ENGINEERING OPERATIONS COMMITTEE
MEETING MINUTES
JULY 2, 2009 – 9:00 A.M.
MULTI-MODAL CONFERENCE ROOM

Present:	G. Johnson	J. Friend	B. O'Brien
	B. Wieferich	C. Roberts	D. Calabrese
	C. Bleech	E. Burns	
Absent:	M. Van Port Fleet	J. W. Reincke	J. D. Culp
	T. Kratofil		
Guests:	D. Gauthier	B. Krom	M. Bott

OLD BUSINESS

1. **Approval of the March 2, 2009, Meeting Minutes – G. Johnson**

   The March 2, 2009, meeting minutes are approved with minor modifications.

NEW BUSINESS

1. **Density Testing and Inspection Manual (Previously know as the Density Control Handbook) – D. Gauthier**

   The current *Density Control Handbook* outlines the requirements that must be followed when conducting density testing and inspection for acceptance on all federal aid projects. This handbook has not been updated since 2003 and in light of recent procedural issues with density testing and reporting of results, revisions are necessary.

   The Construction and Technology Division's Geotechnical Services Section, with input from the Region Area Density Specialists, initiated the task of reviewing the current version of the *Density Control Handbook* and the developed the following revisions:

   - Added a qualification/disqualification procedure for testers
   - Changed the title to *Density Testing and Inspection Manual*
   - Added language not permitting the addition of water to the in-place test site
   - Specified maximum distance for a retest of a previous failing test
   - Clarified language for submittal of test reports
   - Added testing frequency for shoulders
   - Clarified existing language requiring establishment of new maximum density
   - Added a section for personal protective equipment
   - Eliminated all instances of dual units
   - Updated all photos, charts, tables and test reports, as necessary

   Once published, the revised manual will be distributed to all staff listed as current holders of the existing manual. The revised manual will also be accessible electronically.

ACTION: EOC approves the revisions to the current *Density Control Handbook*.

2. **Pavement Selections – B. Krom**

a. I-94 Reconstruction: CS 39022 & 39024, JN 105128

The rehabilitation alternatives considered were a hot mix asphalt (HMA) (Alternative 1 – EUAC $133,874/directional mile) and a jointed plain concrete pavement (Alternative 2 - EUAC $104,417/directional mile). A life cycle cost analysis was performed and Alternative 2 was approved based on having the lowest EUAC. The pavement design and cost analysis are as follows:

13”.....Non-Reinforced Conc Pavt, P1 Modified, w/16’ jt spacing (mainline & shldrs)
6”.....Open-Graded Drainage Course (mainline & shoulders)
Geotextile Separator (mainline & shoulders)
10”..... Sand Subbase
6” dia.....Open-Graded Underdrain System
29”.....Total Thickness

Present Value Initial Construction Cost..... $1,450,049/directional mile
Present Value Initial User Cost..... $365,807/directional mile
Present Value Maintenance Cost ..... $116,905/directional mile
Equivalent Uniform Annual Cost ..... $104,417/directional mile

b. I-75 Reconstruction: CS 73112, JN 100014

The reconstruction alternatives considered were a HMA pavement (Alternative 1 – EUAC $97,975/directional mile) and a jointed plain concrete pavement (Alternative 2 - EUAC $84,595/directional mile). A life cycle cost analysis was performed and Alternative 2was approved based on having the lowest EUAC. The pavement design and cost analysis are as follows:

10”.....Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing (mainline & shldrs)
6”.....Open-Graded Drainage Course (mainline & shoulders)
Geotextile Separator
10”..... Sand Subbase (mainline & shoulders)
6” dia.....Underdrain System
26”.....Total Thickness

Present Value Initial Construction Cost..... $1,269,741/directional mile
Present Value Initial User Cost..... $140,240/directional mile
Present Value Maintenance Cost ..... $155,873/directional mile
Equivalent Uniform Annual Cost ..... $84,595/directional mile

c. US-24 Northbound Reconstruction: CS 63052, JN 85538

The reconstruction alternatives considered were a HMA pavement (Alternative 1 – EUAC $66,117/mile) and a jointed plain concrete pavement (Alternative 2 - EUAC $65,091/directional mile). A life cycle cost analysis was performed and Alternative 2

was approved based on having the lowest EUAC. The pavement design and cost analysis are as follows:

9”..... Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing (mainline)
16”.....Open-Graded Drainage Course (mainline)
Geotextile Separator
6” dia.....Open-Graded Underdrain System
25”.....Total Thickness

Present Value Initial Construction Cost..... $997,392/mile
Present Value Initial User Cost..... $51,695/mile
Present Value Maintenance Cost $155,757/mile
Equivalent Uniform Annual Cost $65,091/mile

d. I-96 and M-43 Reconstruction: CS 19022, 23152, & 23042, JN 45639

The reconstruction alternatives considered were a HMA pavement and a jointed plain concrete pavement. Life cycle cost analyses were performed and Alternative 2 was approved for I-96, and Alternative 1 for M-43, based on having the lowest EUAC. The pavement designs and cost analyses are as follows:

I-96 Alternative 2: Reconstruct with Joint Plain Concrete Pavement
11.5”.....Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing
5”.....Stabilized Open-Graded Drainage Course
Geotextile Separator
Existing Sand Subbase (65% of Project)
11”.....New Sand Subbase (35% of Project)
6” dia.....Open-Graded Underdrain System
16.5”.....Total Thickness

Present Value Initial Construction Cost..... $1,167,170/directional mile
Present Value Initial User Cost..... $266,047/directional mile
Present Value Maintenance Cost ..... $106,597/directional mile
Equivalent Uniform Annual Cost ..... $83,188/directional mile

M-43 Alternative 1: Reconstruct with Hot Mix Asphalt Pavement
1.5”..... HMA, 5E3, Top Course (mainline)
2”.....HMA, 4E3, Leveling Course (mainline)
3.5”.....HMA, 3E3, Base Course (mainline)
6”..... Aggregate Base
18”..... Sand Subbase
6” dia.....Underdrain System
31”.....Total Section Thickness

Present Value Initial Construction Cost..... $1,060,645/mile
Present Value Initial User Cost..... $279,332/mile
Present Value Maintenance Cost $234,046/mile
Equivalent Uniform Annual Cost $77,223/mile

e. I-75 and M-84 Reconstruction: CS 09034 & 09011, JN 106344 & 48271

The reconstruction alternatives considered were a HMA pavement and a jointed plain concrete pavement. Life cycle cost analyses were performed and Alternative 2 was approved for I-75, and Alternative 1 for M-84, based on having the lowest EUAC. The pavement designs and cost analyses are as follows:

I-75 Alternative 2: Reconstruct with Joint Plain Concrete Pavement

10”.....Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing
6”.....Open-Graded Drainage Course
Geotextile Separator
10”..... Sand Subbase
6” dia.....Open-Graded Underdrain System
26”.....Total Thickness

Present Value Initial Construction Cost..... $1,232,789/directional mile
Present Value Initial User Cost..... $143,338/directional mile
Present Value Maintenance Cost ..... $155,873/directional mile
Equivalent Uniform Annual Cost ..... $82,766/directional mile

M-84 Alternative 1: Reconstruct with Hot Mix Asphalt Pavement

1.5”..... HMA, 5E3, Top Course (mainline)
2.5”.....HMA, 4E3, Leveling Course (mainline)
3.75”.....HMA, 3E3, Base Course (mainline)
6”..... Aggregate Base
18”..... Sand Subbase
6” dia..... Subbase Underdrain System
31.75”.....Total Section Thickness

Present Value Initial Construction Cost..... $837,933/mile
Present Value Initial User Cost..... $107,468/mile
Present Value Maintenance Cost $179,484/mile
Equivalent Uniform Annual Cost $55,188/mile

f. M-53 Reconstruction: CS 50011, JN 80920

The reconstruction alternatives considered were a HMA pavement (Alternative 1 – EUAC $68,116/directional mile) and a jointed plain concrete pavement (Alternative 2 - EUAC $57,179/directional mile). A life cycle cost analysis was performed and Alternative 2 was approved based on having the lowest EUAC. The pavement design and cost analysis are as follows:

9”..... Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing (mainline)
16”.....Open-Graded Drainage Course (mainline)
Geotextile Separator
6” dia.....Open-Graded Underdrain System
25”.....Total Thickness

Present Value Initial Construction Cost..... $743,866/directional mile
Present Value Initial User Cost..... $197,180/directional mile

Present Value Maintenance Cost ..... $117,342/directional mile
Equivalent Uniform Annual Cost ..... $57,179/directional mile

g. I-75 Reconstruction: CS 09034, JN 87508

The reconstruction alternatives considered were a HMA pavement (Alternative 1 – EUAC $98,882/directional mile) and a jointed plain concrete pavement (Alternative 2 - EUAC $84,509/directional mile). A life cycle cost analysis was performed and Alternative 2 was approved based on having the lowest EUAC. The pavement design and cost analysis are as follows:

10”.....Non-Reinforced Conc Pavt, P1 Modified w/14’ jt spacing (mainline & shldrs)
6”.....Open-Graded Drainage Course (mainline & shoulders)
Geotextile Separator
10”..... Sand Subbase (mainline & shoulders)
6” dia.....Open-Graded Underdrain System
26”.....Total Thickness

Present Value Initial Construction Cost..... $1,261,648/directional mile
Present Value Initial User Cost..... $146,743/directional mile
Present Value Maintenance Cost ..... $155,873/directional mile
Equivalent Uniform Annual Cost ..... $84,509/directional mile

3. **Allowance of Crushed Concrete as an Open Graded Base in an Unbound State Under Mainline – S. Palmer**

The department’s *2003 Standard Specifications for Construction* prohibits the use of open-graded drainage course (OGDC) crushed concrete when the subbase of the pavement section is graded to an engineered open-graded base edge drain system. Primary concerns were based on the transport of the leachable cementitious fines from the crushed concrete into the new edge drains, resulting in sedimentation deposits within the edgedrain that may inhibit the flow of water away from the pavement structure. The restrictions defined in the current specifications impose a negative consequence relative to allowing opportunities (on a statewide basis) for recycling of the old concrete pavement back into the new pavement structure for the majority of the department’s concrete pavement reconstruction projects.

An in-house laboratory study was conducted to quantify the risks associated with permitting this recycled material. Crushed concrete, limestone, natural gravel and blast furnace slag were selected to measure the comparative potential cumulative leachate volumes. The study focused on the following three essential issues.

- Verify leachate from unbound crushed concrete will not clog the edge drain system.
- Verify the pH of effluent is below environmental threshold for hazardous waste.
- Verify the leachate does not contain any elements of environmental concern.

Results over 12 weeks of laboratory testing indicate blast furnace slag generates almost twice as much leachate as the crushed concrete. Extrapolation of current data tends to demonstrate that the amount of leachate from blast furnace slag may potentially moderate in approximately two years. Current specifications allow the use of blast furnace slag as OGDC. Further, the pH levels for all four aggregate types evaluated for the MDOT leachate study are below the maximum threshold of 12.5, as defined for hazardous waste by the

Michigan Department of environmental Quality (MDEQ). Field evaluation of existing projects with both blast furnace slag and crushed concrete as the OGDC were evaluated. Both projects showed more fines in the edgedrain than would be found with natural aggregate OGDC. The blast furnace slag also showed corrosion of the rodent screen.

Since blast furnace slag is currently acceptable as an OGDC, it is recommended the use of crushed concrete be allowed as an OGDC in an unbound state under mainline pavement.

ACTION: Approve the recommendation to use crushed concrete as an OGDC in an unbound state under mainline pavement, effective with the September 2009 letting. In addition, the following actions will be taken:

1. Revise current special provisions as needed to allow the use of crushed concrete.
2. For projects let prior to September 2009**,** the TSC delivery engineer shall send all requests to change to the new specification to Steve Palmer, Pavement Operations Engineer, at the Construction and Technology Division. Any approval to change the material will require an appropriate cost adjustment. The Construction and Technology Division will develop a Construction Advisory to explain the procedures and requirements.
3. Extend the laboratory study to 36 weeks to further evaluate the leachate characteristics of the crushed concrete and the blast furnace slag.
4. Evaluate alternative rodent screens to minimize the amount of leachate build up behind the rodent screens, as well as alternative materials that may be more resistant to corrosive action.

(Signed Copy on File at C&T)
Brenda J. O'Brien, Secretary
Engineering Operations Committee

BJO:kar

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