The Kentucky Transportation Cabinet (KYTC) has an active bridge maintenance painting program that let some 15 bridge maintenance painting contracts totaling approximately 8,000,000 sq ft for an estimated $30,000,000 in 2003. The KYTC bridge painting project development team monitors all facets of the program to optimize the use of funds allocated for it. The project development team constantly reviews ongoing and completed projects. Indications are that most facets of the program perform well. Materials issues are more than competently addressed through the KYTC Qualified Products List and the project sampling and verification process. Surface preparation, containment, lighting, and related issues are referenced to well understood industry standards. The contractor qualification and bidding processes are established by statute and are therefore beyond the purview of the project development team.

In the late 1990s, consistent inspection was determined to have a great impact on program quality and was a facet of the program for which upgrades could be addressed by the project development team. We therefore developed a training course to address issues specific to bridge coating inspection and the KYTC bridge maintenance painting program. The training was used to implement a QC/QA program that requires inspectors to be qualified by examination for KYTC projects. This article describes our program.

Inspection/Training

The KYTC has historically used the National Highway Institute (NHI) courses as basic training for bridge coating inspection. The NHI courses are typically conducted by consultants and are occasionally modified to address specific KYTC issues. These course materials provide good general information but do not satisfactorily address overcoating issues. Overcoating was the KYTC’s only bridge maintenance painting approach from 1990 until 2001.

Early attempts to institute a Quality Control (QC) program by requiring contractors to have a specified QC officer were not effective since we did not specify a level of training or competence. Subsequent attempts to upgrade the QC program by requiring a minimum of
successful completion of Session 1 of the NACE Coatings Inspection program revealed the NACE course materials were heavily focused on abrasive blasting and steel structures other than bridges.

In 1998, the KYTC decided to implement a Quality Control/Quality Assurance (QC/QA) program for bridge painting. Members of the project development team attended the NACE Coatings Inspection courses and various SSPC courses on coatings for structural steel. Members of the team had more than 65 years of experience combined in bridge painting and 200 years of experience combined in their various fields of expertise (e.g., environmental, worker safety, chemistry). The team developed a course to address the needs of the KYTC and its maintenance painting program.

All KYTC bridge painting projects let to contract after January 2000 have been developed with a QC/QA concept that holds the contractor responsible for quality control and the KYTC responsible for assurance of quality before project funds are disbursed.

Typical contract wording is as follows.

"The contractor performs Quality Control inspections on all areas. Employ at least one full-time staff member whose sole duty is to perform quality control inspections (i.e., the QC inspector). The QC inspector(s) must have successfully completed Commonwealth of Kentucky, Transportation Cabinet, Department of Highways Qualified Bridge Coating Inspector Training and be experienced with paint-related quality control. The QC inspector(s) must be capable of accessing, inspecting, and performing the specified quality control tests. The QC inspector(s) will identify locations requiring re-work and repairs and maintain a level of quality of specified work that is acceptable to the Engineer. All QC inspectors used on the project must attend the Pre-construction meeting and the application of the test patch(es) on the bridge."

The Qualified Bridge Coating Inspector Training course is presented each year in February or March before the paint season begins in Kentucky on April 1. There is a registration fee of $500, and each applicant receives a minimum of 32 hours of instruction over a four-day period. To be qualified, each applicant must pass a comprehensive written exam and a practical demonstration exam with a minimum of 80% correct on each exam. The KYTC attempts to insure that any particular class is comprised of both KYTC and non-KYTC applicants so that QC and QA inspectors work together in class, just as they will on projects. Qualification is valid for two years;
then, an inspector must re-qualify. Re-qualification courses are offered each February. Requalification courses involve a $250 application fee, two days of review (minimum of 16 hours), and passing both written and practical exams (minimum 80% on each). The KYTC qualification and disqualification process is described in Kentucky Method 64-001-02 “QUALIFICATION PROGRAM FOR TECHNICIANS.”

All pre-qualified contractors and consultants were notified in 1999 that the QC/QA program would be implemented in 2000. The first Qualified Bridge Coating Inspector Training was conducted in February 2000 and the first re-qualification training was conducted in February 2002. Since 2000 the KYTC has offered 8 Qualified Bridge Coating Inspector Training courses with 173 applicants of which 84% successfully completed the training. KYTC personnel comprise 74 applicants or 43%. Most failures of the Qualified Bridge Coating Inspector Training were attributable to applicants with fewer than 5 years of field experience with bridge painting.

Three re-qualification training courses were conducted in 2002 and 2003 with a total of 41 applicants. KYTC personnel comprised 28 of the applicants, and 12 of the 41 did not successfully complete the requalification exams.

Course Content
The course material is presented in seven sections and eight accompanying appendices. While some overlap of material is impossible to prevent, each section is dedicated to a general issue related to bridge coatings inspection. The text covers topics including safety, specifications, coatings handling, quality control and quality assurance, environmental issues, and surface preparation. The appendices include product data sheets and material safety data sheets for systems currently approved by the KYTC, state regulations concerning environmental issues, and some pertinent industry guides related to inspection.

With an ever increasing emphasis on safety, the course design team felt it appropriate to present health and safety issues as Section One. The KYTC has developed the KYTC Employee Health and Safety Compliance Standard for Inspection of Bridge Painting Projects and the KYTC Respiratory Protection Program. The compliance standard was derived from the U.S. Occupational Safety and
Health Administration Standards for Construction, 29 CFR 1926. The compliance standard follows the format of 29 CFR 1926.62 and outlines the measures to be taken by the KYTC to protect its employees from exposure to lead during bridge maintenance painting operations. The respiratory protection program was designed to satisfy the requirements of 29 CFR 1910.134. This program provides training for the proper selection, use, and maintenance of respiratory protection. In addition to the standards and programs developed by the KYTC, each course offering includes training provided through the Training and Education Branch of the Kentucky Labor Cabinet. This training focuses on worker protection for lead awareness and fall protection.

Section Two of the manual includes pertinent excerpts of Kentucky Standard Specifications for Road and Bridge Construction. These are presented in order to clarify the order of precedence of project specifications. Section Three concerns handling and application of coatings. The section outlines requirements for storage, sampling, and testing of coatings delivered to Kentucky bridge painting projects. Application of coatings is also discussed, from proper mixing of materials to methods of application and an overview of common film defects.

Special Notes are developed for each maintenance painting project. In accordance with Kentucky Standard Specifications, Special Notes are the highest order of precedence of contract documents. With such an emphasis placed on the understanding of Special Notes, Section Four presents examples typical of Special Notes as they may be found in actual contract documents.

Within Section Five, the roles of the Quality Control Technician (QC) and the Quality Assurance Technician (QA) are identified. The paramount need for knowledge and understanding of the project specifications and documentation of daily inspections is emphasized throughout Section Five. Instruction is provided on the proper use of the basic inspection instruments required to perform QC and QA inspections. After the presentations have been made explaining the proper use of each of the inspection instruments, students are encouraged to use each of the instruments to prepare for a practical examination at the conclusion of the course.
A lthough there are volumes of state and Federal regulations concerning environmental protection, Section Six highlights several Kentucky statutes that may directly affect bridge maintenance painting projects. Discussions center on groundwater protection plans, which are specific to Kentucky, and the appropriate handling of hazardous and industrial wastes.

The final section, Section Seven, emphasizes the importance of proper surface preparation and inspection. Many of the industry recognized standards for surface preparation are discussed throughout presentations for this section.

A fter the course materials have been presented, students are given the opportunity to inspect steel members at various stages of completion during a field exercise. Students work in small groups to inspect various prepared surfaces for conformity to the specification. Instructors are available to maximize the experience of the simulated inspection and answer questions.

The final day of the course consists of a written, closed book examination and timed practical examination.

Conclusions

The KYTC has developed a comprehensive bridge coatings inspection technician training course focusing on the development of competent and safety-conscious bridge coatings inspectors.

The KYTC does not have an obvious tool for measuring the field success of implementing the inspection training program. Review of KYTC bridge painting projects indicates that the levels of competency and consistency of inspection have improved.

Several painting contractors who regularly perform KYTC bridge painting have noted improvements and have commended the effort of KYTC to include both contractor and state personnel in each course offering. Combined courses have resulted in improved working relationships between the Quality Control Inspector and the Quality Assurance Inspector for many KYTC bridge painting contracts.

Increased understanding of project specifications and inspection tasks has reduced the quantity of contractor rework required for acceptance and has minimized the amount of time lost to conflict resolution.

Before implementation of the contractual requirement for qualified inspection, a regional disparity in unit bid prices for similar work existed within the state. Since implementation of this requirement, unit bid prices for similar work have become more consistent across the state.

Field experience appears to be important but not crucial to successful completion of the KYTC Qualified Bridge Coating Inspector Training. Most applicants who failed had less than 5 years field experience. Applicants who failed the requalification exams typically were not regularly involved in bridge paint inspection during the intervening two years.

Editor's Note: This article is based on a paper given at SSPC 2003 and published in the conference proceedings. Bob Meade and Derrick Castle can be reached at 502-564-4556.