Research Report
KTC-08-20/FR155-06-1F

KENTUCKY TRANSPORTATION CENTER

EXPERIMENTAL CONCRETE COATING APPLICATION ON THE MEDIAN BARRIER OF I-65 IN LOUISVILLE

UNIVERSITY OF KENTUCKY
College of Engineering

OUR MISSION

We provide services to the transportation community through research, technology transfer and education. We create and participate in partnerships to promote safe and effective transportation systems.

OUR VALUES

Teamwork
Listening and communicating along with courtesy and respect for others.

Honesty and Ethical Behavior
Delivering the highest quality products and services.

Continuous Improvement
In all that we do.

Research Report
KTC-08-20/FR155-06-1F

Experimental Concrete Coating Application on the Median Barrier of I 65 in Louisville

By

Rick Younce
Transportation Technician

Theodore Hopwood II
Associate Engineer III, Research

And

Sudhir Palle
Associate Engineer II, Research

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

In cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

June 2008

1. Report No. KTC-08-20/FR155-06-1F	**2.Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Experimental Concrete Coating Application on the Median Barrier Of I 65 in Louisville		**5. Report Date** June 2008 **6. Performing Organization Code**
7. Author(s) Rick Younce, Theodore Hopwood and Sudhir Palle		**8. Performing Organization Report No.** KTC-08-20/FR155-06-1F
9. Performing Organization Name and Address Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0043		**10. Work Unit No. (TRAIS)** **11. Contractor Grant No.** FRT 155
12. Sponsoring Agency Name and Address Kentucky Transportation Cabinet State Office Building Frankfort, KY 40622		**13. Type of Report and Period Covered** Final **14. Sponsoring Agency Code**

15. Supplementary Notes

Prepared in cooperation with the Kentucky Transportation Cabinet, Federal Highway Administration, and U.S. Department of Transportation. Study Title: Disposal of Bridge Paint Debris

16. Abstract

The objectives of this research were to evaluate the experimental protective coating that was applied to approximately 1,200 linear feet of concrete median barrier along the paving project on a section of I 65 between mile points 131.289 and 136.421 in downtown Louisville.

The project was completed generally in accordance with the specifications and special notes. This experimental project is the first trial of concrete coatings identified under KYSPR 05-271 Coatings, Sealants and Fillers to Address Bridge Concrete Deterioration and Aesthetics-Phase 1. The coatings systems identified under that study were intended to provide improved protection and aesthetics for reinforced concrete. This project proved that one candidate coatings system could be applied successfully on existing concrete. It is recommended that KYTC further pursue use of this knowledge by conducting more experimental/ prototype projects to further investigate how coatings hold up on new and old concrete barriers.

17. Key Words Coatings, Concrete, Barriers		**18. Distribution Statement** Unlimited with the approval of the Kentucky Transportation Cabinet	
19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 22	**22. Price**

TABLE OF CONTENTS

TABLE OF FIGURES

EXECUTIVE SUMMARY

The objectives of this research were to evaluate the experimental protective coating that was applied to approximately 1,200 linear feet of concrete median barrier along the paving project on a section of I 65 between mile points 131.289 and 136.421 in downtown Louisville.

The project was completed generally in accordance with the specifications and special notes. All areas were cleaned prior to application of the coatings. Both coats of paint were applied within the specified limits except in the areas that had to be re-washed due to the problems associated with paving work. In those areas the top coat was applied at a greater wet film thickness as agreed upon by the painting subcontractor and KYTC officials. This issue might have been avoided by better coordination between the prime contractor and painting subcontractor.

This experimental project is the first trial of concrete coatings identified under KYSPR 05-271 Coatings, Sealants and Fillers to Address Bridge Concrete Deterioration and Aesthetics-Phase 1. The coatings systems identified under that study were intended to provide improved protection and aesthetics for reinforced concrete. This project proved that one candidate coatings system could be applied successfully on existing concrete. It is recommended that KYTC further pursue use of this knowledge by conducting more experimental/ prototype projects to further investigate how coatings hold up on new and old concrete barriers.

BACKGROUND

In August 2006, the Kentucky Transportation Cabinet (KYTC) awarded a contract to Gohmann Asphalt and Construction, Inc. of Clarksville, Indiana to apply an experimental asphalt overlay on existing pavement and bridge decks of a section of I 65 between mile points 131.289 and 136.421 in downtown Louisville. As part of this work, the contractor was to apply an experimental protective coating to approximately 1,200 linear feet of concrete median barrier along the paving project. Gohmann was the lone bidder and awarded the contract for $6,973,000.00. The cost for coating application portion of the contract was $338,562.50.

The Kentucky Transportation Center (KTC) was contracted to monitor the asphalt overlay and concrete coating. That work was to be performed under Federal Research Aid Task 155, Experimental Concrete Coating Application on the Median Barrier of I-65 in Louisville. This report addresses the experimental concrete coating application.

SPECIAL NOTES

The contract for this project included Special Notes for:

- Median Barrier Wall Surface Preparation And Thin Film Coating Application,
- Fixed Completion Dates And Disincentive Fees,
- Project Identification Signs,
- Provision For Waste And Borrow Sites,
- Traffic Response And Incident Management Assisting The River Cities (TRIMARC),
- Traffic Control Plan, and
- Project Monitoring

In addition to the listed special notes the contract required that all work be done in accordance with the Kentucky Transportation Cabinet, Department of Highways, and Standard Specifications for Road and Bridge Construction.

The special note for painting allowed the contractor to choose one of two coatings systems which are on the Department's List of Approved Materials. A two coat system was used by the contractor containing an epoxy primer and a polyurethane topcoat. No coatings were to be applied until the area had been inspected and approved by the Engineer. The coatings were to be applied to clean, dry surfaces and according to the manufacturer's recommendation. The contractor was required to repair all defects in the coating including pinholes, cracks, blisters, and runs.

PROJECT OVERVIEW

Gohmann subcontracted the barrier wall cleaning and painting to Five Star Painting. Traffic control for the painting portion of the contract consisted of a total northbound or southbound closure from Friday at 8:00 p.m. to Monday at 5:00 a.m. for three weekends in each direction. One direction was to remain open at all times.

A test patch for coating application on concrete was applied at the Gohmann field office in Clarksville, Indiana on September 27, 2006. Kentucky Transportation Cabinet, Gohmann, Five Star Painting, and Sherwin Williams personnel were present to view the test patch application. The ambient conditions at the time of the test were 66^{o} F temperature and 72% relative humidity. The parties agreed that the concrete was to be cleaned by pressure washing 24 hours prior to coating application. Only the prime coat was applied at this time (Figure 1).

Cabinet officials and the contractor agreed that the cleaning standard method would consist of power washing all concrete surfaces at 3,000 psi. They also agreed that any holes in the concrete allowing water to accumulate would either be sealed with a two-part epoxy or opened to permit drainage. A visual inspection would be made to determine if the concrete was clean and dry before the coating could be applied. They also agreed that all faces of the median barrier wall, including any overhead sign bases, would be coated from mile point 131.289 to 135.5. The prime coat was to be applied by rolling according to the manufacturer's product data sheets. The contract was to brush out any puddles of coating that accumulated on the concrete.

The finish coat application of the test patch was made on October 6, 2006. Kentucky Transportation Cabinet, Kentucky Transportation Center, Gohmann Asphalt and Construction, Inc., Five Star Painting Co., and Sherwin Williams personnel were also present for this test. The ambient conditions at this time were: 53^{o} F temperature and relative humidity of 53%. The finish coat was applied by rolling and brushing according to the manufacturer's product data sheets (Figures 2-4). The parties agreed that, as with the prime coat, any puddles of coating would be brushed out.

Painting operations began during the second weekend of October, 2006. On Friday, October 13, before the subcontractor began his work, KTC and KYTC personnel identified areas containing cracks, spalled concrete, exposed reinforced steel and pre-existing patched areas (Figures 5-8). Those areas were noted for reference in future inspections.

The contactor began his coatings operations at the north end of the project. Two workers stationed on opposite sides of barrier performed the concrete cleaning operation. They used clean potable water as the pressure washing medium. The water was stored in a large tank mounted on a flatbed truck. The truck towed a single-axle trailer containing two gasoline-powered pressure washers (Figure 9). The workers used sprayers equipped with turbo-tip nozzles to wash the barrier at the specified pressure of 3,000 psi using gages mounted on the washers to verify the washing pressure. To keep the workers from spraying each other, their work was staggered. The first worker began washing on the northbound side of the wall at approximately 9:00 PM. The second followed up on the southbound side of the wall at

approximately 9:30 PM. They moved southward along the project in that staggered array working on opposite sides of the median. Approximately one mile of barrier wall was cleaned in each 12-hour work shift. Pressure washing operation was completed by the second weekend of the project.

After the median barrier was cleaned, it was allowed to dry for 24 hours. Then, 12 painters began applying the prime coat to the washed area of the barrier wall (Figures 10-17). As wet film thickness readings were difficult to perform, KYTC and the painting subcontractor agreed that as long as all areas were uniformly covered, the coating would be deemed acceptable.

Several times during the project, cleaning and painting operations were delayed by the paving work. Consequently, the painting subcontractor would have to return to previously washed and/or painted areas and rinse the median walls to remove accumulated dust and grime that resulted from the paving work (Figures 19 & 20).

As the painters applying the primer progressed their work along the barrier wall, 21 additional painters followed them applying the topcoat to primed areas that had been inspected (Figures 20-27). As with the primer, concurrent paving work caused some problems with the topcoat. Dust, dirt, tack oil, and other debris would accumulate on the previously painted surfaces. The painting subcontractor then would have to rewash those areas. Once the pressure washing was completed and the areas were dry, the painting subcontractor had the option of; 1) re-applying the primer in areas where it was re-washed and then applying the topcoat or 2) applying the topcoat heavier in those areas. In most cases, the painting subcontractor chose the second option.

The painting subcontractor completed the project on October 29, 2006. No additional rework was necessary. KTC researchers intended to perform additional coatings tests (color and adhesion) once the coating had cured. Unfortunately, weather and site access issues prevented the completion of that task. KTC will seek to conduct those tests later under long-term monitoring.

CONCLUSIONS

The project was completed generally in accordance with the specifications and special notes. All areas were cleaned prior to application of the coatings. Both coats of paint were applied within the specified limits except in the areas that had to be re-washed due to the problems associated with paving work. In those areas the top coat was applied at a greater wet film thickness as agreed upon by the painting subcontractor and KYTC officials. This issue might have been avoided by better coordination between the prime contractor and painting subcontractor.

This experimental project is the first trial of concrete coatings identified under KYSPR 05-271 Coatings, Sealants and Fillers to Address Bridge Concrete Deterioration and Aesthetics-Phase 1. The coatings systems identified under that study were intended to provide improved protection and aesthetics for reinforced concrete. This project proved that one candidate coatings system could be applied successfully on existing concrete.

FIGURES

Figure 1. Median barrier segments (similar to the existing median on I-65) at the Gohman field office used for the test patch. The segments have been cleaned by pressure washing and the epoxy prime coat has been applied.

Figure 2. A worker applying the test patch topcoat using a roller.

Figure 3. A worker applying the test patch topcoat by brushing.

Figure 4. A KYTC inspector using a tooth gage to take wet film thickness (WFT) reading on the top coat.

Figure 5. A typical pre-existing crack in the median barrier.

Figure 6. Exposed corroded reinforcing steel in the median barrier. Note the patch which was applied prior to this project.

Figure 7. A previously patched area on the median barrier.

Figure 8. Existing impact damage on the median barrier.

Figure 9. A worker using pressure washing to clean the I-65 median barrier.

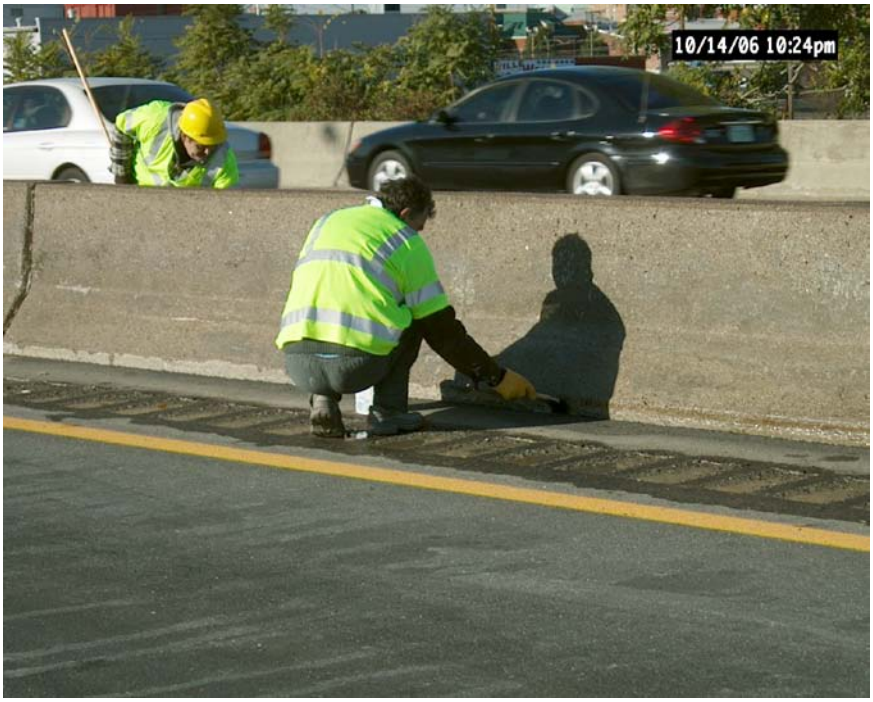

Figure 10. A painter applying primer at the base of the median barrier with a brush.

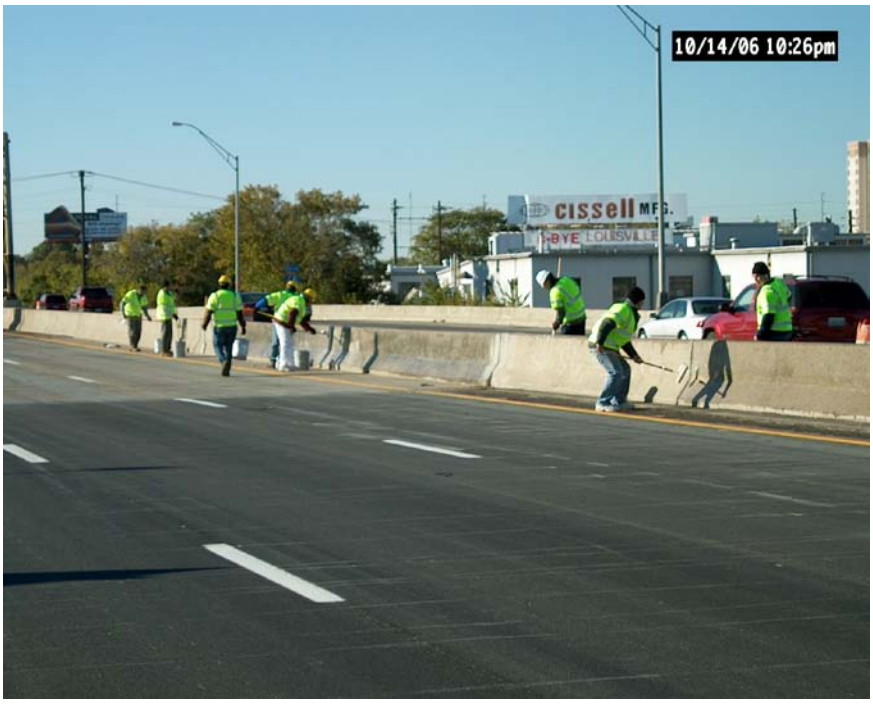

Figure 11. Painters applying the primer to the median barrier.

Figure 12. A painter using a brush to apply the prime coat in a joint.

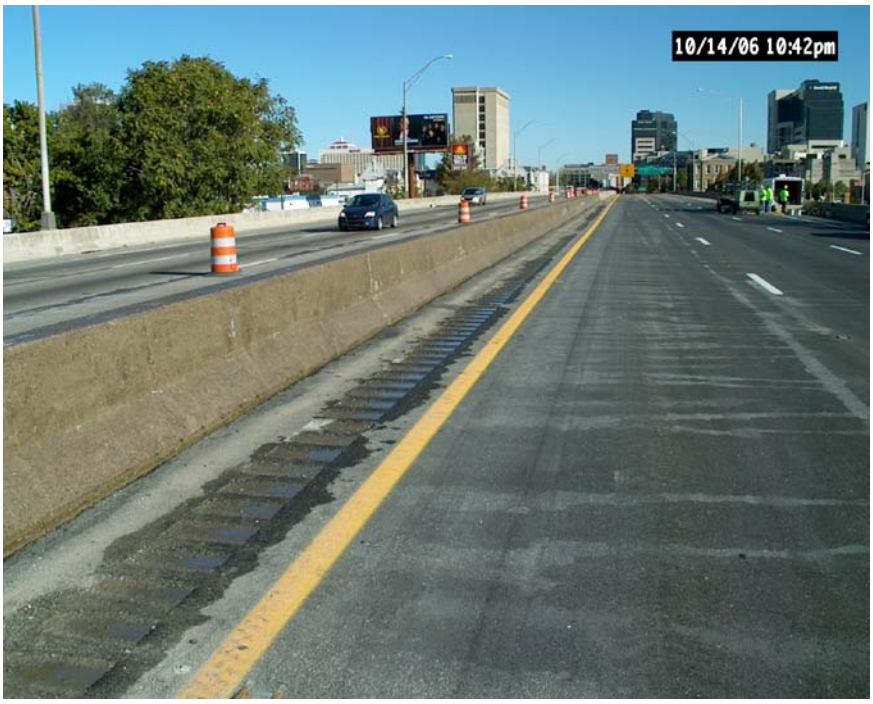

Figure 13. A primed section of the median barrier.

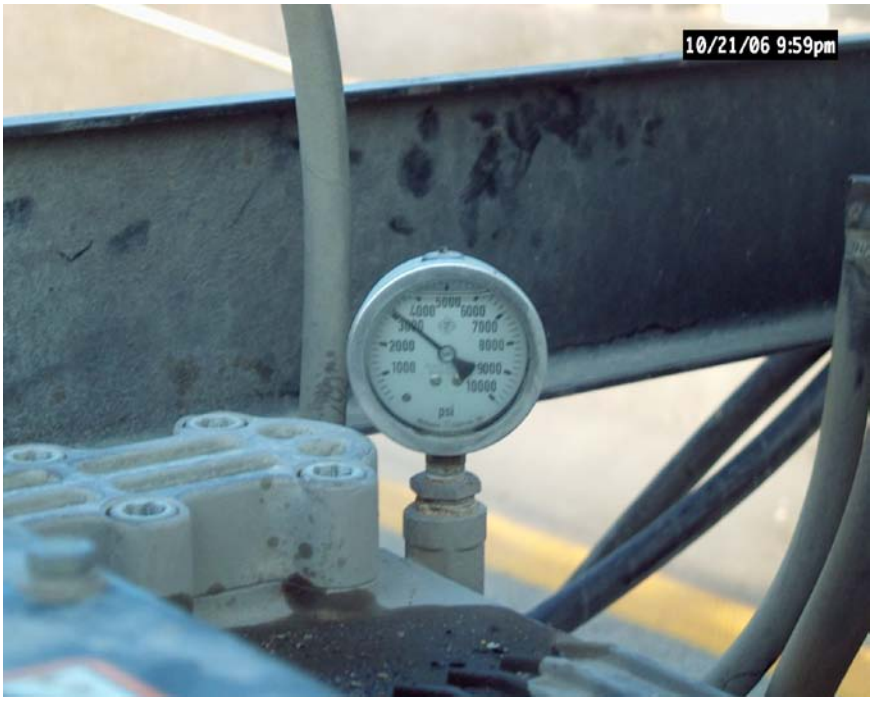

Figure 14. A pressure gauge during pressure washing indicating 3000 psi.

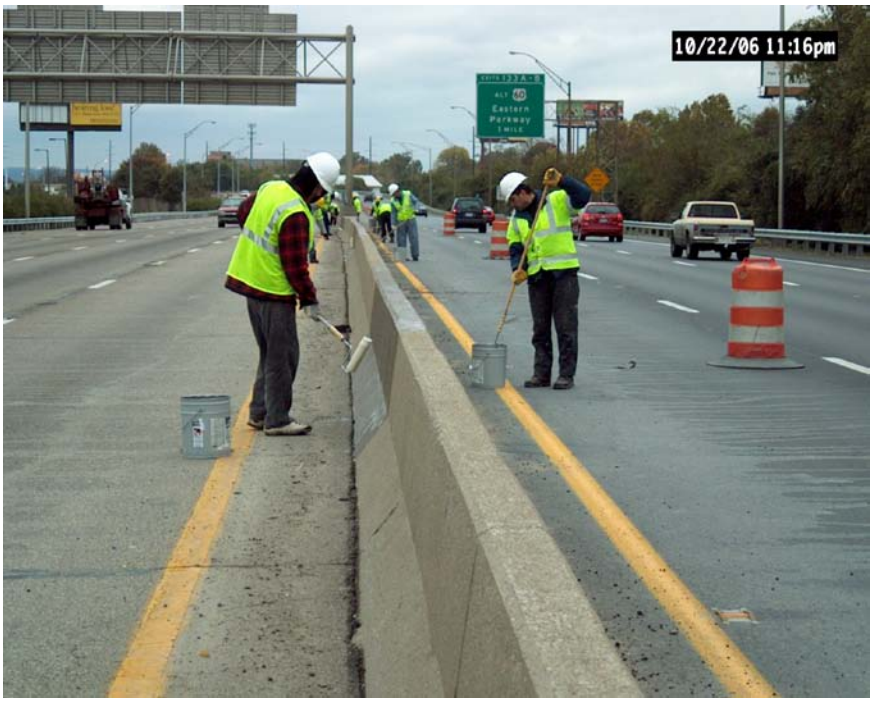

Figure 15. The prime coat being applied on both the north and south bound lanes.

Figure 16. The prime coat settling and ponding on the crevices in the concrete.

Figure 17. The prime coat being applied about a sign base.

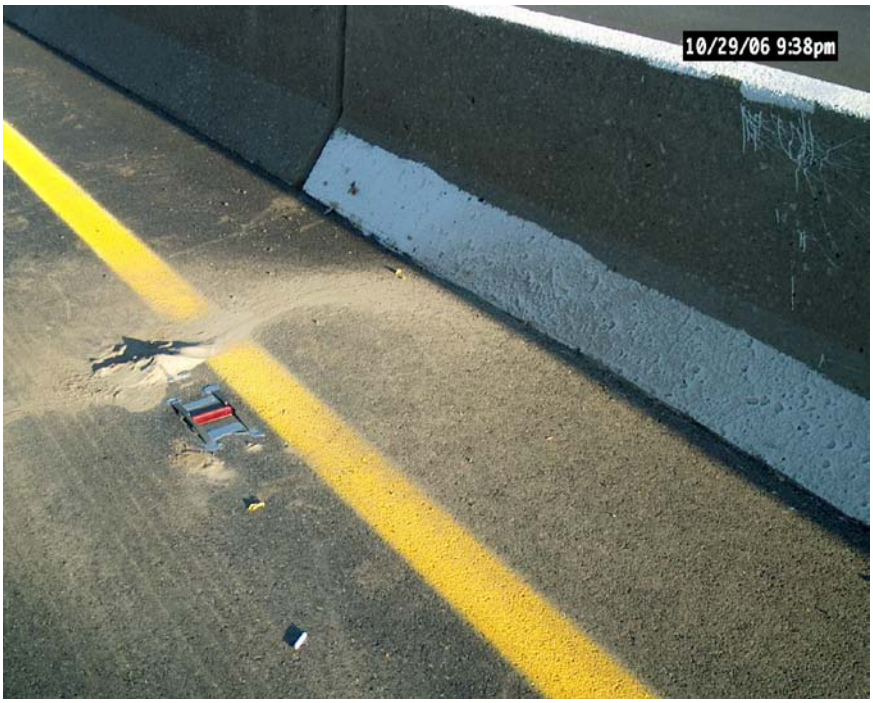

Figure 18. A picture showing a reflector that had been installed and the dirt that was blown onto the painted area of the barrier wall.

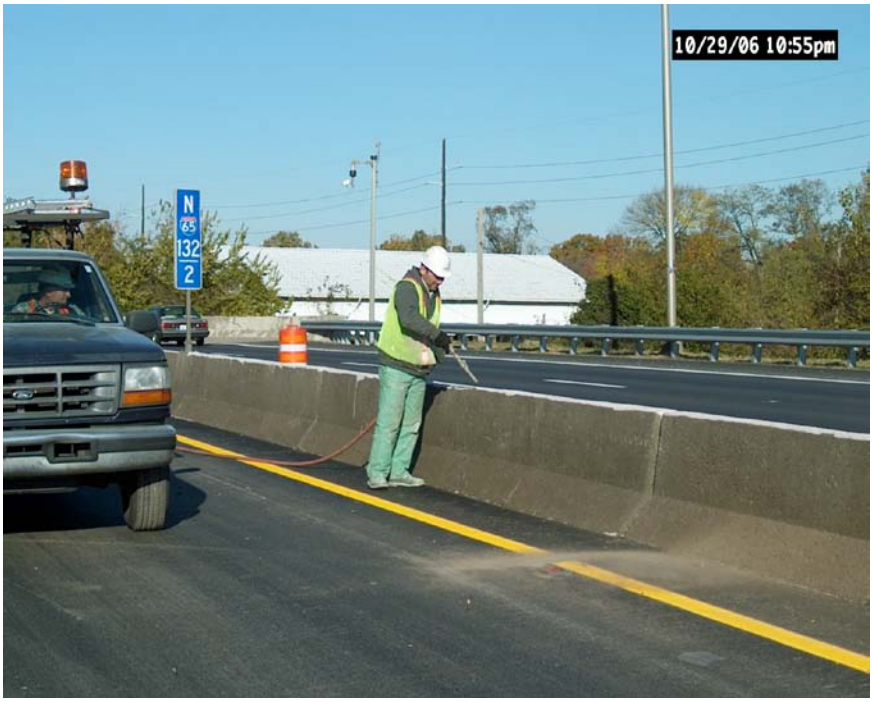

Figure 19. A worker using compressed air to remove dirt and dust from the top of the median barrier.

Figure 20. A worker mixing topcoat at the job site using a pneumatic hand drill.

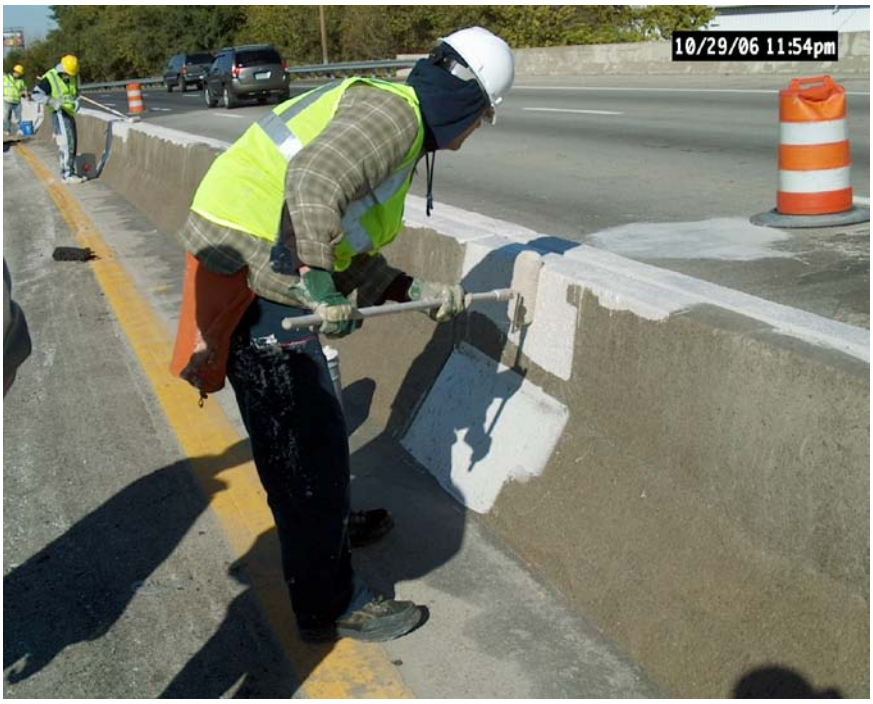

Figure 21. A painter applying the topcoat with a roller.

Figure 22. An inspector taking a wet film thickness reading on the barrier wall.

Figure 23. A reflector being installed to the top of the barrier. Note that the horizontal surface of the barrier has already been top coated.

Figure 24. A portion of the barrier wall that has been completely painted.

Figure 25. Painters applying the topcoat at night.

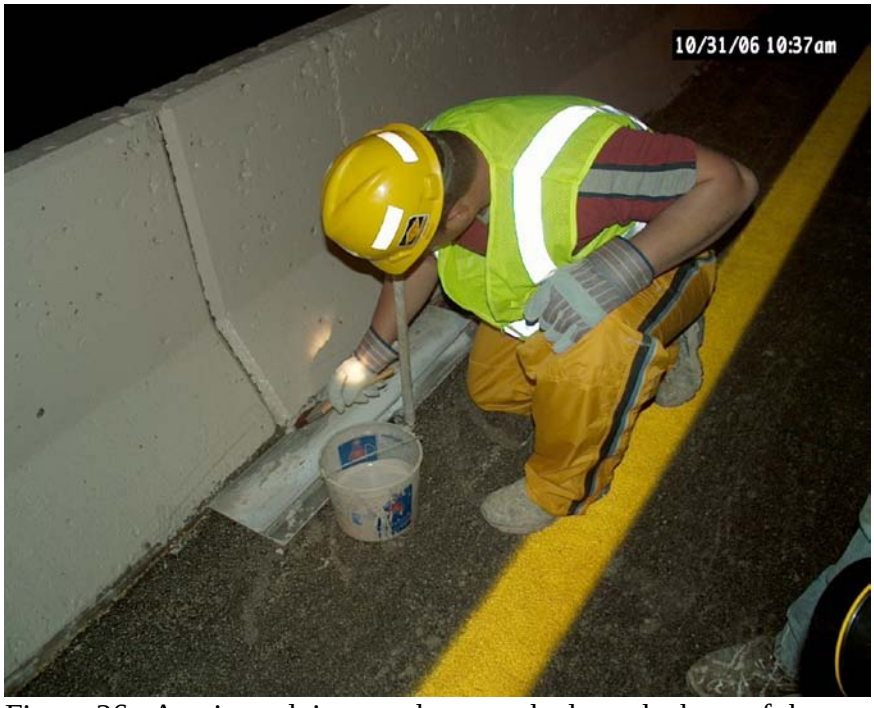

Figure 26. A painter doing touch up work along the base of the median barrier.

Figure 27. A painter performing touch up work at the barrier joints.

For more information or a complete publication list, contact us at:

KENTUCKY TRANSPORTATION CENTER

176 Raymond Building
University of Kentucky
Lexington, Kentucky 40506-0281

(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.ktc.uky.edu
ktc@engr.uky.edu