2011

Wisconsin Department of Transportation

Outstanding Highway Construction Awards

Asphalt Paving Category

TBG111011092927MKE

Milwaukee and Waukesha Counties
WisDOT SE Region

Interstate 94, East-West Freeway

Project ID
1060-32-70, 1060-35-70
1060-32-71, 1060-35-71

November 2011

I-94 east-west
REPAVING PROJECT
A Better Ride Ahead

WISCONSIN DEPARTMENT OF TRANSPORTATION

OUTSTANDING HIGHWAY CONSTRUCTION AWARDS
ASPHALT PAVING CATEGORY

I. GENERAL PROJECT INFORMATION

Region: Southeast

STATE PROJECT ID	PROJECT DESCRIPTION	HIGHWAY	COUNTY
1060-32-70	East-West Freeway – Roadway STH 16 to East County Line	IH 94	Waukesha
1060-35-70	East-West Freeway 70th Street to 32nd Street WB Roadway	IH 94	Milwaukee
1060-32-71	East-West Freeway – Structures STH 16 to East County Line	IH 94	Waukesha
1060-35-71	East-West Freeway 70th Street to 32nd Street WB Structures	IH 94	Milwaukee

Project Length:
Waukesha Co. - 10 miles
Milwaukee Co. - 3 miles

Prime Contractor: Zignego Company, Inc.

Asphalt Paving Contractor: Stark Asphalt & Curran Contracting Company

Project Leader: AJ Catalanotte, CH2M HILL
Roadway Engineer: Nate Schlegel, CH2M HILL

DOT Project Manager: Jeff Bohen

PROJECT DESCRIPTION

Challenged with very high traffic volumes, an aggressive schedule, and logistical site challenges, the project was delivered with exceptional quality, unprecedented performance, and with safety at the forefront of the minds of project staff at all times. Perhaps one of the busiest stretches of freeway in the entire State, I-94 from downtown Milwaukee to central Waukesha County was reduced from 3 lanes to 2 lanes for approximately 4 months, and the 69 lane-miles of freeway were

milled, base-patched or rubblized, and subsequently repaved. No additional lane impacts were allowed during the daytime hours; therefore, a significant portion of the work was required to be completed during overnight hours. Along with the roadway repaving work, there were many other safety enhancements constructed along the entire corridor, and all bridges within the project limits were rehabilitated. Throughout the entire life of the construction project, the safety of the project staff and of the traveling public was the top priority.

Project map/layout:

CONSTRUCTION TEAM SAFETY AND TRAFFIC CONTROL STRATEGY:

- Weekly traffic control coordination meetings
- Pre-stage switch coordination meetings—There were 12 significant stage changes during the project, or an average of one significant stage change every 2 weeks during spring and early summer
- Local Sheriff and State Highway Patrol attendance and input/suggestions at all traffic and stage-related meetings
- Weekly construction team safety meetings
- Three members of the traffic control inspection team, allowing continuous monitoring and coverage of work, and ensuring device compliance with the *Manual on Uniform Traffic Control Devices*

PROJECT SCHEDULE

	Start Date		Completion Date (Open to Traffic)	
	Scheduled	**Actual**	**Scheduled**	**Actual**
Entire Project	February 7, 2011	February 10, 2011	November 18, 2011	November 18, 2011
Asphalt Paving*	April 11, 2011	March 30, 2011	August 1, 2011	June 28, 2011

*From March 30 to June 28, approximately 231,000 tons of HMA were placed over the course of 66 days of paving. This equates to 3,500 tons placed each day paving operations were ongoing.

The construction engineering team worked closely with the Department management staff and with contractors, and deemed it possible to pave hot mix asphalt (HMA) surface on all freeway lanes nearly 6 weeks ahead of schedule. This option was available due to significant progress of work on the project, with the engineering team and contractors working shifts of 24 hours per day, for 6 or 7 days per week, during the spring and early summer portion of the project. At one point during the project, there were 84 continuous hours of HMA paving. The HMA surface was completed on the freeway by June 28, and the freeway was reopened to three lanes of traffic prior to Summerfest and the busy summer travel season. The original project plans indicated the freeway was to be reopened to three lanes on the lower HMA course prior to late June, but the installation of the surface course provided drastic improvements on safety, drainage, and ride quality 6 weeks ahead of schedule. Effective partnering efforts by all involved parties contributed to this outstanding accomplishment.

Project Costs:

Original Contract Amount	$44,000,000
Department Added Work (Zoo Interchange Base-patching, CTH F overlay, Fox River ditch work)	$1,400,000 (3.2%)
Plan Inaccuracies (milling depth, three-lift paving, traffic control)	$2,100,000 (4.8%)
Field Changes/Overruns (pavement maintenance and rehabilitation)	$2,100,000 (4.8%)
Final Contract Amount (Estimate)	$49,600,000

A project controls system was developed for the project to track and estimate project costs at completion. Initial cost at complete was projected at $50,000,000. The project is now expected to complete at $400,000 under projected cost, due to aggressive change management and negotiations.

Total Quantity of Asphaltic Concrete Pavement	245,714 TONS
Total Quantity of Asphaltic Material for Plant Mixes	12,504 TONS

Pavement Type: Appropriate Items

☐ E1	☐ E2	☐ E3	☐ E10	☒ E30	☐ E30X	☐ OTHER

Pavement Thickness: 5 to 8 inches

Surface Layer: 2 inches

Binder Layer: 3 ¼ inches

Leveling Layer: 1 to 3 inches

Contractors Performance

Please see attached EC 710 Report of Contractors Performance Forms.

Stark Asphalt utilized Curran Contracting to aid in the installation of the HMA on the project. This gave the contractor the ability to have as many as 6 paving crews working simultaneously on the project. This, of course, aided in the ability for the contractor to meet and exceed the compressed project schedule.

Did the contractor participate in the preparation of this submittal? Yes

The asphalt paving contractor reviewed the information for accuracy, and provided some additional information contained within this award submittal. Sections II and III were the primary sections in which information from the contractor was used.

II. PAVEMENT SMOOTHNESS

Method of Measurement: Profilograph

Smoothness Index: International Roughness Index (IRI)

Type of Construction: Mill, base patch or rubblize, and overlay

Base Preparation: EBS as needed, proof roll, leveling course, and profile mill lower layers of HMA

IRI Results

IRI Measured before milling existing pavement (Mill and Overlay)	No
IRI Measured after milling but before overlay is placed (Mill and Overlay)	No
IRI Measured on all lifts? (Multi Lift)	Yes

IRI Measured on final surface only? (Multi Lift)

Overall Average (All)	40.9
500 -foot Segment Average/High/Low (Penalty and Bonus) (All)	49.5/206.3/19.3
Localized Roughness Length and Maximum IRI and penalty (All)	953 feet/500/$11,980

Pavement intersection with Structure, Structure Approaches, RR Track or other obstacle

Method used is defined in Quality Control Plan	Yes
Smooth Transition	Yes, in QC Plan
Localized Roughness at Transition	Yes, in QC Plan

Actions taken for Localized Roughness

Grinding	No
Mill and Overlay	
Adjustment (Average price adjustment for deficient pavement)	Yes
Excluded	Yes

Ride quality on areas not required to be tested such as roundabouts ramps, tapers, and acceleration and deceleration lanes.

The contractor administered the same quality management techniques when paving ramps and acceleration and deceleration lanes as on the freeway mainline pavement. The 11 interchanges throughout the project meant the incorporation of 33 total ramps. Project engineering staff verified cross-slopes, thicknesses, and transitions into the mainline pavement to ensure they would produce the best possible finished product.

III. QUALITY CONTROL

Base (For overlays, Describe original pavement.)

The typical existing roadway section consists of a 3- to 5-inch asphaltic surface, a 9-inch concrete base, and a granular sub-base. The existing asphaltic surface was milled, and the 9-inch concrete base was rubblized or base patched.

Please describe in one paragraph the procedures used to ensure quality asphalt pavement (e.g. careful, frequent tests, special admixtures, mix design, or other measures).
The frequency of testing performed by the contractor in all aspects of the asphaltic pavement exceeded the requirements, as stated in the specifications. The job mix formula was slightly modified, as needed, throughout the duration of the project to ensure that the material delivered and placed on the project were in accordance with the specifications. The contractor's quality control process captured and identified possible issues and resolved them before the material was delivered to the project site. All density tests were performed by the contractor as indicated in the project special provisions, and QV testing was performed sufficiently enough to exceed the minimum requirement. The QV testing on the entire project was completed by the construction engineering team. Both the contractor and the construction engineering team were committed to achieving a uniform and consistent pavement, and the resulting freeway surface is a smooth ride with and extended pavement service life.

If this was a warranty project, discuss in one paragraph the warranty program.
This project does not fall under the warranty program.

Discuss in one paragraph the contractors quality management program, Aggregate Mixture.
The contractor submitted a Quality Management Program (QMP) plan for the IRI Ride and HMA Density Testing items. The IRI Plan was revised 4 times, at the request of the construction engineering team, to ensure all key components were in place to provide the optimal processes for a pavement with a smooth ride. The QMP plans included project contacts/chain of command, mix designs, equipment utilized, process quality control methods, and an issue resolution process. Continuous communication and monitoring between the asphalt plant manager and the QC manager eliminated any potential material issues and ensured that a quality material was produced.

Did moving averages on the standardized control charts exceed the warning limits?
Of the over 3,000 plotted moving average data points for this project, only 8 exceeded the warning limits (a success rate of over 99.7 percent within the warning limits). There were no instances of more than two consecutive moving averages exceeding the warning limits. The high success rate was a testament to the fact that the aggregates used were crushed using a separate operation devoted only to the project. The focus of the production could be channeled towards consistency. Additionally, the contractor had the flexibility to produce the same mix design at three different plant locations, which gave the ability to counteract any mechanical plant issues.

Were the individual tests on the standardized control charts that exceed the control limits?
A small number of individual test data points did exceed control limits in isolated incidents. Many of them were related to mechanical issues at the plant or moisture-related issues from the aggregate stockpile. In the first case, production was moved from the plant with the problem to another plant to ensure a steady supply of material. For the latter case, moisture contents of the stockpiles were measured and input into the plant controls in order to accurately weigh the correct portions of material.

Was there any unsatisfactory asphalt mixture that was subject to reduced payment?

Amount accepted @ reduced payment: Zero tons

Amount removed/ replaced: Zero

How well did the control testing and assurance testing agree?
Quality control personnel took the opportunity to meet with the DOT regional HMA specialists prior to job startup in order to help identify any potential issues with comparison testing. Multiple samples were tested with the results compared to one another. Equipment calibrations, discussion of testing methodologies, and frequent communication with DOT testing personnel aided in minimizing variability between quality control and assurance testing. All testing personnel also had independent assurance evaluations performed on the project, with all testers meeting the allowable comparison tolerances.

How well were density requirements met?
Although not required, the contractor monitored density on the leveling layer to ensure a sufficient base. Throughout the project, the contractor submitted daily density data – along with a narrative – to the project staff, which greatly helped identify potential problems and was a key factor to achieving such positive results on density testing. Overall, density was largely achieved, and no pavement had to be removed due to lack of compaction.

Amount accepted at reduced payment: 845 tons, Payment Factor: 98%
1803 tons, Payment Factor: 95%
2146 tons, Payment Factor: 91%
537 tons, Payment Factor: 85%
339 tons, Payment Factor: 70%

A toal of 5670 tons accepted at a reduced payment, equating to 2.3% of the HMA placed.

Amount removed/replaced: Zero

IV. COMPLEXITY

Number of interchanges: • 11 • 2 system interchanges, 9 service interchanges • 33 total ramps	Work Zone Traffic Volume: Milwaukee Co. – 133,000 to 153,000 AADT Waukesha Co. – 104,000 to 136,000 AADT
Number of businesses Along Project: Numerous businesses adjacent to work zone. Of note: Henry Maier Festival (Summerfest) Park, Miller Park, State Fair Park, Milwaukee County Zoo, Brookfield Square, Waukesha County Airport	Number of Bridge Approaches: Milwaukee Co. – 14 Waukesha Co. – 20

Number of Intersections: N/A	Number of Utility Manholes**:** 4
Number of Driveways: N/A	
Special Material Requirements: N/A	

One of the significant challenges of the project was the schedule. The project had to be significantly complete (three lanes reopened to traffic) by late June, which meant an early February start on many of the roadway items such as excavation, concrete pavement, rubblization, and HMA. The construction engineering staff had to work closely with the contractor to monitor upcoming weather conditions and postpone or accelerate certain operations if the forecast did not look to be favorable.

Another significant challenge on the project was working through all of the interchanges. Only 5 of the 33 ramps were closed long-term, and all other interchanges had to remain open at all times, except for nighttime closures. Base patching or rubblization and paving had to be coordinated such that they all could be completed overnight, with no disruption to the ramps or freeway mainline during daytime hours. Multiple contractor operations were staged to work through the ramps overnight, which also required a great deal of inspection and layout needs from the construction engineering staff.

V. Innovation

Please describe in one paragraph any special accessories or modifications to the paving equipment or procedures. Please provide details on modifications that improved quality and/or productivity.

The project plans indicated that the HMA was to be completed in two layers. After careful consideration, the construction engineering team and the contractor determined that it would be best over the rubblized areas to pave the road with three layers of HMA. This method used a "leveling layer" installed directly onto the rubblized surface, followed by a 3-inch binder layer and then a 2-inch surface layer. Optimal surface smoothness was achieved by use of this method, as any inconsistencies in the rubblized pavement could be eliminated. The contractor also used a profile mill on the new lower HMA layers to provide for the best possible ride on the new pavement. Lastly, there were three separate production plants and an aggregate source solely devoted to this project, which provided a consistent mix and the ability to deliver the HMA such that the accelerated project schedule could be met.

Please describe in one paragraph any innovations used in the design, specifications, contracting procedures, or construction of the project. If so, please describe.

Several techniques were implemented on the project so that longitudinal joint deterioration would be minimized in subsequent years. The two primary longitudinal joints of concern lie between lanes 1 & 2 and lanes 2 & 3. Lanes 2 and 3 (24 feet in total width) were paved in tandem, so that there was never a true cold joint created between the two lanes. The joint between lanes 1 and 2 is a true cold joint, but a longitudinal butt joint was created prior to placing the adjacent pavement, optimizing HMA thickness and compaction efforts. A longitudinal joint reheater was also used at this joint, likely decreasing the chances of deterioration.

VI. FINISHED PROJECT AND CONSTRUCTION PHOTOS

I-94, Waukesha County at Hwy 164 (finished project)

I-94, Waukesha County at Goerke's Corners (finished project)

I-94, Milwaukee County at Stadium Interchange (finished project)

I-94, Waukesha County at Moorland Rd (finished project)

I-94, Waukesha County at Goerke's Corners (finished project)

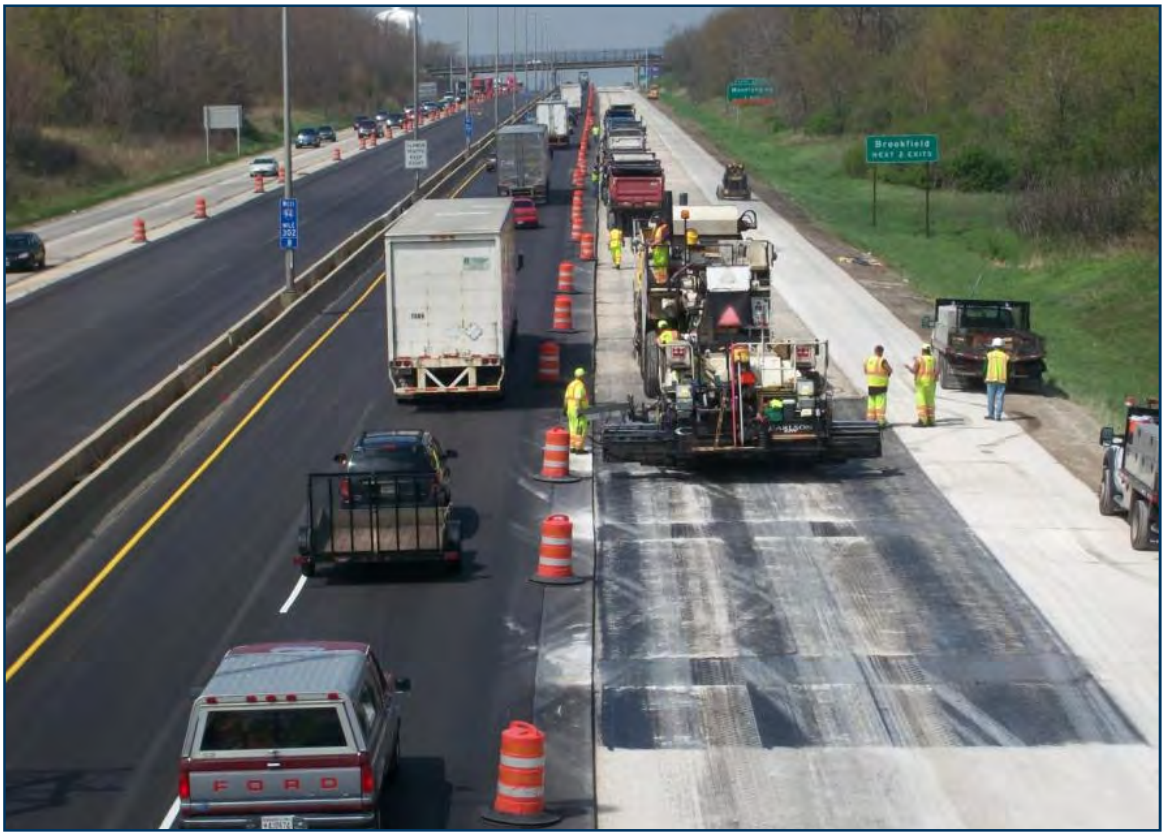
I-94, Waukesha County at Brookfield Rd. (finished project)

HMA surface paving, I-94 westbound, Waukesha County

Traffic Staging, I-94 westbound, Milwaukee County

Traffic Staging, Waukesha County

Rubblizing, I-94 eastbound, Waukesha County



HMA paving, I-94 westbound, Waukesha County

Submitted by: Jeff Bohen, WisDOT Project Manager

RATING CRITERIA

The following features of each project will be evaluated by the selection panel: (The nominating documents and photographs should emphasize these features).

II. Smoothness

Average profile index for the project in inches/mile.
Corrective grinding requirements.
Adjustments for deficient ride quality.

III. Quality Control

Items to be considered are:

- Variability
- Uniformity and Consistency
- Density

IV. Complexity

The complexity of a project is recognized as an important rating factor. Items which effect the complexity include:

- Project Size
- Geometrics
- Interchanges
- Intersections
- Railroad Crossings
- Bridge Approaches
- Special Contract Requirements
- Material Requirements (Recycling, etc.)
- Work Zone Traffic Volume & Control

The over-riding issue is timeliness of completion. Special consideration will be given to getting the job done on or ahead of schedule.

V. Innovation

Special items that enhance quality, timeliness of completion, and safety will be considered. Unique features such as equipment innovations or modifications, new materials, construction sequences, and design cross-sections will be of interest.

VI. Photographs

Photographs of the finished project (and the construction process if available) are required for proper judging of the nomination. Please include photographs of the project with the nomination.

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I-94 east-west
REPAVING PROJECT
A Better Ride Ahead

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