	100	Pass
3/8"	5.6	91.0	89.2		90	Pass
1/4"	10.3	80.7	-			
#4	7.3	73.4	70.6			
#8	19.2	54.3	53.5	28	58	Pass
#16	8.9	45.4	45.1			
#30	9.9	35.5	36.1			
#50	17.1	18.3	17.3			
#100	8.6	9.7	8.2			
#200	3.0	6.7	5.4	2	10	Pass
Pan	5.4	1.3	-			

Bitumen, % by wt. of total mix: 5.4 5.3 - -



**Extraction and Gradation  
of Bituminous Paving Mixture  
ASTM D2172 - ASTM D 5444**

Laboratory Services Group

750 Corporate Woods Parkway Vernon Hills, IL 60031

Phone: (847) 279-2500 Fax: (847) 279-2550

**AECOM Project No.: 60300501**  
**Project Name: Adams County CTH B Asphalt**  
**Date: 8/14/2013**

**Bituminous Paving Mixture Analysis**

**Sample ID: Core #14**  
**Top 2" Overlay Tested**

**Date Sampled: -**  
**Date Tested: 7/15/2013**

Sieve Size	Percent Retained	Percent Passing	Job Mix Formula	Job Mix Tolerance (% Passing)		Pass/Fail
				Min	Max	
1-1/2"	0.0	100.0	-			
1"	0.0	100.0	100.0	100		Pass
3/4"	0.0	100.0	100.0	100		Pass
1/2"	3.5	96.5	96.5	90	100	Pass
3/8"	5.5	91.0	89.2		90	Fail
1/4"	9.9	81.1	-			
#4	8.4	72.7	70.6			
#8	19.2	53.5	53.5	28	58	Pass
#16	8.9	44.6	45.1			
#30	9.8	34.8	36.1			
#50	17.0	17.8	17.3			
#100	8.6	9.2	8.2			
#200	3.1	6.2	5.4	2	10	Pass
Pan	5.2	1.0	-			

**Bitumen, % by wt. of total mix:** 5.6      5.3      -      -

# **Appendix E**

## **Asphalt Mix Design**



# MATHY CONSTRUCTION CO.

## GENERAL CONTRACTORS

920 10<sup>TH</sup> AVE N POST OFFICE BOX 189 ONALASKA, WI 54650  
 PHONE 608-781-4683 FAX 608-781-4694

### Report of Bituminous Mix Design

Project Name	City of Mauston - East STH 82
Date	July 11, 2012
Project #	5010-01-71
Test#	15-12-153-E1-12.5(R)
County	Juneau
Specifications	12.5mm E1 Mix
Course/Layer	



#### Aggregate Sources

	Percent	Material	Location / Source	G <sub>sb</sub>
1	15	5/8 Bit Gravel (217)	Manthey East Pit/26/35,17,7E Adams	2.715
2	20	3/4" Bit Gravel - 229	Manthey East Pit/26/35,17,7E Adams	2.700
3	35	5/8 Screened Sand (231)	Manthey East Pit/26/35,17,7E Adams	2.664
4	10	1/4" Washed Man Sand(342)	Manthey East Pit/26/35,17,7E Adams	2.713
5	20	RAP(3.7%AC)310	Manthey East Pit/26/35,17,7E Adams	2.705
6				
7				
8				
Total		1 2 3 4 5 6 7 8	Comb G <sub>sb</sub>	2.692
Virgin Agg Blend		18.75 25.00 43.75 12.50	Comb G <sub>se</sub>	2.742

#### Aggregate Gradations

Sieve		Material								Job Mix	Spec	
(Std)	(mm)	1	2	3	4	5	6	7	8		High	Low
2"	50	100.0	100.0	100.0	100.0	100.0				100.0		
1.5"	37.5	100.0	100.0	100.0	100.0	100.0				100.0		
1"	25	100.0	100.0	100.0	100.0	100.0				100.0		
3/4"	19	100.0	100.0	100.0	100.0	98.0				99.6		
1/2"	12.5	88.0	90.0	97.0	100.0	90.0				93.2		
3/8"	9.5	58.0	76.0	92.0	100.0	82.0				82.5		
#4	4.75	9.0	49.0	80.0	97.0	67.0				62.3		
#8	2.36	4.0	34.0	72.0	70.0	55.0				50.6		
#16	1.18	3.5	26.0	66.0	52.0	48.0				43.6		
#30	0.6	3.2	20.0	52.0	41.0	41.0				35.0		
#50	0.3	3.0	15.0	23.0	24.0	26.0				19.1		
#100	0.15	2.5	9.6	6.5	8.0	13.0				8.0		
#200	0.075	2.0	6.1	3.5	3.3	8.3				4.7		
Soundness		225-215	225-215	225-215	225-215							12 Max
LAR 100/500 Rev		2011	2011	2011	2011							13 & 50 Max
Crush 1 Face (%)		100.0	65.0	30.0	99.0	90.0				75.8		65 Min
Crush 2 Face (%)		100.0	64.0	26.0	98.0	88.0				74.4		
Sand Equiv.										76.0		40 Min
Flat & Elong (%)		4.0	0.4	0.3	2.5	0.4				1.7		5 Max
Fine Agg Ang										41.3		40 Min
Water Abs.		1.2	1.1	0.7	1.0	1.0				0.9		

Test Methods: D312, T176/D2419, T11/C117, T27/C136, D4791, D5821, T304/C1252, T96/C131, T209/D2041, T166/D2726



# MATHY CONSTRUCTION CO.

## GENERAL CONTRACTORS

920 10<sup>TH</sup> AVE N POST OFFICE BOX 189 ONALASKA, WI 54650  
 PHONE 608-781-4683 FAX 608-781-4694

### Report of Bituminous Mix Design

Project Name	City of Mauston - East STH 82
Date	July 11, 2012
Project #	5010-01-71
Test #	15-12-153-E1-12.5(R)
County	Juneau
Specifications	12.5mm E1 Mix
Course/Layer	
Design ESALs	500,000



#### Mix Properties

Trial #	1	2	3	4	5	6
AC Content (% by Wt)	4.5	5.0	5.5	6.0		5.1
Compaction Level	<b>Design</b>	<b>Design</b>	<b>Design</b>	<b>Design</b>		<b>Max</b>
Air Voids V <sub>a</sub> (%)	5.7	4.2	2.9	1.4		4.0
%G <sub>mm</sub> @ N <sub>i</sub>	89.3	90.9	92.0	93.4		90.9
%G <sub>mm</sub> @ N <sub>final</sub>	94.3	95.8	97.1	98.6		<b>96.4</b>
VMA (%)	14.6	14.4	14.3	14.1		14.1
VFA (%)	61.1	70.7	80.0	90.0		71.4
Density (kg/m <sup>3</sup> )	2407	2426	2442	2459		2438
G <sub>mb</sub>	2.407	2.426	2.442	2.459		2.438
G <sub>mm</sub>	2.552	2.533	2.513	2.494		<b>2.529</b>

Gyrations	
N <sub>i</sub>	7
N <sub>d</sub>	60
N <sub>m</sub>	75

Antistrip
None

#### Mix Design

Property	Value	Specification
Design P <sub>b</sub>	5.1	
Added P <sub>b</sub>	4.4	
V <sub>a</sub>	4.0	4.0
VMA	14.4	14.0 Min
VFA	72.2	65 - 78
G <sub>mm</sub>	2.529	
G <sub>mb</sub>	2.428	
P <sub>be</sub>	4.4	
P <sub>ba</sub>	0.7	
Dust/Binder Ratio	1.1	0.6 - 1.2
%G <sub>mm</sub> @ N <sub>i</sub>	91.0	< 90.5 Rec
%G <sub>mm</sub> @ N <sub>d</sub>	96.0	~ 96.0
%G <sub>mm</sub> @ N <sub>m</sub>	96.4	98.0 Max
TSR Ratio	83.9	70 Min
Rec. Mix Temp.	275-300	

Primary AC Source	AC Type	G <sub>b</sub>
MIA - La Crosse	PG 58-28	1.032
<b>Alternate Sources</b>		
MIA - La Crosse	PG 58-34	1.026
MIA - La Crosse	PG 64-22	1.038
MIA - La Crosse	PG 64-34	1.028
MIA - La Crosse	PG 70-28	1.031

% Binder Replacement

**13.5%**

Average # of Gyrations	14
------------------------	----

Since this design is material specific, the conclusions and recommendations contained within are obtained from material submitted to and subjected to observations under laboratory conditions. Adjustments may become necessary when field laboratory data is obtained from plant produced mix. No guarantee or warranty is implied or offered.

Signature *John E. Jungman* Cert. No. 361 Date: 7/11/2012

City of Mauston - East STH 82  
 Design # 15-12-153-E1-12.5(R) -- 12.5 mm Mix -- Blend 1

