ASPHALT RUBBER
CEMENT CONCRETE
WEBSTER COUNTY

CONSTRUCTION REPORT
IOWA DEPARTMENT OF TRANSPORTATION
PROJECT HR-555

FEBRUARY 1993

Highway Division

Iowa Department of Transportation
Construction Report
for
Iowa Department of Transportation
Project HR-555

Asphalt Rubber Cement Concrete
Webster County

by
Chris Anderson
515-239-1382
Office of Materials
Highway Division
Iowa Department of Transportation
Ames, Iowa 50010

February 1993
Discarded tires have become a major disposal problem in the U.S. Different techniques of recycling these discarded tires have been tried. The state of Iowa is currently evaluating the use of discarded tires ground into crumb rubber and blending it with asphalt to make asphalt rubber cement (ARC). This was the sixth project this process has been used in. This project is located on US 169 from the east junction of IA 175 west and north to US 20.

Only the binder course was placed this year with the surface course to be let at a later date. There are four test sections, two sections with conventional mixtures and two with ARC mixtures.
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**DISCLAIMER**

The contents of this report reflect the views of the author and do not necessarily reflect the official views of the Iowa Department of Transportation. This report does not constitute any standard, specification or regulation.
INTRODUCTION

Recycling discarded tires into asphalt rubber cement (ARC) is currently being researched by the Iowa DOT.

The process used in this project involves blending the crumb rubber with AC-5 before mixing it with the aggregates.

The Iowa DOT currently has six projects completed using ARC, which they are evaluating.

This project is located on US 169 from the east junction of IA 175 west and north to US 20. Only the binder course was completed on this project. There will be reconstruction on portions of the roadway, then the entire project will be overlaid at a later date. The project contains two test sections of ARC and two control sections. The control sections were placed on August 13, 1992 and the ARC test sections were placed on August 24, 1992.

OBJECTIVE

The objective of this project is to compare the cost and performance of ARC to conventional asphalt cement concrete.

CONTRACTOR

Mathy Construction Company of Onalaska, Wisconsin was the contractor on this project. Rouse Rubber Products of Vicksburg,
Mississippi furnished the reactor blender and the fine crumb rubber for the project.

**PROJECT LOCATION**

The project is located on US 169 from the east junction of IA 175 west and north to US 20. The test sections are located in Table I.

<table>
<thead>
<tr>
<th>Table I</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

**PRECONSTRUCTION SURVEY**

The original roadway was a 24 ft. wide 7 in. thick portland cement concrete (PCC) pavement built in 1930 and overlaid with 3 in. of asphalt cement concrete (ACC) in 1960. The 1991 traffic volume was 2550 VPD with 12% trucks.

A crack and patch survey was conducted on the research sections before construction began. The Road Rater was used to test the structural rating of the sections prior to construction. Portions of the test sections had been milled. The roadway had a large number of reflective cracks and was showing signs of distress.
MATERIALS

The ground tire rubber provided by Rouse Rubber Products of Vicksburg, Mississippi was a GF-50 rubber. The course aggregate was furnished by Martin-Marietta, Fort Dodge Mine, Webster County Iowa. The crushed limestone manufactured sand was produced by Martin-Marietta, Hodges, Humboldt County Iowa and the natural sand was produced by Northwest Limestone, Yates, Webster County Iowa. The AC-5 used in the asphalt rubber cement (ARC) mixture and the AC-10 used in the conventional mixture was supplied by Bituminous Materials of Algona, Iowa.

MIX DESIGN

Low lab voids were a problem with both the conventional mixtures and the ARC mixtures. The conventional mixture was changed twice and a new mix design was implemented for the last two days of production. Even with a new mix design, including an aggregate interchange and a reduced asphalt liquid content, the lab voids still remained below 3%. The ARC mixture had low lab voids at 1.5% the first day so ARC content was reduced from 6.5% to 6.1% to help increase the lab voids. This did increase the lab voids to 3.6%. The asphalt content on the conventional mix started out at 5.1% and was lowered to 4.9%.

In the ARC mixture 15% crumb rubber was used. This amounted to 1% of the asphalt concrete mixture. All mix designs are shown in Appendix B.
PLANT OPERATION

This was the first time a drum plant had been used for producing the ARC mixture. This worked satisfactorily with approximately 250 ton per hour being produced. Normally, this Bituma Drum Plant has a production rate of 350 ton per hour producing conventional mixtures. Past production of the ARC using the Rouse Reactor was normally 150 ton per hour. This was mainly due to the fact that maintaining high enough temperatures for adequate reaction to take place was a problem which caused reaction to take longer. Between 1991 and 1992, Rouse Rubber added an auxiliary heater to the reaction unit which increased production. The heater increased the temperature 50°F from what it was coming out of the tanker up to 390°-400°F. It was pumped out of the reactor-blender at a rate of 75 gal. per minute at a stabilized temperature of 350°F.

PAVING OPERATION

There were no construction problems with the conventional mix and segregation was minimal.

The ARC mix seemed to handle well but the mix appeared rather dry. The appearance seemed to improve after the first 1500 ft. There was a slight problem with tearing of the mat with the ARC mixture when the finish roller ran over it. Mathy backed the finish roller off some which helped reduce the problem. This same problem had also occurred on the ARC project in Muscatine
County Iowa. With the Muscatine project and this project, the tearing was not apparent the next day. The temperature of the mat behind the paver was between 275°F and 300°F with the conventional mixture and about 290°F with the ARC.

Mathy used a Blaw Knox PF-180H Paver and Dynapac vibratory roller with a steel finish roller on this project.

CONSTRUCTION TESTING
A sample of the GF-50 rubber was taken for gradation testing. The rubber and AC-5 were sampled for viscosity testing. Samples were also obtained for creep and resilient modulus testing. All lab results are given in Appendix B.

Road Rater testing was completed prior to project completion. These results are in Appendix C.

COST COMPARISON
A major difference between conventional mixtures and the ARC mixtures is the cost. On this project the asphalt cement was bid at $84.00 per ton while the asphalt rubber cement was bid at $190.00 per ton which is 126% higher. The cost of the conventional asphalt cement concrete and the ARC concrete are shown in Table II. The ARC mixture cost 40% more than the conventional mixtures.
Table II

<table>
<thead>
<tr>
<th></th>
<th>Conventional Binder</th>
<th>ARC Binder</th>
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</thead>
<tbody>
<tr>
<td>Mix $4.9%$ AC-10</td>
<td>$14.53$</td>
<td>$14.53$</td>
</tr>
<tr>
<td>Mix $6.1%$ ARC</td>
<td>$4.12$</td>
<td>$11.59$</td>
</tr>
<tr>
<td>Total</td>
<td>$18.65$ per ton</td>
<td>$26.12$ per ton</td>
</tr>
</tbody>
</table>

EVALUATION

Standard project testing of the mix was completed. Creep and resilient modulus tests has also been completed.

The evaluation will also consist of Road Rater testing, friction testing, and crack and rut surveys.

The project will be evaluated for five years. After five years, hopefully a conclusion can be made to determine if using asphalt rubber binders will:

1. Improve performance.
2. Extend the life of the roadway.
3. Be of enough value in an environmental standpoint to compensate for its higher cost.

CONCLUSIONS

From the project the following conclusions can be made:

1. The ARC mixture can be constructed with little or no difference from that of a conventional mixture.

2. The ARC pavement appears to be in as good a condition as the conventional pavement. There is a slight difference in color.
Appendix A
Special Provisions and Proposal
Iowa Department of Transportation

SPECIAL PROVISIONS for
ASPHALT RUBBER CEMENT (ARC) CONCRETE

NHS-169-6(43)—19-94 Webster County

April 28, 1992

THE STANDARD SPECIFICATIONS, SERIES OF 1984, ARE AMENDED BY THE FOLLOWING MODIFICATIONS. THESE ARE SPECIAL PROVISIONS, WHICH SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

1069.01 DESCRIPTION.

The asphalt rubber cement (ARC) concrete mix composition will include the incorporation of ARC in the mixture, using the aggregates selected by the Contractor.

The Contractor shall have a representative of the rubber supplier available on the project site during production of the asphalt rubber cement concrete mixture.

1069.02 GENERAL REQUIREMENTS.

The ARC concrete mixes shall conform to the requirements of the standard specifications for the standard asphalt cement concrete mixes as specified in the plans. The Standard Specifications are modified as follows:

A. Mineral Aggregate for the ARC Concrete Mixes.

Mineral aggregate requirements shall meet type "A" quality and be in accordance with the plans and the standard specifications except the gradations for the concrete mixtures shall meet the following:

<table>
<thead>
<tr>
<th>Sieve size</th>
<th>Percent passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>98-100</td>
</tr>
<tr>
<td>1/2</td>
<td>76-92</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>60-83</td>
</tr>
<tr>
<td>#4</td>
<td>40-62</td>
</tr>
<tr>
<td>#8</td>
<td>26-45</td>
</tr>
<tr>
<td>#30</td>
<td>11-24</td>
</tr>
<tr>
<td>#200</td>
<td>3-7</td>
</tr>
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</table>
B. Asphalt Rubber Cement.

The asphalt rubber cement shall be a uniform reacted blend of compatible paving grade asphalt cement, ground reclaimed vulcanized rubber and extender oil if required. The asphalt rubber cement shall meet the physical parameters listed below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Viscosity, 347°F., Spindle 3, 12 RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cps (ASTM D2669 Brookfield)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration, 77°F., 100 g, 5 sec.: 1/10 mm.</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>(ASTM D5)</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Penetration, 39.2°F., 200 g, 60 sec.: 1/10 mm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ASTM D5)</td>
<td>100</td>
<td></td>
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<tr>
<td>Softening Point: 0°F., (ASTM D36)</td>
<td></td>
<td>120</td>
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<tr>
<td>Resilience, 77° F., % (ASTM D3407)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Ductility, 39.2° F., 1 cpm: cm. (ASTM D113)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TFOT Residue, (ASTM D1754) Penetration Retention, 39.2° F.: %</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Ductility Retention, 39.2° F.: %</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

C. Asphalt Extender Oil.

An asphalt extender oil may be added, if necessary, to meet the requirements of asphalt rubber cement. Extender oil shall be a resinous, high flash point, aromatic hydrocarbon meeting the following test requirements.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, SSU, at 100 degrees F (ASTM D88)</td>
<td>2500 min.</td>
</tr>
<tr>
<td>Flash Point, COC, degrees F (ASTM D92)</td>
<td>390 min.</td>
</tr>
<tr>
<td>Molecular Analysis (ASTM D 2007):</td>
<td></td>
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<tr>
<td>Asphaltenes, Wt. %</td>
<td>0.1 min.</td>
</tr>
<tr>
<td>Aromatics, Wt. %</td>
<td>55.0 min.</td>
</tr>
</tbody>
</table>

D. Equipment.

All equipment shall conform to the standard specifications unless noted otherwise in this Special Provision.

1069.03 GROUND RECLAIMED VULCANIZED RUBBER.

A. General.

The ground rubber shall be produced from the processing automobile and/or truck tires. The rubber shall be substantially free from contaminants including fabric, metal, mineral, and the non-rubber substances. The rubber shall be sufficiently dry to be free flowing and not produce a foaming problem when added to hot asphalt cement. Up to 4% by weight of talc or other appropriate blocking agent can be added to reduce agglomeration of the rubber particles.
A.1 Physical Requirements.

Gradation and Particle Length: When tested in accordance with ASTM C-136 using a 50 gram sample, the resulting rubber gradation shall meet the following gradation limits.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>#10</td>
<td>100</td>
</tr>
<tr>
<td>#30</td>
<td>26-100</td>
</tr>
<tr>
<td>Max. Particle Length</td>
<td>3/16&quot;</td>
</tr>
</tbody>
</table>

A.2 Fiber Content.

The fiber content of the ground rubber shall be less than 0.3% by weight.

A.3 Moisture Content.

The moisture content of the ground rubber shall be less than 0.75% by weight.

A.4 Mineral Contaminants

The mineral contaminant amount of the ground rubber shall not be greater than 0.25% by weight as determined after water separating a 50 gram rubber sample in a 1 liter glass beaker filled with water.

A.5 Metal Contaminants

The rubber shall contain no visible metal particles as indicated by thorough stirring of a 50 gm. sample with a magnet.

B. Packaging

The ground rubber shall be supplied in moisture resistant packaging such as either disposable bags or other appropriate containers. Bags shall be palletized into units for shipment and glue shall be placed between layers of bags to increase the unit stability during shipment. Palletized units containing bags shall be wrapped with ultra-violet resistant stretch wrap. The maximum allowable tolerance per bag will be ± 2 lbs. for bags weighing 100 lbs or less.

C. Labeling

Each container or bag of ground rubber shall be labeled with the manufacturer designation as to the size and type, the nominal rubber weight designation with tolerance, and the manufacturer lot designation. Palletized units shall contain a label which indicates the manufacturer and production lot number designations, rubber type, and net pallet weight.

D. Certification

The supplier shall ship with the rubber, certificates of compliance which certify that all requirements of these specifications are complied with for each production lot number of shipment.
1069.04 ASPHALT RUBBER CEMENT BLEND DESIGN

The asphalt cement shall be grade AC-5 unless otherwise recommended by the asphalt rubber supplier and approved by the Engineer. The asphalt rubber cement design shall be performed by the asphalt rubber supplier. The proportion of ground rubber shall be between 15 and 20 percent by weight of the total mixture of the asphalt rubber cement.

1069.05 ASPHALT RUBBER CEMENT (ARC) MIXING AND PRODUCTION EQUIPMENT

Unless otherwise authorized by the Engineer, all equipment utilized in production and proportioning of the ARC shall be described as follows:

A. An asphalt heating tank with a hot oil heat transfer system or retort heating system capable of heating asphalt cement to the necessary temperature for blending with the ground rubber.

B. An ARC mechanical blender with a two stage continuous mixing process capable of producing a homogeneous mixture of asphalt cement and ground rubber, at the mix design specified ratios, as recommended by the supplier of the ground rubber. This unit shall be equipped with a ground rubber feed system capable of supplying the asphalt cement feed system as not to interrupt the continuity of the blending process. A separate asphalt cement feed pump and finished product pump are required. This unit shall have both an asphalt cement totalizing meter in gallons and a flow rate meter in gallons per minute.

C. An ARC storage tank equipped with a heating system to maintain the proper temperature for pumping and adding of the ARC to the aggregate and an internal mixing unit if necessary for uniformity within the storage vessel capable of maintaining a proper mixture of asphalt cement and ground rubber.

D. An ARC supply system equipped with a pump and metering device capable of adding the ARC by volume to the aggregate at the percentage required by the job-mix formula.

An interlock of the ARC and aggregate feed systems will not be required. The Contractor shall accurately proportion the ARC into the mixture.

1069.06 ASPHALT RUBBER CEMENT MIXING, REACTION AND TRANSFER PROCEDURE

A. Asphalt Cement Temperature.

The temperature of the asphalt cement shall be between 300° and 425° F. at the addition of the ground rubber.

B. Blending and Reacting.

The asphalt cement and ground rubber shall be combined and mixed together in a blender unit, pumped into the agitated storage tank, and then reacted for a sufficient time to meet the properties contained in Section 1069.02B of this Special Provision.
C. Transfer.

The reacted asphalt rubber cement shall be metered into the mixing chamber of the hot mix plant at the percentage required by the job mix formula.

D. Delays.

When a delay occurs in asphalt rubber cement use after its full reaction, the asphalt rubber shall be allowed to cool. The asphalt rubber cement shall be reheated slowly just prior to use to a temperature as recommended by the rubber supplier, and shall also be thoroughly mixed before pumping and metering into the hot mix plant for combination with the aggregate. The viscosity of the asphalt rubber cement shall be checked by the asphalt rubber supplier. If the viscosity is out of the range specified in Section 1069.02B of this special provision, the asphalt rubber cement shall be adjusted by the addition of either the asphalt cement or ground rubber as required to produce a material with the appropriate viscosity.

1069.07 COMPACTED REQUIREMENT.

The Asphalt Rubber Cement concrete shall be compacted to 95% of laboratory density.

1069.08 COMPACTED EQUIPMENT.

A minimum of two rollers meeting Article 2001.05, Paragraph B or Paragraph F, of the Standard Specifications shall be furnished. Compaction with pneumatic tired rollers will not be allowed.

1069.09 METHOD OF MEASUREMENT AND BASIS OF PAYMENT OF ASPHALT RUBBER CEMENT (ARC) CONCRETE.

The Asphalt Rubber Cement Concrete Mix will be measured as per the standard specification, and be paid for in tons. Asphalt Rubber Cement for use in the Asphalt Rubber Cement Concrete Mix will be measured as per the standard specifications and be paid for in tons.
ESTIMATING PROPOSAL

TO THE IOWA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

Bidder hereby certifies that no other principal is involved in or has an interest in this proposal; that the bidder has thoroughly examined the plans and specifications and this contract form and is aware of the special provisions contained herein; that the bidder has examined the site of the work and understands that the quantities of work required by the plans and specifications are approximate only and are subject to increases and decreases; that the bidder understands that all quantities of work actually required must be performed and that payment therefore shall be at the prices stipulated herein; that the bidder proposes to timely furnish the specified materials in the quantities required and to furnish the masonry, equipment, labor and expertise necessary to competently complete this project by the time specified; that no state or county official or employee has a direct or indirect interest in the contract which would cause violation of Section 314.2 Code of Iowa; that the bidder has made no agreement with any supplier of motor fuel or special fuel which will result in violation of Section 324.17181 Code of Iowa.

If this bid is accepted, Bidder agrees: to perform all "extra work" required to complete the project at unit prices or lump sums to be agreed upon prior to commencement of such "extra work" or if prior agreement cannot be reached, to perform the work on a "force-account basis" as added in the specifications; to execute the formal contract within thirty days of the date of approval for award or to forfeit the proposal guaranty and any furnished herewith; to begin work in accordance with the contract documents and to either complete the work within the contract period or liquidated damages, which shall accrue at the daily rate specified below, for each additional working day the work remains uncompleted; and to furnish a performance bond in an amount equal to the contract award as security for the full and complete performance of the contract in accordance with the plans and specifications.

<table>
<thead>
<tr>
<th>Amount of Proposal Guaranty</th>
<th>Construction Period</th>
<th>Working Days</th>
<th>Liquidated Damages Per Day</th>
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</thead>
<tbody>
<tr>
<td>$50,000.00</td>
<td>SPECIFIED COMPLETION DATE 10/23/92</td>
<td>45</td>
<td>$600.00</td>
</tr>
</tbody>
</table>

See herewith a certified check, credit union share draft, Cashier's check, bank draft on a solvent bank or a bid bond in the penal sum shown above as security for the full and complete performance of this contract. It is understood by bidder that the said guaranty document shall be retained by the Iowa Department of Transportation as a forfeiture in the event the formal contract is not executed or performance bond is not furnished if the award is to the undersigned.

In the event of statutory authority preference will be given to products and provisions grown and coal produced within the state of Iowa where available.

Observation: 5.0%

Formation: NONE APPLICABLE

Wages: MINIMUM WAGES IN EFFECT

Date of Letting: APRIL 28, 1992
Time: 9:00 A.M.
## SCHEDULE OF PRICES

**Proposal ID No.** 920547  
**Contractor's No.**  
**County** WEBSTER  
**Project No.** NHS-169-6(43)--19-94  
**Type of Work** ASPH CEMENT CONC RESURFACING  

**Bid Order No.** 95

---

### BID ALL

**ITEMS IN THIS SECTION**

<table>
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<tr>
<th>Line No.</th>
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<th>Item Description</th>
<th>Item Quantity and Units</th>
<th>Unit Price</th>
<th>Amount</th>
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<td><strong>SECTION 001</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0010</td>
<td>ASPHALT CEMENT CONCRETE, TYPE A BINDER COURSE, MIXT. SIZE 3/4 IN.</td>
<td>29654.000 TONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0020</td>
<td>0400175</td>
<td>ASPH.CEM.CONC., TYPE A BINDER, 3/4 IN. (ASPHALT RUBBER CEMENT (A.R.C.) CONCRETE)</td>
<td>8371.000 TONS</td>
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<td>PRIMER OR TACK-COAT BITUEN</td>
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<td>0070</td>
<td>PATCHES, FULL-DEPTH, BY COUNT</td>
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<td>0080</td>
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<td>38.000 TONS</td>
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<td>0100</td>
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<td>SAMPLES</td>
<td>1.000 LUMP SUM</td>
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</tbody>
</table>

---

**Note:** Unit bids must be typed or shown in ink or the bid will be rejected.
## SCHEDULE OF PRICES

Proposal: D No. 920547  
COST CNTR: 611000  
OBJ NUM: 892  
Bid Order No. 95  
County: WEBSTER  
Page No. 2  

Project No. NHS-169-6(43)--19-94  
Type of Work: ASPH CEMENT CONC RESURFACING

**UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.**

<table>
<thead>
<tr>
<th>Line No.</th>
<th>Item No.</th>
<th>Item on which bid is based.</th>
<th>Item Quantity and Units</th>
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**SUBTOTAL FOR SECTION 001**

**BID TOTAL**
PROPOSAL REQUIREMENTS
SPECIAL PROVISIONS TEXT

County WEBSTER

Type of Work ASPH CEMENT CONC RESURFACING

---

FHWA-1273 AUGUST 1, 1989

FEDERAL AID CONSTRUCTION CONTRACTS WAGE DECISION NO. IA91-1 DATED FEBRUARY 22, 1991 AND THE FOLLOWING MODIFICATIONS APPLY TO THIS PROJECT.

MODIFICATION RECORD NO. PUBLICATION DATE

1 MARCH 8, 1991
2 DECEMBER 13, 1991
3 JANUARY 10, 1992

*** ADDITIONAL REQUIREMENT ***

THE PRIME CONTRACTOR SHALL SUBMIT CERTIFIED PAYROLLS FOR ITSELF AND EACH APPROVED SUBCONTRACTOR WEEKLY TO THE PROJECT ENGINEER. THE CONTRACTOR MAY USE THE IOWA D.O.T. CERTIFIED PAYROLL FORM OR OTHER APPROVED FORM.

THE CONTRACTOR SHALL LIST THE CRAFT FOR EACH EMPLOYEE COVERED BY THE DAVIS-BACON ACT. THE PRIME CONTRACTOR SHALL SIGN EACH OF THE SUBCONTRACTOR'S PAYROLLS TO ACKNOWLEDGE THE SUBMITTAL OF THE CERTIFIED PAYROLL.

SP-1069 APRIL 28, 1992

SPECIAL PROVISIONS FOR ASPHALT RUBBER CEMENT (ARC) CONCRETE

*** INTENDED FOR WEBSTER COUNTY ASPHALT CEMENT CONCRETE RESURFACING PROJECT NHS-169-6(43)--19-94 ***

SS-962 JULY 31, 1984
SUPPLEMENTAL SPECIFICATIONS FOR ON THE JOB TRAINING (EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES)

SS-964 JULY 31, 1984
SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES (THIS INCLUDES EMPLOYMENT GOALS FOR MINORITIES AND WOMEN IN CONSTRUCTION.)

SS-1057 FEBRUARY 23, 1988
SUPPLEMENTAL SPECIFICATIONS FOR CERTIFIED PLANT INSPECTION.

SS-1062 AUGUST 1, 1988
SUPPLEMENTAL SPECIFICATIONS FOR MOBILIZATION

SS-1089 DECEMBER 5, 1989
SUPPLEMENTAL SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE PROPORTIONS

SS-5003 MAY 1, 1990
SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITIES (DISADVANTAGED BUSINESS ENTERPRISE) FEDERAL AID PROJECTS
SS-5014 DECEMBER 11, 1990
SUPPLEMENTAL SPECIFICATIONS FOR DELIVERY OF SAMPLES

SS-5025 MARCH 26, 1991
SUPPLEMENTAL SPECIFICATIONS FOR TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION, MAINTENANCE, UTILITY AND EMERGENCY OPERATIONS.

SS-5035 AUGUST 27, 1991
SUPPLEMENTAL SPECIFICATIONS FOR FULL DEPTH PATCHES

SS-5036 AUGUST 27, 1991
SUPPLEMENTAL SPECIFICATIONS FOR PARTIAL-DEPTH PATCHES AND SURFACE PATCHES (INCLUDING CLEANING AND PREPARATION OF BASE)

SS-5040 JANUARY 7, 1992
GENERAL SUPPLEMENTAL SPECIFICATION FOR CONSTRUCTION PROJECTS

005 02
*** REVISION TO SS-5035 ***
DELETE THE FOURTH SENTENCE OF PARAGRAPH 2.C ON PAGE 17 OF SS-5035, 'SUPPLEMENTAL SPECIFICATION FOR FULL DEPTH PATCHES', AND REPLACE WITH THE FOLLOWING TWO NEW SENTENCES IN LIEU THEREOF.

"HOWEVER, NO CORRECTIVE ACTION IS REQUIRED IF THE NEW PROFILOMETER INDEX IS EQUAL TO OR LESS THAN 12 INCHES PER MILE. ALSO, IF THE NEW PROFILOMETER INDEX IS GREATER THAN 12 INCHES PER MILE BUT NOT GREATER THAN 30 INCHES PER MILE, NO CORRECTIVE ACTION IS REQUIRED IF THE DIFFERENCE BETWEEN THE NEW PROFILOMETER INDEX AND THE ABI IS EQUAL TO OR LESS THAN 2 INCHES PER MILE."

005 22
*** REVISION TO SS-5003 ***
IN SS-5003, 'SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITIES (DISADVANTAGED BUSINESS ENTERPRISE) FEDERAL AID PROJECTS'. UNDER SECTION 5003.06, REPLACE SUBSECTION B.3. ('TRANSPORTATION OR DELIVERY SERVICES') WITH THE FOLLOWING:

3. TRANSPORTATION OR DELIVERY SERVICES

IF A DBE TRUCKING COMPANY PICKS UP A PRODUCT FROM A MANUFACTURER OR REGULAR DEALER AND DELIVERS THE PRODUCT TO THE CONTRACTOR, THE COMMERCIALLY USEFUL FUNCTION PERFORMED IS NOT THAT OF A SUPPLIER BUT THAT OF A TRANSPORTER OF GOODS. UNLESS THE DBE COMPANY IS ITSELF THE MANUFACTURER OR A REGULAR DEALER IN THE PRODUCT, CREDIT ONLY WILL BE ALLOWED FOR THE COST OF THE TRANSPORTATION SERVICE. FOR TRANSPORTATION OF MATERIALS BY TRUCK TO BE USED TOWARD MEETING THE DBE GOAL, THE FOLLOWING SHALL APPLY:

A) THE DBE MUST BE RESPONSIBLE FOR MANAGEMENT AND SUPERVISION OF
THE ENTIRE TRUCKING OPERATION THAT IS TO COUNT TOWARDS THE GOAL. THE DBE SHALL MAINTAIN STRICT RECORDS TO VERIFY THE AMOUNT OF HAULING DONE BY EACH TRUCKER. THESE RECORDS SHALL BE AVAILABLE TO THE PROJECT ENGINEER, UPON REQUEST. ALL PAYMENTS FOR TRUCKING THAT IS TO COUNT TOWARDS THE DBE COMMITMENT SHALL BE MADE BY THE PRIME CONTRACTOR TO THE DBE FIRM SHOWN ON FORM 102115.

B) THE OFFICE OF CONTRACTS OF THE IOWA DEPARTMENT OF TRANSPORTATION WILL MAINTAIN A TRUCK ROSTER FOR EACH DBE THAT PERFORMS TRUCKING. EACH TRUCK ON THE TRUCK ROSTER SHALL BE EITHER OWNED BY THE DBE OR CONTROLLED BY THE DBE UNDER A LEASE. TRUCKS WHICH ARE LEASED SHALL BE FROM A FIRM THAT IS IN THE COMMERCIAL LEASING BUSINESS. THE OWNERS OF THE COMMERCIAL LEASING BUSINESS CAN NOT BE HEAVY-HIGHWAY CONTRACTORS.

C) TO MEET THE DBE GOAL, THE FOLLOWING TRUCKS MAY BE USED:

1. TRUCKS LISTED ON THE TRUCK ROSTER UNDER THE DBE TRUCKING FIRM THAT IS SHOWN ON FORM 102115. AT LEAST ONE OF THESE TRUCKS SHALL BE HAULING ON THE PROJECT AT ALL TIMES.

2. TRUCKS ON THE DBE TRUCK ROSTER LISTED UNDER ANOTHER DBE. THERE IS NO LIMITATION TO THE NUMBER OF THESE TRUCKS THAT CAN BE USED.

3. NON-DBE TRUCKS OWNED BY AN INDEPENDENT OPERATOR, OR AN OWNER/OPERATOR. THE NUMBER OF THESE TRUCKS IS LIMITED TO THE NUMBER OF TRUCKS LISTED, UNDER 3.C)1. ABOVE, THAT ARE ON THE JOB. TRUCKS OWNED BY CONTRACTORS PREQUALIFIED TO BID AS PRIMES SHALL NOT BE CONSIDERED INDEPENDENT OPERATORS.

D) THE DBE TRUCKER SHALL NOTIFY THE PROJECT ENGINEER OF THE TRUCKS HAULING ON THE PROJECT AT LEAST 24 HOURS PRIOR TO THEIR USE. FOR AN INDEPENDENT OR OWNER/OPERATOR TRUCK THE FOLLOWING SHALL BE PROVIDED:

- OWNER'S NAME
- LICENSE PLATE NUMBER
- TRUCK IDENTIFICATION NUMBER (VIN NUMBER)

THESE TRUCKS ARE NOT TO BE CONSIDERED LEASED TRUCKS.

E) WHERE DAVIS/BACON WAGE REQUIREMENTS APPLY, THE DBE TRUCKING COMPANY SHOWN OF FORM 102115 SHALL BE RESPONSIBLE FOR COLLECTING AND SUBMITTING CERTIFIED PAYROLLS FOR ALL DRIVERS. OWNER/OPERATORS SHALL BE LISTED ON THE CERTIFIED PAYROLLS AS OWNER/OPERATORS.

005 23

*** REVISIONS TO GENERAL SUPPLEMENTAL SPECIFICATIONS SS-5040 ***

THE FOLLOWING REVISIONS SHALL APPLY TO SECTIONS 1105, 2214 AND 2303 OF THE IOWA D.O.T. STANDARD SPECIFICATIONS.

SECTION 1105, CONTROL OF WORK.

DELETE THE FIRST SENTENCE OF THE SECOND INDENTED PARAGRAPH IN ARTICLE 1105.14 (AS REVISED IN SS-5040) AND REPLACE IT WITH THE FOLLOWING NEW SENTENCE.

WHEN TEMPORARY PRIMARY HAUL ROADS ARE REQUIRED, THE CONTRACTOR SHALL SUBMIT SUGGESTED HAUL ROUTE OR ROUTES TO THE DEPARTMENT WITHIN 21 CALENDAR DAYS AFTER THE APPROVAL OF AWARD.

SECTION 2214, PAVEMENT SCARIFICATION.

DELETE THE SECOND SENTENCE OF THE FIRST PARAGRAPH OF ARTICLE 2214.07,
PARAGRAPH 'A' (AS REVISED IN SS-5040).
DELETE THE SECOND PARAGRAPH OF ARTICLE 2214.07, PARAGRAPH 'A' (AS REVISED IN SS-5040) AND REPLACE IT WITH THE FOLLOWING NEW PARAGRAPH.

WHEN SCARIFICATION INVOLVES REMOVAL OF A SMALL QUANTITY OF ASPHALTIC MATERIAL, THE CONTRACTOR WILL BE PAID THE CONTRACT PRICE PER SQUARE YARD FOR THE AREA OF SCARIFICATION COMPLETED. THIS SALVAGED MATERIAL SHALL BE INCORPORATED IN THE PROJECT OR STOCKPILED, AS DIRECTED BY THE CONTRACT DOCUMENTS.

DELETE PARAGRAPH 'B' OF ARTICLE 2214.07 (AS REVISED IN SS-5040) AND REPLACE IT WITH THE FOLLOWING NEW PARAGRAPH 'B'.

WHEN THE SCARIFIED MATERIAL IS NOT SUITABLE FOR RECYCLING, THE CONTRACTOR WILL BE PAID THE CONTRACT PRICE PER SQUARE YARD FOR THE SCARIFICATION COMPLETED. THIS MATERIAL SHALL BE INCORPORATED INTO THE WORK OR REMOVED FROM THE PROJECT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

DELETE THE FIRST SENTENCE OF THE LAST PARAGRAPH OF ARTICLE 2214.07, (AS REVISED IN SS-5040) AND REPLACE IT WITH THE FOLLOWING NEW PARAGRAPH.

THIS COMPENSATION SHALL BE FULL PAYMENT FOR FURNISHING ALL MATERIALS, INCLUDING WATER, EQUIPMENT, TOOLS, AND LABOR NECESSARY TO COMPLETE THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, INCLUDING SALVAGING AND STOCKPILING.

SECTION 2303, A.C.C. MIXTURES.
DELETE THE FOURTH, FIFTH AND SIXTH PARAGRAPHS OF ARTICLE 2303.05, PARAGRAPH 'C' (AS REVISED IN SS-5040).

DELETE THE SECOND SENTENCE OF THE FIRST PARAGRAPH OF ARTICLE 2303.15 AND REPLACE IT WITH THE FOLLOWING NEW SENTENCE.

THE OFFSET DISTANCE BETWEEN ALL OTHER LONGITUDINAL JOINTS IN SUCCEEDING COURSES SHALL BE NOT MORE THAN 3 INCHES.

DELETE THE FIFTH PARAGRAPH OF ARTICLE 2303.27, PARAGRAPH 'B' (AS REVISED IN SS-5040) AND REPLACE IT WITH THE FOLLOWING NEW PARAGRAPH.

THE QUANTITY OF ASPHALT CEMENT IN RECLAIMED MATERIAL WHICH IS INCORPORATED INTO THE MIX WILL BE CALCULATED IN TONS OF ASPHALT CEMENT IN THE SALVAGED MATERIAL BASED ON AN ASSUMED ASPHALT CEMENT CONTENT OF 5 PERCENT. THE QUANTITY OF ASPHALT CEMENT IN RECLAIMED MATERIAL, WHICH IS INCORPORATED INTO THE MIX, WILL BE INCLUDED IN THE QUANTITY OF ASPHALT CEMENT USED.

DELETE THE LAST PARAGRAPH OF ARTICLE 2303.27, PARAGRAPH 'B' (AS REVISED IN SS-5040).

*** DBE GOAL INFORMATION ***

THE ESTABLISHED DBE GOAL FOR THIS CONTRACT CONCERNING PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (E.G., SUPPLIERS, AND SUBCONTACTORS) IS SHOWN ON THE FRONT OF THIS PROPOSAL FORM.

REFER TO THE CURRENT 'SUPPLEMENTAL SPECIFICATION FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITIES (DISADVANTAGED BUSINESS ENTERPRISES) FEDERAL AID PROJECTS' FOR ADDITIONAL INFORMATION AND INSTRUCTIONS.

IN ADDITION, IF THE WINNING BIDDER ELECTS TO USE DBE SUBCONTRACTORS AND/OR SUPPLIERS, FORM 830231 (SUBCONTRACT REQUEST AND APPROVAL) SHALL BE SUBMITTED TO THE PROJECT ENGINEER PRIOR TO THE PRECONSTRUCTION CONFERENCE TO DOCUMENT DBE SUBCONTRACTORS AND/OR SUPPLIERS TO BE USED.
The contractor shall attach a completed Form 102117 for each DBE subcontractor and/or supplier.

120 01
The field laboratory or laboratories if applicable shall be on the project at all times testing is required.

181 15
The surface course shall be 3/4 in. mix with no special aggregate frictional requirements.

182 00600
The percentage of crushed particles in the A.C.C. shall be:
BINDER 60%

300 01
*** On the job training ***
The unit prices for 'trainee reimbursement' has been predetermined by the contracting authority. The bidder shall not alter the quantity, the unit price, or the extension provided, but shall include the amount in the total bid.

310 10
*** Flaggers and/or pilot cars ***
The unit prices for 'flaggers' and/or 'pilot cars' has been predetermined by the contracting authority. The bidder shall not alter the quantity, the unit price, or the extension provided, but shall include the amount in the total bid.

410 00
Temporary primary road haul roads are required for this project. The low bidder may submit suggested haul routes to the contracts engineer, as defined by Article 1105.14, using the form included with this proposal.

500 01
The free time allowed between November 15 and April 1 will not be permitted on this project. The contractor shall work during the winter on all working days as defined in 1101.03 working days.

700 00
All groups or divisions (if applicable) on this proposal form are tied. No other ties between groups or projects will be allowed.
Appendix B
Lab Testing and Mix Designs
LAB NO. = ABD2-0182

MATERIAL = TYPE A
INTENDED USE = BINDER
PROJECT NO. = NHS-169-6(43)--19-94
COUNTY = WEBSTER
SPEC NO. = 5040.00
SAMPLED BY = CONTRACTOR: MATHY

DATE SAMPLED: DATE RECEIVED: DATE REPORTED: 08/20/92
PROJ. LOCATION: FROM E. JCT. IOWA 175 TO U.S. 20

AGG. SOURCES:
- CR. LST. & CHIPS - MARTIN MARIETTA, FORT DODGE
- MINE, WEBSTER CO.; MAN. SAND - MARTIN MARIETTA, HODGES, HUMBOLDT CO.; SAND - NORTHWEST LST., YATES, WEBSTER CO.

JOB MIX FORMULA-COMB. GRADATION

1 1/2" 1" 3/4" 1/2" 3/8" NO. 4 NO. 8 NO. 16 NO. 30 NO. 50 NO. 100 NO. 200
100.0 92.0 79.0 56.0 45.0 33.0 22.0 11.0 5.3 4.0

TOLERANCE /100:
98 7 7 7 5 4 2

MATERIAL MIX A94002 A94002 A46006 A94502
% AGGR. PROP. 52.50 12.50 10.00 25.00 0.00

ASPHALT SOURCE AND APPROXIMATE VISCOSITY POISES ALGONA
% ASPHALT IN MIX 4.50 5.50 0.00 0.00
NUMBER OF MARSHALL BLOWS 50 50 0 0
MARSHALL STABILITY - LBS. 2482 2390 0 0
FLOW - 0.01 IN. 6 8 0 0
SP GR BY DISPLACEMENT (LAB DENS) 2.376 2.395 0.000 0.000
BULK SP. GR. COMB. DRY AGG. 2.697 2.697 0.000 0.000
SP. GR. ASPH. @ 77 F. 1.023 1.023 0.000 0.000
CALC. SOLID SP. GR. 2.526 2.488 0.000 0.000
% VOIDS - CALC. 5.94 3.73 0.00 0.00
RICE SP. GR. 2.497 2.462 0.000 0.000
% VOIDS - RICE 4.85 2.72 0.00 0.00
% WATER ABSORPTION - AGGREGATE 0.47 0.47 0.00 0.00
% VOIDS IN MINERAL AGGREGATE 15.87 16.08 0.00 0.00
% V.M.A. FILLED WITH ASPHALT 62.59 76.84 0.00 0.00
CALC. ASPH. FILM THICK. MICRONS 8.85 10.93 0.00 0.00
FILLER/BITUMEN RATIO 0.00 0.78 0.00 0.00

A CONTENT OF 5.1% AC 10 IS RECOMMENDED TO START THE JOB.
TARGET VOIDS 3.5%

DISPOSITION:

SIGNED: ORRIS J. LANE, JR.
TESTING ENGINEER
**LAB No.: ABD2-0183**

**IOWA DEPARTMENT OF TRANSPORTATION**  
**OFFICE OF MATERIALS**  
**TEST REPORT - ASPHALT MIX DESIGN**  
**LAB LOCATION - AMES**

**MATERIAL:** TYPE A ARC  
**INTENDED USE:** BINDER  
**PROJECT NO.:** NHS-169-6(43)--19-94  
**COUNTY:** WEBSTER  
**SPEC NO.:** 5040.00  
**SAMPLED BY:**  

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**LAB LOCATION: AMES**

**MATERIAL:** TYPE A ARC  
**INTENDED USE:** BINDER  
**PROJECT NO.:** NHS-169-6(43)--19-94  
**COUNTY:** WEBSTER  
**SPEC NO.:** 5040.00  
**SAMPLED BY:**  

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**LAB LOCATION: AMES**

**MATERIAL:** TYPE A ARC  
**INTENDED USE:** BINDER  
**PROJECT NO.:** NHS-169-6(43)--19-94  
**COUNTY:** WEBSTER  
**SPEC NO.:** 5040.00  
**SAMPLED BY:**  

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**AGG. SOURCES:** CR. LST. & CHIPS - MARTIN MARIETTA, FORT DODGE MINE, WEBSTER CO.; MAN. SAND - MARTIN MARIETTA, HODGES, HUMBOLDT CO.; SAND - NORTHWEST LST., YATES, WEBSTER CO./15% RUBBER ADDED TO AC.

**JOB MIX FORMULA-COMB. GRADATION**

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**TOLERANCE /100 :**

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**MATERIAL MIX**

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| % ASPHALT IN MIX | 5.25 | 6.25 | 7.25 | 0.00 |
| NUMBER OF MARSHALL BLOWS | 50   | 50   | 50   | 0.0  |
| MARSHALL STABILITY - LBS. | 1933 | 1777 | 1600 | 0.0  |
| FLOW - 0.01 IN. | 9.0  | 12.0 | 13.0 | 0.0  |
| SP GR BY DISPLACEMENT (LAB DENS) | 2.332 | 2.338 | 2.354 | 0.000 |
| BULK SP. GR. COMB. DRY AGG. | 2.697 | 2.697 | 2.697 | 0.000 |
| SP. GR. ASPH. @ 77 F. | 1.022 | 1.022 | 1.022 | 0.000 |
| CALC. SOLID SP. GR. | 2.497 | 2.459 | 2.423 | 0.000 |
| % VOIDS - CALC. | 6.60 | 4.94 | 2.85 | 0.00 |
| RICE SP.GR. | 2.469 | 2.438 | 2.405 | 0.000 |
| % VOIDS - RICE | 5.55 | 4.10 | 2.12 | 0.00 |
| % WATER ABSORPTION - AGGREGATE | 0.47 | 0.47 | 0.47 | 0.00 |
| % VOIDS IN MINERAL AGGREGATE | 18.07 | 18.73 | 19.05 | 0.00 |
| % V.M.A. FILLED WITH ASPHALT | 63.47 | 73.65 | 85.04 | 0.00 |
| CALC. ASPH. FILM THICK. MICRONS | 10.41 | 12.48 | 14.56 | 0.00 |
| FILLER/BITUMEN RATIO | 0.00 | 0.62 | 0.00 | 0.00 |

A CONTENT OF 6.5% BINDER IS RECOMMENDED TO START THE JOB.

TARGET VOIDS 3.5%  

**DISPOSITION:**

**SIGNED: ORRIS·J. LANE, JR.**  
**TESTING ENGINEER**
MATERIAL........: GF 50 CRUMB RUBBER
INTENDED USE.....: A.R.C. BINDER
PRODUCER........: ROUSH
PROJECT NO.......: NHS-169-6 (43) -- 19-94
COUNTY...........: WEBSTER
UNIT OF MATERIAL: GF - 50 RUBBER GRANULES
SAMPLED BY.......: C. ANDERSON
SENDER NO.: CA2-123
DATE SAMPLED: 08/24/92
DATE RECEIVED: 08/27/92
DATE REPORTED: 08/27/92

SIEVE NO. 10 - 100.0

LAB NUMBER
SIEVE ANALYSIS %
#30 98.0
#50 33.0

COPIES TO:
CENTRAL LAB
GEOLOGY
V. MARKS

DISPOSITION:

SIGNED: ORRIS J. LANE, JR.
TESTING ENGINEER
# DAILY PLANT REPORT

**Project:** NHS-KX-6 (47) 17-19  
**Contract No.:** 34938  
**Date:** 8-24-92  
**Report No.:** 11  
**Plant Operated:** 7:15 A.M. to 6:30 P.M.  
**Mix No.:** A802-0162

## Contractor
- **Mathy Construction**

## Plant Location
- **5 Miles South Fort Dodge on Hwy. 169**

## Pollution Equipment
- **Bag houses**

## Mix Type
- **A**

## Asphalt Source & Grade
- **Bituminous AC-05**

## Sand Source
- **Hodges Yates**

## Sample Submissions

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## Sieve Analysis of Combined Aggregates

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| 98-100 | 85-94 | 72-81 | 59-68 | 63-70 | 50-

## Lab. Den. 2.371

## Density Record

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<td>315</td>
<td>315</td>
<td>305</td>
<td>310</td>
<td>AC-5</td>
<td>2585</td>
</tr>
<tr>
<td></td>
<td>457+25T</td>
<td>2.39</td>
<td>Mix</td>
<td>300</td>
<td>305</td>
<td>310</td>
<td>310</td>
<td>300</td>
<td>305</td>
<td>AC-5</td>
<td>2591</td>
</tr>
<tr>
<td></td>
<td>446+14T</td>
<td>2.39</td>
<td>Mat</td>
<td>290</td>
<td>295</td>
<td>300</td>
<td>305</td>
<td>295</td>
<td>300</td>
<td>AC-5</td>
<td>2697</td>
</tr>
<tr>
<td></td>
<td>517+78T</td>
<td>2.39</td>
<td></td>
<td>295</td>
<td>295</td>
<td>300</td>
<td>305</td>
<td>295</td>
<td>300</td>
<td>AC-5</td>
<td>2697</td>
</tr>
</tbody>
</table>

## Production and Placement Record

<table>
<thead>
<tr>
<th>Course Laid</th>
<th>From Station to Station</th>
<th>Tons Today</th>
<th>Tons To Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>514+30 to 430+24</td>
<td>1421.69</td>
<td></td>
</tr>
<tr>
<td>Binder</td>
<td>514+30 to 479+50</td>
<td>604.61</td>
<td>2026.30</td>
</tr>
</tbody>
</table>

## Comments
- Started rubber mix today

## Acceptance Fines/Bitumen Ratio

- Bituminous Treated Base: Enter % Moisture in % Voids Column

**Certified Pro eels:**

**MATERIALS OFFICE – RECORDS CENTER COPY**
### DAILY PLANT REPORT

**BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE**

**Contractor:** Mathy Construction  
**Plant Location:** 5 miles south of Fort Dodge on Hwy. 169

**Make:** Bitumix  
**Pollution Equipment:** Bag house  
**Producer:** Martin Marier  
**Residents Engineer:** Rod De Boer

**Asphalt Source & Grade:** Bituminous AC-05  
**Sand Sources:** Hodges, Yates

**Plant Operation:** 7:00 A.M. to 10:30 P.M.

### SIEVE ANALYSIS OF COMBINED AGGREGATES

<table>
<thead>
<tr>
<th>JOB MIX FORMULA - LIMITS</th>
<th>% PASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>98-100 95-1972-8649-6340-50</td>
<td>18-26</td>
</tr>
</tbody>
</table>

### SAMPLES SUBMITTED

<table>
<thead>
<tr>
<th>Materials</th>
<th>Senders No.</th>
<th>Materials</th>
<th>Senders No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-5</td>
<td>ACC-02</td>
<td>AC-5</td>
<td>ACC-03</td>
</tr>
<tr>
<td>AC-5</td>
<td>ACC-04</td>
<td>AC-5</td>
<td>ACC-03</td>
</tr>
</tbody>
</table>

**Intended Added:** 5% A.C.  
**Intended Total:** 6.1% A.C. Total

### LAB. DEN. 2.362

**DENSITY RECORD**  
**SOLID DEN. 2.450**

<table>
<thead>
<tr>
<th>Course Laid</th>
<th>Station</th>
<th>Refer</th>
<th>Date Laid</th>
<th>* (1) Density</th>
<th>% Density</th>
<th>% Voids</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>477 h 63' LT.</td>
<td>8-25-92</td>
<td>2.33</td>
<td>98.688</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4697 80' LT.</td>
<td>9-2</td>
<td>1.78</td>
<td>99.815</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>463 805 'LT.</td>
<td>9-3</td>
<td>2.38</td>
<td>99.782</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>452 69' LT.</td>
<td>10-2</td>
<td>2.27</td>
<td>99.359</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>444 65' 11' LT.</td>
<td>10-2</td>
<td>2.54</td>
<td>97.629</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>432 60 5' LT.</td>
<td>10-2</td>
<td>2.72</td>
<td>98.772</td>
<td>4.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>427 31 9' 47'</td>
<td>10-2</td>
<td>2.72</td>
<td>98.772</td>
<td>7.5</td>
<td></td>
<td></td>
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</tbody>
</table>

**Temperature Record**

<table>
<thead>
<tr>
<th>Type</th>
<th>Ticket No.</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-5</td>
<td>3009</td>
<td>25.55</td>
</tr>
</tbody>
</table>

**RECYCLED MIX ONLY**

- Total RAP Used Tons: 
- Total Aggr. Used Tons: 
- RAP Used %: 
- Aggr. Used %: 

### PRODUCTION AND PLACEMENT RECORD

<table>
<thead>
<tr>
<th>LT.</th>
<th>Binder</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Station to Station</td>
<td>Tons Today</td>
</tr>
<tr>
<td>478 750 to 481+25</td>
<td>800.99</td>
</tr>
</tbody>
</table>

**Acceptance Cold Feed**

<table>
<thead>
<tr>
<th>Acceptance Cold Feed</th>
<th>1</th>
<th>4</th>
<th>8</th>
<th>16</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>94</td>
<td>82</td>
<td>58</td>
<td>45</td>
<td>34</td>
<td>24</td>
<td>12</td>
<td>7.9</td>
</tr>
</tbody>
</table>

**Comments**

- Rained out at 10:30
- A.C. changed to 5.1% from 5.5%

### Materials Deliveries

- Total RAP Used Tons
- Total Aggr. Used Tons
- RAP Used %
- Aggr. Used %

**Certified Projects Only**

**Acceptance Fines/Bitumen Ratio =**

\[
\frac{4.6}{5.34} = 0.86
\]

**Comments:** Delays, Breakdowns, Corrective Action, etc.

- Thickness: (1) Actual, (2) Intended
- Bituminous Treated Base: Enter % Moisture in % Voids Column

**Signed:** [Signature]

**Cert. No.:** 318

**Inspector:** [Signature]
### BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE

**Contractor:** Mathy Construction

**Plant Location:** Smiles south Fort Dodge on Aug. 16, 1992

**Make:** Bituma

**Size:** 34’

**Location:** 649 house

**Resident Engineer:** Ren DeBoy

**Recycle Source:**

**Asphalt Source & Grade:** Bituminous AC-05

**Sand Sources:** Hodges, Yates

### SIEVE ANALYSIS OF COMBINED AGGREGATES

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>SIEVE NO. - % PASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB MIX FORMULA - LIMITS</td>
<td>98</td>
</tr>
<tr>
<td>Spl. ID</td>
<td>Time</td>
</tr>
<tr>
<td><strong>8-BG AM 46S</strong></td>
<td></td>
</tr>
<tr>
<td><strong>F-83 AM 46S</strong></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL RAP USED TONS:**

**TOTAL AGG. USED TONS:**

**RAP USED%:**

### LAB. DEN. 2.372

**DENSITY RECORD**

#### SOLID DEN. 2.945

<table>
<thead>
<tr>
<th>Course Laid</th>
<th>Station</th>
<th>t Refer</th>
<th>Date Laid</th>
<th>Density</th>
<th>% Density</th>
<th>% Voids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>500</td>
<td>46</td>
<td>5’ AT</td>
<td>8-26-92</td>
<td>2.342</td>
<td>98.735</td>
</tr>
<tr>
<td>469</td>
<td>77</td>
<td>1’ AT</td>
<td></td>
<td>2.318</td>
<td>97.723</td>
<td>5.2</td>
</tr>
<tr>
<td>447</td>
<td>24</td>
<td>9’ RT</td>
<td></td>
<td>2.364</td>
<td>99.663</td>
<td>3.3</td>
</tr>
<tr>
<td>505</td>
<td>78</td>
<td>11’ LT</td>
<td></td>
<td>2.303</td>
<td>97.091</td>
<td>3.8</td>
</tr>
<tr>
<td>490</td>
<td>42</td>
<td>3’ LT</td>
<td></td>
<td>2.349</td>
<td>96.958</td>
<td>3.4</td>
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<tr>
<td>457</td>
<td>7</td>
<td>1’ LT</td>
<td></td>
<td>2.377</td>
<td>99.804</td>
<td>2.9</td>
</tr>
<tr>
<td>447</td>
<td>42</td>
<td>1’ LT</td>
<td></td>
<td>2.306</td>
<td>96.845</td>
<td>5.9</td>
</tr>
</tbody>
</table>

#### TEMPERATURE RECORD

<table>
<thead>
<tr>
<th>Time</th>
<th>Air</th>
<th>A.C.</th>
<th>Agg.</th>
<th>Mix</th>
<th>Mat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57</td>
<td>59</td>
<td>67</td>
<td>76</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>328</td>
<td>337</td>
<td>329</td>
<td>323</td>
<td>324</td>
</tr>
<tr>
<td></td>
<td>393</td>
<td>500</td>
<td>29.8</td>
<td>25.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>315</td>
<td>310</td>
<td>320</td>
<td>310</td>
<td>310</td>
</tr>
<tr>
<td></td>
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<tr>
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<td>315</td>
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<td>305</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>305</td>
<td>320</td>
<td>310</td>
<td>305</td>
</tr>
</tbody>
</table>

#### MATERIALS DELIVERIES

**Total RAP Used Tons:**

**Total Aggr. Used Tons:**

**RAP Used%:**

**Aggr. Used%:**

### PRODUCTION AND PLACEMENT RECORD

**Acceptance Fines/Bitumen Ratio:**

**Advisory - Fines/Bitumen Ratio:**

**Average Field Density Lot #1:**

**Average Field Density Lot #2:**

**Advisory - Voids Ratio:**

**Ave. % Field Voids:**

**O.I. (Density):**

<table>
<thead>
<tr>
<th>Course Laid</th>
<th>From Station to Station</th>
<th>Tons Today</th>
<th>Tons To Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>507+60 to 1794+00</td>
<td>2369.17</td>
<td>3730.91</td>
</tr>
<tr>
<td>Binder</td>
<td>514+60 to 429+00</td>
<td>1369.17</td>
<td>34397.76</td>
</tr>
</tbody>
</table>

#### COMMENTS

- Delays, Breakdowns, Corrective Action, etc.
- Thickness: (1) Actual, (2) Intended
- Bituminous Treated Base: Enter % Moisture in % Voids Column

**Acceptance Fines/Bitumen Ratio:**

**Acceptance Fines/Bitumen Ratio:**

**Cert. No.:**

**RINCE J. ELLI**

**Cert. No.:**

**MATERIALS OFFICE - RECORDS CENTER COPY**
DAILY PLANT REPORT
BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE

Contractor: Mathy Construction
Plant Location: 5 miles south, Fort Dodge on Hwy. 169

Plant Type: Dolm
Mix Type: A
Class: 3/4" Crushed Aggr.
Source: Buhag House

Mix Analysis:
- Binder: 322+09 1/2" RT, 8-27-42
- Aggr.: 360+66 5/8" RT, 323+80 11/2" RT, 312+09 1/2" RT, 368+27 11/2" LT, 331+79 7" LT, 322+55 1" LT

Sieve Analysis of Combined Aggregates:

<table>
<thead>
<tr>
<th>Sample</th>
<th>1/4</th>
<th>1/2</th>
<th>3/4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>16</th>
<th>30</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>0.96</td>
<td>98</td>
<td>67.5</td>
<td>80.5</td>
<td>83</td>
<td>92</td>
<td>94</td>
<td>95</td>
<td>18.5</td>
<td>0.65</td>
<td>0.5</td>
<td>0.3</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Aggr.</td>
<td>0.98</td>
<td>99</td>
<td>74.5</td>
<td>86.5</td>
<td>89</td>
<td>104</td>
<td>106</td>
<td>108</td>
<td>20</td>
<td>6.5</td>
<td>6.5</td>
<td>6.5</td>
<td>6.5</td>
<td></td>
</tr>
</tbody>
</table>

Sample Analysis:
- Lab. Den.: 2.371
- Dens. Record: 2.451

Temperature Records:
- Air: 59
- A.C.: 83
- Aggr.: 83
- Mix: 83
- Mat: 83

Materials Deliveries:
- Total RAP Used Tons: 30.49
- Total Aggr. Used Tons: 30.49
- RAP Used %: 18%
- Aggr. Used %: 18%

Production and Placement Record:
- From Station to Station: 383+50 to 303+50
- Tons Today: 1930.58
- Tons To Date: 3700.79

Acceptance Fines/Bitumen Ratio = 4.5/5.21 = 0.85

Comments: Delays, Breakdowns, Corrective Action, etc.

Acceptance Mix:
- Rubber Mix

Signed: [Signature]
Cert. No. 318

MATERIALS OFFICE - RECORDS BUREAU 28
TEST SECTION WORKSHEET

DATE: 8/26/92  STATE: Town  COUNTY: Webster
PROJECT NUMBER:  HIGHWAY: 26-169
MARKER:  % RUBBER: 15%
TYPE RUBBER: GFSCA  UNIT RPM: 80
TOTAL RUBBER USED/DAY: 48,375  ASPHALT TEMP: 352°F
Q1.5 skid = 6'2350 lb = 48,375

BROOKSFIELD DATA

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEMP</th>
<th>SPINDLE</th>
<th>V/F READING</th>
<th>FACTOR</th>
<th>CPS</th>
<th>VISCOSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>350</td>
<td>3</td>
<td>2025</td>
<td>700</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>11:30</td>
<td>350</td>
<td>3</td>
<td>6</td>
<td>200</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>1:30</td>
<td>350</td>
<td>3</td>
<td>5.5</td>
<td>200</td>
<td>1100</td>
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<tr>
<td>5:00</td>
<td>350</td>
<td>3</td>
<td>7</td>
<td>200</td>
<td>1400</td>
<td></td>
</tr>
</tbody>
</table>

Made 4.750 tons Asphalt concrete 8/27/92

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEMP</th>
<th>SPINDLE</th>
<th>V/F READING</th>
<th>FACTOR</th>
<th>CPS</th>
<th>VISCOSITY</th>
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</thead>
<tbody>
<tr>
<td>8:00</td>
<td>355</td>
<td>3</td>
<td>6</td>
<td>200</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>350</td>
<td>3</td>
<td>8</td>
<td>200</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>350</td>
<td>3</td>
<td>8.5</td>
<td>200</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>3:00</td>
<td>347</td>
<td>3</td>
<td>10.0</td>
<td>200</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>5:00</td>
<td>345</td>
<td>3</td>
<td>6.5</td>
<td>200</td>
<td>2000</td>
<td></td>
</tr>
</tbody>
</table>

Rubber used = 21.5 skids @ 2250 lb = 48,375

Made 4.750 tons Asphalt concrete
**TEST SECTION WORKSHEET**

**DATE:** 8/24/92  
**STATE:** IOWA  
**COUNTY:** WEBSTER  
**PROJECT NUMBER:**  
**HIGHWAY:** IA 169  
**MARKER:**  
**% RUBBER:** 15  
**TYPE RUBBER:** GE-50A  
**UNIT RPM:** 80  
**TOTAL RUBBER USED/DAY:** 19 galleys  
**ASPHALT TEMP:** 340-360°F  
**2250 #/gallon = 40,250 #**

**BROOKSFIELD DATA**

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEMP</th>
<th>SPINDLE</th>
<th>B/F READING</th>
<th>FACTOR</th>
<th>CPS</th>
<th>VISCOSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00</td>
<td>350</td>
<td>3</td>
<td>5</td>
<td>400</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>360</td>
<td>3</td>
<td>8</td>
<td>400</td>
<td>3200</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>350</td>
<td>3</td>
<td>6</td>
<td>400</td>
<td>2400</td>
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</tr>
<tr>
<td>13:30</td>
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<td>3</td>
<td>8</td>
<td>400</td>
<td>3200</td>
<td></td>
</tr>
</tbody>
</table>

8/25/92

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEMP</th>
<th>SPINDLE</th>
<th>B/F READING</th>
<th>FACTOR</th>
<th>CPS</th>
<th>VISCOSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30</td>
<td>360</td>
<td>3</td>
<td>5</td>
<td>400</td>
<td>1800</td>
<td>310</td>
</tr>
<tr>
<td>9:00</td>
<td>345</td>
<td>3</td>
<td>5</td>
<td>400</td>
<td>2000</td>
<td>310</td>
</tr>
<tr>
<td>11:00</td>
<td>375</td>
<td>3</td>
<td>6</td>
<td>400</td>
<td>2400</td>
<td>310</td>
</tr>
</tbody>
</table>

**10 RPM**

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEMP</th>
<th>SPINDLE</th>
<th>B/F READING</th>
<th>FACTOR</th>
<th>CPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30</td>
<td>360</td>
<td>3</td>
<td>25</td>
<td>400</td>
<td>1800</td>
</tr>
<tr>
<td>9:00</td>
<td>345</td>
<td>3</td>
<td>5</td>
<td>400</td>
<td>2000</td>
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<tr>
<td>11:00</td>
<td>375</td>
<td>3</td>
<td>6</td>
<td>400</td>
<td>2400</td>
</tr>
</tbody>
</table>

**Used 7 galleys**

**2250 #/gallon = 15,750 #**

**Made**
Marshall Stability, Creep & Resilient Modulus Testing

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>ARC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marshall Stability</strong></td>
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<tr>
<td>3/4&quot; Binder - 50 Blows</td>
<td>2,436</td>
<td>1,790</td>
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<td><strong>Creep</strong></td>
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<td>3/4&quot; Binder - 50 Blows</td>
<td>88</td>
<td>77</td>
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<tr>
<td><strong>Resilient Modulus</strong></td>
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<tr>
<td>3/4&quot; Binder - 50 Blows</td>
<td>710,000</td>
<td>580,000</td>
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Appendix C
Road Rater Results
Road Rater Results
Preconstruction
May 14, 1992

<table>
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<th>Average</th>
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<td>3.18</td>
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