Experimental Coating on
Interstate 264 in Jefferson County
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Research Report
KTC-11-14/FR182-10-1F

Experimental Coating on Interstate 264 in Jefferson County

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In cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

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16. Abstract  
   A waterborne acrylic coating was applied over a washed and tool cleaned zinc/vinyl system as a maintenance overcoat. The coating has several positive characteristics in that it is “user friendly”, substrate tolerant, develops good adhesion quickly, and is environmentally friendly. There were some issues concerning quality of work in surface preparation and application and in the fact that on two locations bubbles developed in the newly applied coating. The cause of the bubbling has not been determined.

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The authors would like to thank District 5 personnel for helping in securing daily information reports for the painted bridges.
EXECUTIVE SUMMARY

A high build waterborne acrylic coating was used as an overcoat on pressure washed and tool cleaned bridges. After the initial overcoating efforts produced a variety of problems, the contractor re-equipped, retrained, and completed the project more or less in accordance with the specifications. However, throughout much of the project, there continued to be problems with surface preparation, inconsistent washing and tool cleaning, and coating application, especially with thin film on the latter bridges.

The coating is user friendly, has good adhesion, and appears to perform well in the short term except for two limited areas where bubbles developed. The cause of the bubbles has not been definitively identified but the underlying vinyl may be part of the problem.

KYTC needs to develop an Approved List of substrate friendly, user friendly, and high performing coatings to be used in overcoating projects. The experimental coating applied for this project appears to have potential as an overcoating material. KYTC needs to review policy in regard to the QC/QA process. In particular, it is likely that QA inspectors will need to be in containment to conduct quality assurance testing during the application of many of the likely coatings to be used in future overcoating projects.
1. INTRODUCTION

In May 2010 the Kentucky Transportation Cabinet (KYTC) awarded a contract for the cleaning and painting of 6 bridges on Interstate 264 (I-264) in Jefferson County, Kentucky. The project was awarded to PANTHER INDUSTRIAL PAINTING LLC of Mishawaka, Indiana with a bid of $3,299,220.00. The Engineer's Estimate was $3,674,360.76. Three bids were received and ranged from the low bid to $3,439,950.00. The 6 bridges are all plate girder construction, a mix of mainline and overpass structures located between milepoints 15.67 and 22.11 of I-264. The description and location of the bridges are provided in Table 1.

One of the bridges (B00002N) was abrasive blast cleaned and repainted with a standard KYTC three coat zinc primer system. The other five bridges were pressure washed and overcoated with a two-coat waterborne acrylic system. The coating system used was FAST CLAD® HB ACRYLIC supplied by the Sherwin-Williams Corporation. The Product Data Sheet for the subject coating is contained in Appendix A. Surface preparation was SSPC SP1 solvent cleaning, and subsequently by pressure washing, followed by pack rust removal, followed by SSPC SP3 tool cleaning. The pressure washing specified a 0° spinner tip at a minimum of 4,000 psi held perpendicular to the surface at a maximum distance of 12 inches.

The bridges being overcoated were painted in 1991 with a shop applied inorganic zinc primer and a field applied vinyl top coat. The condition of the bridges were similar with rust-through at splash zones and flange edges but no significant section loss (Figures 1 and 2). Steel surface area of the bridges ranged from 35,000 ft² to 85,000 ft² for a total of 294,000 ft². The unit cost for the overcoated bridges was $9.41 ft² and the unit cost for the abrasive blast cleaned bridge was $20.00 ft².

The coating used on this project had been previously submitted by the Sherwin Williams Corporation for consideration to be included on the KYTC List of Approved Materials as part of a 3-coat direct to metal paint system. The system as submitted used a zinc based primer with the FAST CLAD® HB ACRYLIC used as both the intermediate and top coats. Testing was conducted by KTC per ASTM 5894 which incorporates accelerated weathering (cyclic UV/humidity-QUV) and corrosion (cyclic condensation/evaporation-Prohesion). After 5,000 hours of accelerated weathering, the coating system was evaluated according to the KYTC Division of Materials protocol and placed on the List of Approved Materials (Structural Steel Coatings).

When the FAST CLAD® HB ACRYLIC was specified for the I-264 overcoating project, no zinc primer was specified and the surface preparation specified was the aforementioned pressure wash and power tool cleaning, therefore; the project became an
experimental project. As such, the KYTC and Federal Highway Administration (FHWA) desired monitoring and documentation of application and coating performance. In August of 2010 the KYTC with the concurrence of the FHWA approved a Federal Aid Research Task with the University of Kentucky Transportation Center (KTC) to document the construction and performance of the experimental project. The objectives of the study were: to document the field activities at each structure, assess the coating, and prepare a final report. The final report would document construction activities, any problems that occurred, their resolution, and short-term coating performance.

2. SPECIFICATION

The cleaning and painting contract Special Notes for this project referenced KYTC Standard Specifications, coating manufacturers’ recommendations, and the Society for Protective Coatings (SSPC) standards. The process included solvent cleaning (SSPC SP-1), pressure washing by prescriptive special notes, stratified rust removal, mechanical surface preparation (SSPC SP-3), and paint application meeting both KYTC and coating manufacturers’ recommendations. The contractor was required to meet the most restrictive application conditions, KYTC or manufacturers’, thus assuring compliance with both.

The prescriptive pressure washing notes required washing with a minimum of 4,000 psi and a maximum of 5,000 psi working pressure at any location, 0° spinner nozzles, water stream perpendicular to the cleaned surface, and maximum 12-inch stand off distance of the nozzle from the cleaned surface. The purpose of the washing requirement was to remove all debris from the surface and to proof test the existing vinyl topcoat for adhesion. Special Notes for the overcoating work are contained in Appendix B.

3. CONSTRUCTION

Work began on the project on August 16, 2010. The first bridge cleaned and painted was B00002N, the abrasive blast and recoated bridge. Work on the overcoated bridges proceeded from east to west beginning with B00442N. Rigging of B00442N began on August 23 2010 and surface preparation began August 30 2010. Progress of work for each bridge is shown in Table 1. Rigging and containment of each bridge began while the previous bridge was in the process of being cleaned and painted.

Traffic Control Notes for this project required that traffic was maintained when cleaning and painting was conducted inside containment over traffic (i.e. in overpass structures). The containment consisted of chain link fencing covered with impermeable tarps and supported by cables meeting the specified requirement of SSPC Guide 6 – Containment Classification Class
The Special Notes also required that all wash water be filtered prior to release. The contractor met this requirement by pumping water from the containment to a filter lined receptacle, Figure 5. There is no record of sampling or testing of the released wash water.

The contractor began work on B00442 without understanding the specified requirements or intent of the Special Notes. The KYTC QA inspector onsite requested technical assistance and a meeting was subsequently held on August 31, 2010 at which time the contractor’s operations were reviewed and the Special Notes were explained. Initially, the contractor was rinsing the substrate at 3,000 psi with fan tips held at angles and distances varying from the specification. Subsequently the contractor reequipped and attempted to work in compliance with the specification. Initially, pressure washing was somewhat inconsistent as the stand-off distance and angle of the water stream were not according to specification. This appears to be due to workers standing the containment tarps when pressure washing. As a consequence, the lower half of beams were washed correctly but the upper half received less effort because it was above the workers’ heads. The resulting difference in surface preparation can be seen in Figure 6. Pressure washing/proof testing was corrected as work progressed through the first structure.

After pressure washing the entire structure, the contractor began mechanical surface preparation. Initially, the contractor tool cleaned rusted areas to an SSPC SP 11 condition, Figure 7. After QA inspection pointed out the excessive cleaning, the contractor reverted to the specified SSPC SP 3 cleaning with feathered edges of existing paint for the remainder of the project, Figure 8.

After surface preparation was accepted, the contractor began a spot painting of tool-cleaned areas. Cabinet personnel pointed out that spot painting was not required by the contract but the contractor felt that it would produce a better end product and continued with the extra step. An epoxy mid-coat, Sherwin-Williams Macropoxy 646, from the B00002N bridge was used for spot painting bridge B00442N. Application of the epoxy spot coat resulted in several lifted edges of the existing paint. Workers scraped the lifted edges before applying primer.

After B00442N was completed both the primer and top coat for all remaining bridges on the project were striped and spot coated with the specified acrylic primer coating, Figures 9 and 10. The epoxy paint was not used on the remaining structures. Throughout the rest of the project, there were occasional lifted edges encountered when using the acrylic paint but fewer than with the epoxy, Figure 11.

Remove and replace bridge painting projects, abrasive blast and recoat, use nondestructive testing for coating film thickness inspection. The process specified for this project, overcoating, leaves the existing coating in place. The thickness of the remaining existing coating after washing, proof testing, varies to the extent that no reasonable amount of testing would establish a baseline thickness value to allow the use of nondestructive tests to evaluate the film thickness of the newly applied coating.
The Special Notes required the wet film thickness (WFT) of the applied coating to be determined by Kentucky Method 64-258-08 PROCEDURE A – MEASUREMENT OF WET FILM THICKNESS OF STRUCTURAL STEEL COATINGS. QA inspectors on this project attempted to obtain dry film thickness (DFT) measurements per Kentucky Method 64-258-08 PROCEDURE B – MEASUREMENT OF DRY FILM THICKNESS OF STRUCTURAL STEEL COATINGS BY DESTRUCTIVE MEANS on the first bridge overcoated (B00442N). Difficulties in taking DFT measurements were encountered due to tearing and stretching of the coating. After the first bridge was completed only WFT measurements were obtained for the remaining bridges. The QA inspector had applicators obtain the measurements and pass the notch gage outside containment for review. Quantities of paint used were also documented to estimate WFT.

Cleaning and painting continued sequentially from B00442N, B00439N, B00434N, B00438N to B00437N. The top coat was applied on the final bridge (B00437N) on October 21, 2010. Touch-up of de-rigging marks was completed on October 30 and the project was determined to be complete pending final inspection.

3.1 ISSUES

A minor problem with the project was that KYTC had not specified an overcoating project in several years, thus the contractor and the inspection staff were unfamiliar with the process. This led to: 1) inconsistent surface preparation (both pressure washing and tool cleaning), and 2) uneven coating application (respraying to achieve film build resulting in heavy overspray). Fortunately, these problems were worst at the beginning of the project. Exacerbating this situation was inconsistent communication at the initial preconstruction meeting. The contractor, apparently not familiar with the proposal, asked about spot painting tool cleaned areas, which was not required by the specification. To compound the situation, the question was incorrectly answered by a coatings supplier’s technical representative (who should not have provided a response). KYTC personnel at the meeting did not correct that situation. This led to disagreements in the field. As the project staff gained experience with the coating and the process the quality of work improved and became more consistent.

WFT measurements by QC/QA inspectors are difficult to obtain. KYTC policy is for QA inspectors to remain outside of containment until spray out is completed. This policy is based on worker protection due to exposure to solvents. Initial personnel monitoring to establish respiratory protection levels is conducted with QA inspectors outside of containment until QC inspection and touch-up is completed. A variety of factors may affect curing. Consequently, WFT measurements are only accurate immediately after application.

This coating, and many others, cure through a process of coalescence and therefore the curing rate is significantly affected by ambient temperature, steel temperature, relative humidity
and other job-specific factors. This coating has 41.5% volume of solids therefore there is a significant difference between WFT and DFT. DFT is very difficult to obtain, due to elasticity of the coating, until the coating is well cured which may not occur until weeks after application. Therefore, DFT measurements are not practical when using this coating.

WFT measurements and application rates calculated from quantities of paint used are the only realistic ways to assess film build. However, these methods have their own problems in that overspray and inconsistent application would render calculated WFT inaccurate and reading of tooth gages used by applicators are not verifiable by the QA inspector unless he/she stays in containment during coating application. Furthermore, the methods used to track WFT violate the concept of QC/QA inspection as used by the KYTC in that the QC inspector is charged with ascertaining that the specified coating application is met and the QA inspector is charged with final assurance of compliance by use of follow-up spot checks. Film thickness of this coating continues to change for several days if not weeks therefore DFT would take several weeks to ascertain. While the issues with film build determination are significant, this coating is “user friendly” and sufficient coating can be safely applied to assure meeting minimum requirements (if the contractor is aware of the issues and willing to apply some extra paint). Measurement of total paint consumption as an indicator of film build remains somewhat problematic due to the possibility of overspray or other losses. However, it can indicate when minimum or inadequate amounts of paint are employed.

Another significant problem occurred in two locations of the project. Top coat was applied to B00439N on September 13, 2010. Inspection of the primer before top coat application and inspection of the top coat on September 16 found only routine issues, such as minor holidays or scuffed top coat, which were repaired. KTC personnel were at the bridge on October 6 to conduct adhesion testing and found several bubbles on the outside face of the southwest facia girder. The bubbles occurred between the primer and top coat. On October 11 the bubbles were cut off and top coat reapplied. Follow-up inspections by KTC personnel found that the bubbles reappeared and remain in place as of this report. The number and size of bubbles appear to remain unchanged after initial reappearance.

At bridge B00437N the top coat was applied on October 2, 2010. QA inspection of the primer and top coat on October 25, again found only routine paint issues which were repaired. Final inspection on November 1st found bubbles on the outside face of the southwest facia girder, Figure 12. At a meeting of KYTC officials, the contractor, the material supplier, and KTC researchers on November 4, the decision was made to leave the bubbles in place until further investigative work was performed that might determine the cause. KYTC decided to include repairs to the bubbles on these bridges to an upcoming project to clean and paint the remaining I-264 bridges. Subsequent inspections by KTC personnel found that the number and size of the bubbles at this location continued to increase through following months. KTC conducted a final pre-report inspection in May of 2011. At that time several bubbles had appeared on the inside face of the same girder.
4. FIELD DATA

4.1 FILM BUILD

Coatings film thickness data at the time of application for the first overcoated bridge (B000442N) was difficult to ascertain. Initial efforts to measure DFT were unsuccessful due to the softness and elasticity of the coating. The QC/QA inspectors began using WFT measurements and tracking quantities of paint for the top coat of B000442N and all bridges painted thereafter. All reported WFT measurements ranged from .012 to .014 inches. Quantities of paint expended were used to calculate WFT on a bridge by bridge basis. The total quantity of paint per bridge was considered in those calculations. Other paint losses including, overspray, stripping, and unused coating material left in a bucket were not accounted for. Calculated WFT ranged from a high of .031 inch (i.e. 31 mils) for the primer coat of B000442N to .013 inch (i.e. 13 mils) for most of the remaining coats on all bridges. Using the volume of solids, 41.5% from the Product Data Sheet, DFT was calculated on the same basis as the WFT. Calculated DFTs ranged from .013 down to .005 inch (i.e. 13 mils down to 5 mils). Progress of work dates, bridge areas, paint quantities, and calculated film thicknesses are shown in Table 2.

Since .005 inch (i.e. 5 mils) is the minimum recommended DFT per coat and the calculated DFT applied per coat, researchers were concerned that actual paint film might not meet the minimum specified DFT of .005 inch. DFT measurements were obtained, per Kentucky Method 64-258-08 PROCEDURE B, at all bridges at various dates but most of them were obtained after April of 2011. Measured DFT on all bridges showed inadequate coating thicknesses for both the primer and top coats. Film build readings tended to decrease in the order the bridges were painted with the final two bridges having approximately 50% of the recommended film thickness. Measured DFT for all bridges is shown in Table 3.

4.2 ADHESION

Coating adhesion over a period of time was measured on three of the bridges (B00442N, B00439N, and B00437N). The tests were conducted at various times after application with shortest cure time prior to adhesion testing being 2 days after application at two of the bridges. The longest cure time tested was 200 days. All adhesion measurements were in accordance with ASTM 4541–09 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers - Method D (1). After two days cure, adhesion ranged from 200 to 500 psi and averaged 393 psi. After 165 days cure adhesion ranged from 618 to 1341 psi and averaged 1057 psi. Where an epoxy spot coat had been applied on B00442N, the coating test failure was an adhesive failure between the acrylic and epoxy coatings. The remainder of the coating test failures was cohesive failures in the vinyl coating.
4.3  CHLORIDE

Three bubbles in the newly applied coating on bridge B00437N were cut exposing the underlying vinyl coating. Then chloride extraction tests were performed on the underlying coating, Figures 13, 14 and 15. The Bresle extraction method was used with results of 24, 35, and 42 µS/cm. Those values approximate chloride contaminate values of 3.0, 4.4, and 5.3 µg/cm² as converted per SSPC Technology Guide 15 (1)

5. COATINGS PERFORMANCE

The FAST CLAD® HB ACRYLIC coating has performed well in the short term. After some problems with insufficient film build, multiple application, and running paint on the first bridge overcoated, the contractor became familiar with the paint. Thereafter application on the subsequent bridges became more consistent with fewer problems. This coating is “user friendly” in that it sprays out well, has sufficient sag resistance to allow film build in excess of that specified, produces fewer “lifted edges” on existing paint than many other coatings, possesses an indefinite pot life, and creates minimal overspray problems.

Coating adhesion was very good. After 2 days cure, coating adhesion ranged from 200 to 500 psi. After 165 days cure, coating adhesion ranged from 450 to 1340 psi and averaged 925 psi. Some of the lower strength tests were probably glue failures caused by cold weather encountered during testing. All adhesion test breaks were cohesive breaks in the underlying vinyl coating.

Although the coating has good characteristics, KTC researchers are concerned with the bubbling problem that developed shortly after application in two locations. At both locations the bubbles did not appear immediately but several days later and in one case (bridge B000437N) continued to increase in number, size, and affected area throughout the observation period for this study (May 2011). At the present, there is no proven explanation for the bubbling problem. The coating was applied over freshly washed aged vinyl that is very porous. The vinyl may have retained water when overcoated and the bubbling may have occurred when the water vaporized and tried to move outward through the acrylic topcoat. That does not entirely explain the continued development of bubbles that were observed after months of curing. Field tests indicate low chloride levels, 3.0, 4.4, and 5.3 µg/cm², that should not have induced osmotic blistering.

6. CONCLUSIONS

The contractor did a good job in conducting abrasive blast and repainting operations. However, he was not prepared to conduct the overcoating work as specified. After the initial overcoating efforts produced a variety of problems, the contractor re-equipped, retrained, and completed the
project more or less in accordance with the specifications. However, throughout much of the project, there continued to be problems with surface preparation, inconsistent washing and tool cleaning, and coating application especially with thin film on the latter bridges.

The coating, Sherwin Williams’ FAST CLAD® HB ACRYLIC, is user friendly, has good adhesion, and appears to perform well in the short term except for two limited areas where bubbles developed. Even a few hundred square feet of bubbled paint out of approximately 300,000 square feet is unacceptable. The cause of the bubbles has not been definitively identified but the underlying vinyl may be part of the problem.

7. RECOMMENDATIONS

KYTC has hundreds of bridges that have been painted with zinc primer systems over the past 10 years. There are other bridges that have been painted with long oil alkyds or similar coatings during the same time period. As a result of observations during this study the following recommendations are;

1) Develop an Approved List of substrate friendly, user friendly, and high performing coatings to be used in overcoating those systems to provide added years of protection at low costs.

2) The Sherwin Williams’ FAST CLAD® HB ACRYLIC material appears to have potential. Future projects using this coating need to be monitored until the problem issue is completely understood and resolved. In addition, comparable acrylic or other competitive coatings with similar potential need to be identified and tested to provide a competitive market.

3) As the use of overcoating increases the use of waterborne coatings formulated for overcoating will increase. KYTC needs to review policy in regard to the QC/QA process. In particular, it is likely that QA inspectors will need to be in containment to conduct quality assurance testing during the application of many of the likely coatings to be used in future overcoating projects.

4) As KYTC specifies more overcoating projects, more experimental coatings and differing surface preparation will be specified. The current KYTC contractor prequalification process doesn’t address contractor ability to respond to unfamiliar circumstances. KYTC should take additional steps during pre-bid conferences and test patch application to insure that all new or experimental materials or processes are fully understood and properly applied by the contractor.

8. REFERENCES

9. TABLES

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<th>Bridge No.</th>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Description</th>
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<td>B00437N</td>
<td>I-264 over US 31 (Bardstown Rd)</td>
<td>38 12' 40.90&quot;</td>
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<td>B00438N</td>
<td>I-264 over KY 155 (Taylorsville Rd)</td>
<td>38 13' 17.40&quot;</td>
<td>85 39' 03.30&quot;</td>
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<td>B00434N</td>
<td>KY 1932 (Breckenridge Ln) over I-264</td>
<td>38 13' 42.03&quot;</td>
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<td>CR 1003 (Browns Ln) over I-264</td>
<td>38 13' 59.32&quot;</td>
<td>85 37' 38.31&quot;</td>
<td>75 ft – 149 ft – 109 ft – 48 ft Steel Girder Spans</td>
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<td>B00442N</td>
<td>I-64 WB to I-264 WB ramp over I-264</td>
<td>38 14' 15.40&quot;</td>
<td>85 37' 24.40&quot;</td>
<td>70 ft – 139 ft – 173 ft – 87 ft Steel Girder Spans</td>
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<td>B00002N</td>
<td>US 42 (Brownsboro Rd) over I-264</td>
<td>38 16' 47.58&quot;</td>
<td>85 38' 10.74&quot;</td>
<td>40 ft – 60 ft – 60 ft – 40 ft Steel Girder Spans</td>
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Table 1. Bridge locations and structure details

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<th>B439 - Browns Lane</th>
<th>B434 - Breckenridge</th>
<th>B438 - Taylorsville</th>
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<td>WFT</td>
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<td>0.011</td>
<td>0.015</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>DFT</td>
<td>0.006</td>
<td>0.005</td>
<td>0.006</td>
<td>0.005</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Table 2. Chronology of overcoating work and film build calculated from quantities used.
<table>
<thead>
<tr>
<th>Bridge No. and Location</th>
<th>Total Cure Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>B442 - I-264 Ramp</td>
<td>2</td>
</tr>
<tr>
<td>B439 - Browns Lane</td>
<td>2</td>
</tr>
<tr>
<td>B437 - Bardstown</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3. Applied coating adhesion.

<table>
<thead>
<tr>
<th>Bridge No. and Location</th>
<th>DFT in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>B442 - I-264 Ramp</td>
<td>0.002 0.006</td>
</tr>
<tr>
<td>B439 - Browns Lane</td>
<td>0.005 0.005</td>
</tr>
<tr>
<td>B434 - Breckenridge</td>
<td>0.006 0.004</td>
</tr>
<tr>
<td>B438 - Taylorsville</td>
<td>0.0035 0.0025</td>
</tr>
<tr>
<td>B437 - Bardstown</td>
<td>0.003 0.0035</td>
</tr>
</tbody>
</table>

Table 4. Measured dry film thickness.
10. FIGURES

Figure 1. Condition of bridges prior to overcoating.

Figure 2. Condition of bridge coating prior to overcoating.
Figure 3. Cable and fencing used to support containment.

Figure 4. SSPC Class 2W containment.
Figure 5. Wash water is pumped from impermeable tarps to a filter prior to release.

Figure 6. Pressure washed/proof tested existing coat.
Figure 7. Excessive initial tool cleaning.

Figure 8. Properly tool cleaned surface with feathered edges.
Figure 9. Spot coating of primer over tool cleaned areas.

Figure 10. Spot and partial stripe coating the primer coat.
Figure 11. Lifted edge on newly applied coating. Surface preparation did not feather edge.

Figure 12. Development of bubbles in newly applied coating on B00437N.
Figure 13. A bubble which developed on bridge B00437N.
Photo was mislabeled as B417.

Figure 14. The bubble sliced away exposing the underlying preexisting vinyl coating.
Photo was mislabeled as B417.
Figure 15. Bresle chloride extraction patch on exposed vinyl coating. Photo was mislabeled as B417.

Figure 16. Typical example of overcoated bridge on I 264 after completion.
### APPENDIX A – Product Data Sheet for Sherwin-Williams

**FAST CLAD® HB ACRYLIC**

### PRODUCT INFORMATION

**Product Description**

FAST CLAD HB ACRYLIC is a one component, fast dry, high build finish designed for one coat application directly to organic or inorganic zinc rich primers or other recommended primers. May also be applied directly to prepared steel.

- High film build in one coat
- Superior gloss and color retention
- Fast Dry
- Outstanding early moisture resistance
- Chemical resistant
- Low odor, low VOC
- Corrosion resistant

**Recommended Uses**

For use over prepared:

- Organic zinc rich primers
- Inorganic zinc rich primers
- Other recommended primers

Examples:

- Buildings
- Stadiums
- Structural Steel
- Machinery
- Equipment
- New Construction
- Power plants
- Irrigation
- Storage Tank Exteriors
- Select Marine
- Bridges
- Water treatment plants
- Structures

Conforms to AWWA D102-03, OCS #0

Suitable for use in USDA inspected facilities

Acceptable for use in high performance architectural applications

Under certain atmospheric conditions, provides dry film properties on exterior applications

### PERFORMANCE CHARACTERISTICS

**Substrate:** Steel

**Surface Preparation:** SSPC-SP10

**System Tested:**

1. Zinc Cad II Plus @ 3.0-4.0 mils (75-100 microns) dft
2. Fast Clad HB ACRYLIC @ 8.0-8.0 mils (160-200 microns) dft

**Test Data:**

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Test Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion Resistance</td>
<td>ASTM D4534</td>
<td>&lt;158 mgs/60000</td>
</tr>
<tr>
<td>Abrasion Resistance</td>
<td>AASHTO R31, Section 9 Test 4</td>
<td>&lt;200 mgs/60000</td>
</tr>
<tr>
<td>Adhesion</td>
<td>ASTM D3354</td>
<td>487 psi</td>
</tr>
<tr>
<td>Adhesion</td>
<td>AASHTO R31, Section 9 Test 5</td>
<td>1915 psi</td>
</tr>
<tr>
<td>Corrosion Resistance</td>
<td>ASTM D5034, 6 cycles, 168 hours</td>
<td>3.5 hrs</td>
</tr>
<tr>
<td>Corrosion Resistance</td>
<td>AASHTO R31, Section 8 Test 3</td>
<td>3.5 hrs</td>
</tr>
<tr>
<td>Direct Impact Resistance</td>
<td>ASTM D2734</td>
<td>&gt;150 lbf, direct and indirect</td>
</tr>
<tr>
<td>Dry Film Resistance</td>
<td>ASTM D4685</td>
<td>200°F (93°C)</td>
</tr>
<tr>
<td>Exterior Durability</td>
<td>1 year, 45°F South</td>
<td>Excellent</td>
</tr>
<tr>
<td>Flexibility</td>
<td>ASTM D562, 90° bend, 180° mandrel</td>
<td>Passes</td>
</tr>
<tr>
<td>Moisture Resistance</td>
<td>ASTM D5260, 100°F (38°C), 1000 hours</td>
<td>Passes</td>
</tr>
<tr>
<td>Penetration Resistance</td>
<td>ASTM D5633</td>
<td>68</td>
</tr>
<tr>
<td>Salt Fog Resistance</td>
<td>ASTM B117, 5,000 cycles, 10% NaCl</td>
<td>Rating 10 per ASTM D1615 for neutral, Rating 10 per ASTM D174 for belching</td>
</tr>
<tr>
<td>Salt Fog Resistance</td>
<td>AASHTO R31, Section 8 Test 6</td>
<td>Blister Rating 10, Average Creep @ .0001 in 1 hour</td>
</tr>
<tr>
<td>Freeze Thaw</td>
<td>AASHTO R31, Section 8 Test 6</td>
<td>Average Failure Strength = 2,000 psi</td>
</tr>
</tbody>
</table>

**Drying Schedule**

- 12.0 mils wet (300 microns)
  - @ 40°F/74°F C, 50% RH
  - 1 hour to touch
  - 4 hours to handle
  - 24 hours to reheat

**Theoretical Coverage**: 604 ft²/gal (16.3 m²/l)

**Product Characteristics**

- **Finish**: Semi-Gloss
- **Color**: Wide range of colors available
- **Volume Solids**: 41.5% ± 2%, may vary by color
- **Weight Solids**: 52.3% ± 2%
- **VOC (EPA Method 24)**: < 200 g/L, 1.66 lb/gal

**Recommended Spreading Rate per coat**

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0</td>
<td>15.0</td>
</tr>
<tr>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>83</td>
<td>136</td>
</tr>
</tbody>
</table>

**Theoretical Coverage** 604 ft²/gal (16.3 m²/l) at 71°F/22°C, 50% RH

**Storage**: 30 months, unopened. Store @ 40°F/4°C to 100°F/38°C

**Flash Point**: >200°F (93°C), Seta

**Reducer/Clean Up**: Water

www.sherwin-williams.com/protective
12. APPENDIX B – Project Special Notes

BRIDGE CLEANING AND PAINTING
DISTRICT NO. 5
I-264
Jefferson County
FD52 1200 IM 2641 (167)
BRIDGE CLEANING AND PAINTING

SPECIAL NOTE FOR BIDDING PREQUALIFICATION AND STAFFING

Bidders must be Pre-qualified under 18B – Bridge Painting to have a bid opened and read.

The contractor must retain staff meeting the requirements listed below for the duration of this contract. Any production work conducted while not meeting these requirements is not eligible for payment. Company personnel must have been directly responsible for field operations of a bridge painting project;

1. Over a river or having multiple structures (more than three),
2. Having specific containment requirements, and
3. Maintaining vehicular traffic.

The projects must have been completed to the facility owners’ satisfaction

SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION

MP 056 0264 B00437N 15.67, MP 056 0264 B00438N 16.99, MP 056 0264 B00434N 17.92

MP 056 0264 B00439N 18.20 and MP 056 0264 B00442N 19.04

Clean and paint all structural steel in accordance with the Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction (current edition) and the following requirements:

A: SUBMITTALS

The Contractor will submit the following written items to the Project Engineer 14 days prior to the Pre-Construction Conference:
1. A detailed Progress of Work Schedule. The Progress of Work Schedule will be reviewed and approved by the KYTC Engineer.

2. Traffic Control Plan. The Traffic Control Plan will be reviewed and approved by the KYTC Engineer.

3. Worker Protection Plan. The Worker Protection Plan will be reviewed by the KYTC Engineer.

4. Environmental Compliance Plan, including a Waste Management and a Ground Water Protection Plan. The Environmental Compliance Plans will be reviewed by the KYTC Engineer.

5. Manufacturers’ recommended Film Thickness and application conditions for the coating system to be used.

6. Design for containment shall be signed and stamped by a licensed Kentucky Professional Engineer. The Design for containment will be reviewed by the KYTC Engineer.

B: CONTAINMENT

Totally enclose all structural steel during all phases of the work. Use containment that meets the criteria for **SSPC Guide 6 – Containment Classification Class 2W.** A minimum air movement in containment is not specified but the contractor will demonstrate that the air movement in the containment will provide the necessary engineering control to comply with OSHA worker safety requirements.

Quantity of emissions from containment will be assessed using **Method A** – Visible Emissions of **SSPC Guide 6 - Level 2 Emissions.** Emissions will be monitored for at least 15 minutes and reported in the log book (see Quality Control) at least once for every four (4) hours of cleaning and painting. Observance of emissions at any time may require (at the discretion of the Engineer) that cleaning and painting cease until the containment is sufficient to prevent emissions.

Method G – At a minimum, visually assess the worksite for cleanliness at the beginning and end of each work shift. Record each assessment in the logbook noting the location and description of any accumulation of debris. Production work will not continue without approval of site cleanliness.

Provide proper (OSHA COMPLIANT) lighting on all operations (i.e. surface preparation, painting and inspection). Lighting for QA inspections will meet the criteria described in **SSPC Guide 12** (Guide for Illumination of Industrial Painting Projects) for inspection.
Collect wastes deposited on the containment materials daily. In addition, clean prior to moving/dismantling the containment. The Engineer may direct additional cleaning as conditions warrant.

C: SURFACE PREPARATION

Solvent Cleaning

Prior to using any of the methods of substrate preparation specified herein, remove visible grease and oil from the surface. Clean the surface in accordance with SSPC-SP 1 to remove oil, grease, and any other surface contaminants. Only use solvents or detergents that are acceptable to the coating manufacturer and the Department. Use clean cloths for the final wiping of the cleaned surface. Collect, handle, store, and dispose of all cleaning materials as hazardous waste.

Compressed Air

When compressed air is used for any work, use only compressed air that is free from oil and/or water. Verify the cleanliness of the compressed air in accordance with ASTM D 4285 (blotter test). Verify the cleanliness of the compressed air at least once per shift per compressor or as directed by the Engineer.

Pressure Washing

Clean all structural steel by pressure washing. Equip spray wands used in pressure washing with 0° spinner nozzles. Equip the pressure washer(s) with calibrated gage(s) and pressure regulators to ascertain and regulate water pressure. Provide manufacturers’ tables/charts indicating line pressure loss per lineal foot of hose used at the specified conditions. Size the pressure washers so that no combination of hose length or pressure washer placement will result in an output pressure less than 4,000 psi or more that 5,000 psi from any spray wand at any pressure washing location. The washing wand must be approximately perpendicular to the washed surface and within 12 inches of the surface. Wand extensions greater than 36 inches will be subject to Central Office Division of Construction approval.

Stratified/Pack Rust Removal

Remove all stratified and pack rust from all structural steel. Collect all rust debris and dispose with the other debris generated by pressure washing.

Mechanical Surface Preparation
After pressure washing, perform mechanical surface preparation on all surfaces not possessing clean, adherent paint (e.g. rust, loose paint, or loose mill scale). Clean those surfaces to correspond with **SSPC – SP3**. Ensure that the appropriate resulting surface condition for **SSPC-SP3** is present at the time of painting.

After tool cleaning and prior to painting, remove all residue, dirt, dust, or similar contaminants from the cleaned surface to the satisfaction of the Engineer.

The contractor is solely responsible for any damages arising from the surface preparation operations.

**D: MANAGEMENT OF INDUSTRIAL AND HAZARDOUS WASTE (SEE SPECIAL NOTE FOR ENVIRONMENT AND WORKER SAFETY REGULATIONS)**

Have a “Competent Person for lead abatement” as defined by **OSHA 1926.62** on site during any operations which disturb lead. The “competent person” will have successfully completed the **SSPC C3** “Supervisor /Competent Person Training for De-leading of Industrial Structures” or equivalent training.

All wastes are to be collected and placed in appropriate containers on a daily basis. *(See SPECIAL NOTE FOR ENVIRONMENTAL AND WORKER SAFETY REGULATIONS).*

**Industrial Waste**

Dispose of industrial wastes (non-hazardous wastes) such as paint buckets, paint-contaminated rags, rollers, clogged spray hoses and brushes. Store industrial waste in appropriate containers, and appropriately labeled, prior to disposal. Industrial waste containers not covered or designed to prohibit entry of water, must be included in and comply with Ground Water Protection requirements.

All waste wash water will be filtered prior to release. Employ filter fabric consisting of a polypropylene, non-woven, needle-punched geo-textile or equivalent. The fabric will have the following properties:

- **Grab tensile (ASTM D4632):** 100 lbs. or greater
- **Apparent opening size (ASTM D4751):** 0.43 mm (#40 US Sieve)
- **Permittivity (ASTM D4491):** 0.7 - 1.0 sec. or better

Provide written certifications from the filter fabric manufacturer(s) that the material furnished complies with the requirements of this specification.

The Department will obtain approval for release of the filtered wash water. The Department will conduct periodic sampling of the wash water during the project.
E: PAINT APPLICATION

Do not paint areas until they have been inspected and approved by the Engineer (or at the direction of the Engineer, the Department’s inspector). Apply paint only to clean and dry surfaces when the steel surface and ambient air temperature is 40 °F or greater, the surface temperature of the steel members to be painted is at least 5 °F above the dew point, and the relative humidity is less than 90 percent or in accordance with the coating manufacturer’s recommended ambient condition ranges, whichever is more stringent. Ensure that the appropriate resulting surface condition, as described in the Abrasive Blast Cleaning section, is present at the time of primer application (i.e. re-treat if rust-back occurs). **Apply a Class IV (Type VI) coating system from the approved list referenced in the SPECIAL NOTE FOR PAINT and consisting of:**

1. **Prime Coat** --Paint all structural steel with one (1) coat (dry film thickness per manufacturers’ product data sheet) of acrylic primer See SPECIAL NOTE FOR PAINT.

2. **Finish Coat** - Paint all structural steel with one (1) full finish coat (dry film thickness per manufacturers’ product data sheet). See SPECIAL NOTE FOR PAINT.

The prime coat will be white

The finish coat will be a dry grind formulation gray closely approaching Federal Standard No. 595B-X6187.

**Damages** - Take all steps necessary to preclude damage to public property from paint overspray. Those steps may include changes in the type of containment or cessation of spraying operations. The contractor is solely responsible for any damages arising from the painting operations. **Repair of paint defects** - Repair all defects in new paint.

F: WORKMANSHIP

All structural steel surfaces are to be properly cleaned and painted to the satisfaction of the Engineer. There will be no provision for missed areas or substandard work regardless of size of the area in question. All improperly prepared or painted surfaces are to be repaired to meet the provisions of this specification. Good painting practices such as striping coats, missed coats, feathering of coats, etc are expected and will be incidental to the lump sum bid for Clean and Paint Structural Steel.

Allowable field variation of the color of all cured finish coats on structural steel will be 1.5 \( \Delta E_{cmc} \). These values shall be obtained from a spectrophotometer utilizing a D65 illuminant at 45° illumination and 0° viewing with a 2° observer. The reference for this test will be readings obtained on the initial test patch (SEE SPECIAL NOTE FOR QUALITY CONTROL). Surfaces with finish coats with color variations exceeding the
1.5 $\Delta E_{cmc}$ value will be repainted at the option of the Engineer. SPECIAL NOTE FOR QUALITY CONTROL

The contractor will provide QC inspectors to monitor all work, insure that all work is completed in accordance with the Special Notes and Standard Specifications, and record inspection results. All QC inspectors will possess at a minimum one of the following certifications: **SSPC-BCI level 1 or NACE CIP level 1 & CIP One Day Bridge Course**. The QC inspector(s) may not perform production work that requires QC/QA inspection. The Department’s (QA) inspector will conduct in-progress reviews of the Contractor’s operations and perform follow-up quality assurance (QA) inspections after the QC inspector has certified that a portion of work is complete.

**Progress of Work** - Work shall proceed by sections, bays or other readily identifiable parts of the structure. All work will proceed from top to bottom of the structure. The work will be broken down into adjacent sections (control areas) separated by bulkheads. Bulkheads will be sealed to the containment and meet all **SSPC Guide 6 – Containment Classification Class 2A** requirements. Only one phase of work will be permitted in a given control area at any time.

In any control area, Quality Control Point inspection and approval must precede the start of succeeding phases of work. Quality Control Points are progress milestones that occur when one phase of work is complete and ready for inspection prior to continuing with the next operational step. At those points, the Contractor will provide the Departments QA inspectors with OSHA compliant access to inspect all pertinent surfaces. If QA inspection indicates a deficiency, that phase of the work shall be corrected and re-inspected prior to beginning the next phase of work.

<table>
<thead>
<tr>
<th>Quality Control Point</th>
<th>QC Inspection Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Surface Preparation</td>
<td></td>
</tr>
<tr>
<td>A. Solvent cleaning</td>
<td>Visually inspect.</td>
</tr>
<tr>
<td>B. Stratified and pack rust removal</td>
<td>Visually and Mechanically inspect.</td>
</tr>
<tr>
<td>C. Water wash and tool cleaning or abrasive blast cleaning</td>
<td>Measure profile</td>
</tr>
<tr>
<td></td>
<td>Visually inspect for cleanliness.</td>
</tr>
<tr>
<td></td>
<td>Additional methods as required.</td>
</tr>
</tbody>
</table>
2 Full Prime Coat Application  
Check for dry film thickness, and defects in paint

3 Full Intermediate Coat  
Check for dry film thickness, and defects in paint

4 Finish Coat Application  
Check for dry film thickness, paint appearance, color and quality of application

Note: Swirls from power washing left behind will not be accepted.

The QC Inspector will inspect prepared surfaces to determine whether those conform to the specification (see SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION). Coating application will be inspected using KM64-258-05 (Procedure A) and a visual inspection for any coating defects. The Engineer may request tests, including destructive DFT tests, at additional sites or he may elect to perform additional tests.

The QC inspector will maintain a handwritten record of all-painting activities, operations and inspections in the log book(s). At a minimum, the following information must be recorded:

1. all paint inventory and approval information,
2. daily records of ambient conditions (including all measurements taken),
3. daily progress of work information including start-up/shut-down times, bridge locations by control numbers, structural steel components by proper terminology and pertinent operations by control points, and
4. QC inspection information including evaluations at control points, rework comments, or approvals.

Make entries on consecutive pages of the logbook (in indelible ink) and make corrections by marking through mistakes with a single line. Do not remove pages or erase or obliterate entries in the logbook.

The QC inspector and QA inspector will jointly assign adjacent control areas consecutive numbers and a short description defining their location. After completion of a phase of work in a control area, the QC inspector will perform an inspection and will determine whether the area has been satisfactorily prepared. If work in a control area is unsatisfactory, the QC inspector will require the contractor to make the necessary corrections. That process will be repeated as necessary until suitable corrections have
been made. Maintain all logbooks at the job site at all times during the project. Make those available, upon request, to the Department’s representatives. At the end of the project, submit all such logs to the Engineer for his review and records.

**Test Patch** - Prior to initiation of painting, prepare at least one test patch to serve as a standard for reference during the balance of the painting operations. Locate the test patch at an accessible area incorporating surface types of the project. Use the specified surface preparation on a surface with at least 20 ft² per application method per coating plus 20 ft² for surface preparation.

When Central office personnel, the Engineer, QC inspector, and the QA inspector, agree that the appropriate level of cleanliness and surface preparation have been achieved, the contractor will apply a clear sealer, supplied by the coatings manufacturer, to at least 20 ft² of the prepared surface. The contractor will then apply coating to the remainder (at least 20-ft²) of the test patch. Set aside the test patch area as a standard for proper application and appearance. Do not paint the reference areas until the balance of the project is completed. After the project is complete, re-blast the area of the test patch with clear sealer, and apply all specified coatings. Apply all coatings, including the clear sealer, in the presence of Central Office personnel, District Office personnel, the Engineer, the QA inspector, QC inspector, and a technical representative of the paint manufacturer. If QC and QA inspectors agree, clear coat preservation of the test patch may be replaced with pictorial records.

(D) **Groundwater and Surface water Protection**

The contractor will prepare and implement a groundwater and surface water protection plan in accordance with 401 KAR 5:037 (Ground Water), KRS 224.70-110 and 401 KAR 10:031 (Surface water) with the exception that hazardous waste or hazardous materials container volume is not limited to greater than 55 gallons or weight to 100 pounds.

**GENERAL TRAFFIC NOTE FOR CONTROLLING AND MAINTAINING TRAFFIC**

The contractor shall maintain a minimum of **16.5 foot** of vertical clearance over any lane where traffic is allowed unless otherwise noted. No work will be conducted over unprotected traffic at any location.

Rolling roadblocks will be used for rigging, erecting platforms and containment. When using rolling road blocks the Contractor shall employee one marked police vehicle per lane including ramps as necessary, in one direction at a predetermined time and predetermined speed as directed by the Engineer. There shall be no stopping of the
rolling roadblock. Prior to instituting such the roadway ahead shall be cleared of traffic as directed by the Engineer. The area of influence shall be sealed off (all on-ramps or access intersections closed) by use Flaggers and or Contractor’s vehicles. The purpose is to seal off a certain work area and/or work function as designated in the notes so that the Contractor can perform certain work without any hazard to traffic. The rolling roadblock shall prevent any other vehicles at a slower speed than normal and forcing all vehicles to follow behind the Contractor’s vehicles at their predetermined speed. Rolling roadblock will be used during non-peak hours as directed by the Engineer.

The use of Double Fine Zones may be used at the Contractor’s discretion.

Payment

Payment of the contract lump sum amount for "maintain and control traffic" shall be full compensation for all items necessary to maintain and control traffic on this project. All traffic control items shall remain the property of the contractor when the work is complete.

MP 056 0264 B00437N 15.67

I-264 over US 31E (Bardstown Road)

Cleaning and painting over US 31E (Bardstown Road) and All ramps will be completed while maintaining traffic on all lanes. A working platform will be constructed to protect traffic when working over the lanes. Shoulders in each direction of I-264 may be closed during off peak hours for rigging and erecting platforms and containment. Flagging and/or rolling roadblocks may be used on US 31E (Bardstown Road) during non-peak hours for rigging, erecting platforms and containment. The Contractor shall maintain a minimum 15’-0” vertical clearance over traffic. This clearance shall be signed. All work using flagging and/or rolling roadblocks will be done during the hours of 8:00 PM and 6:00 AM.

MP 056 0264 B00438N 16.99

I-264 over KY 155 (Taylorsville Road)

Cleaning and painting over KY 155 (Taylorsville Road) will be completed while maintaining traffic on all lanes. A working platform will be constructed to protect traffic when working over the lanes. Shoulders in each direction of I-264 may be closed during off peak hours for rigging and erecting platforms and containment. Flagging and/or rolling roadblocks may be used on KY 155 (Taylorsville Road) for rigging, erecting platforms and containment. The Contractor shall maintain a minimum 15’-0”
vertical clearance over traffic. This clearance shall be signed. All work using flagging and/or rolling roadblocks will be done during the hours of 8:00 PM and 6:00 AM.

**MP 056 0264 B00434N 17.92**

KY 1932 (Breckenridge Lane) over I-264

Cleaning and painting over I-264 will be completed while maintaining traffic on all lanes. A working platform will be constructed to protect traffic when working over the lanes. All work will be completed with shoulder closures of I-264. Rolling roadblocks will be used on I-264 and a single lane closure on KY 1932 (Breckenridge Lane) may be used for rigging, erecting platforms and containment. All work using rolling roadblocks and lane closures will be done during the hours of 8:00 PM and 6:00 AM.

**MP 056 0264 B00439N 18.20**

CR 1003 (Browns Lane) over I-264

Cleaning and painting over I-264 will be completed while maintaining traffic on all lanes. A working platform will be constructed to protect traffic when working over the lanes. All work will be completed with shoulder closures of I-264 and/or CR 1003 (Browns Lane). Rolling roadblocks will be used on I-264 for rigging, erecting platforms and containment. All work using rolling roadblocks will be done during the hours of 8:00 PM and 6:00 AM.

**MP 056 0264 B00442N 19.04**

I-64 WB to I-264 WB ramp over I-264

Cleaning and painting over I-264 will be completed while maintaining traffic on all lanes. A working platform will be constructed to protect traffic when working over the lanes. All work will be completed with shoulder closures of I-264. Rolling roadblocks will be used on I-264 and a single lane closure on I-64 WB to I-264 WB ramp may be used for rigging, erecting platforms and containment. All work using rolling roadblocks and lane closures shall be done during the hours of 8:00 PM and 6:00 AM.