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***Overcoating Sixteen Interstate Bridges
in Kentucky for Less Than \$1.50 per
Square Foot***

by

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1996 Heavy Movable Structures Inc. Symposium

"Overcoating Sixteen Interstate Bridges in Kentucky for less than \$1.50 per Square Foot"

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In 1995, the Kentucky Department of Highways let two contracts to overcoat sixteen bridges on I64 and I75.

This paper will describe the condition, surface preparation, environmental control, and paint application to overcoat these structures for a complete cost of less than \$1.50 per sq. foot (exact costs will be available soon). Overcoating can be an economical alternative to total removal to blast cleaned steel (\$6.50-\$16.00 per sq. foot).

BACKGROUND

In 1995, the Kentucky Department of Highways (KYDOH) let three experimental overcoating projects involving single and multiple structures on state secondary and interstate routes. Those projects were considered experimental as they incorporated untried surface preparation procedures, new specifications and different paint systems. The primary objectives of those projects were to determine the effectiveness of the specifications, to evaluate the application characteristics of different paint systems and to determine unit costs based upon project specifications and scope.

One project, on I 64 in Franklin County, was comprised of 4 plate-girder bridges with approximately 2,400 tons of steel. A second project involved complete painting of 12 plate-girder and I-beam bridges (totalling 3,450 tons of steel) and 660 steel rockers on 38 concrete bridges on or over I 71 in 6 counties between Louisville and the junction of I 71 & I 75 near Cincinnati, OH. A third project involved

painting of a single 2-span truss bridge (199 tons of steel) on KY 22 at Falmouth. The three projects were successfully completed in the fall of 1995.

All of the bridges on those projects possessed aged alkyd paints applied over mill scale. Typically, the existing paint was found to have chalked at exterior surfaces. The worst existing paint was encountered on the KY-22 bridge. On that structure, most of the paint was brittle. It was peeling and disbonding at many sites and the underlying steel was corroding at those locations.

Both the I-64 and I-71 projects contained large (770-ft span) twin bridges that spanned the Kentucky River. At many locations on those structures, the existing paint had disbonded exposing large areas of mill scale. Extensive mildew contamination was present on interior existing paint on the I-64 bridges over the Kentucky River. The existing paint on the two smaller plate girder bridges in the I-64 project had disbonded at some locations, but was in better condition. The existing paint on the other 10 main-line and overpass bridges comprising the I-71 project was in good condition.

On the three projects, surface preparation was limited to high-pressure water washing. On the I-64 bridges, 3,000 psi washing was employed due to the presence of a tenacious grime on the existing paint. On the I-71 bridges, 2,500 psi pressure washing was used. Occasionally supplemented by the use of detergents and hand wiping with wet rags to remove chalk and grime. The contractor on the KY-22 project used 4,000 psi pressure washing.

Different coating systems were specified for the three experimental projects. On all three projects, a spot prime coat was applied by brushing at locations where the existing coating had failed by corrosion or disbonding. On the KY-22 and I-64 projects, full intermediate coats were applied by rolling or brushing. No intermediate coat was used on the I-71 project.

On all three projects, the topcoat could be applied by either spraying or rolling. Spraying was used on the I-64 and I-71 main line bridges and rolling was employed on the I-71 overpass bridges to minimize overspray damage to vehicles. Due to the proximity of the KY-22 bridge with houses and buildings in Falmouth, brushing was employed for the topcoat. On that project, the contractor was allowed to use painting mitts instead of brushing.

The polyurethane coating systems employed on the I-64 and I-71 projects were based upon cookbook/performance specifications. Those systems were derived from an experimental system that had performed well on a previous experimental project. Two different paint manufacturers supplied paint for the I-64 and I-71 projects. A proprietary polyurethane coating system was used for the KY-22 project.

Aluminum-pigmented moisture cure polyurethane paints were used for the spot prime and intermediate coats on the KY-22 and I-64 projects. An aluminum/MIO-pigmented moisture cure polyurethane paint was used for the spot prime on the I-71 project. All three projects employed two-component acrylic polyurethane paints for topcoats.

FIELD WORK

The projects began in the early Summer of 1995 and were completed by that Fall. Pressure washing resulted in the inadvertent removal of a small amount of existing paint on the larger structures of I-64 and I-71 projects. Much existing paint was removed from the KY-22 bridge. It was collected and disposed as a hazardous waste.

The painting application work for the three projects proved relatively problem free.

The coating systems used on the KY-22 and I-64 projects had limited recoat windows (1 & 3 days respectively) which proved inconvenient to the contractors.

The three projects were thoroughly inspected by KYDOH during the progress of the work. Field inspections were assigned to KYDOH inspectors familiar with earlier experimental overcoating work. The inspectors were present each day during the contractors' operations. When the projects were completed, KYDOH acceptance inspections revealed that the workmanship on the projects was very good and that the bridges' appearance met or exceeded KYDOH expectations.

RESULTS

All of the projects appeared to be satisfactory. There were several extreme cold spells in Kentucky during the Winter of 1995-6 and, in March 1996, some paint on one of the I-64 bridges over the Kentucky River was observed to have disbonded on the exterior portion of a fascia girder. The failure area was relatively small (less than 100 ft²), but it was disconcerting. Follow-up inspections of all other bridges on the three projects revealed no similar failures. It is believed that the failure might have been due to a weak bond between the existing alkyd paint and the mill scale. The failed locations will be repaired in July 1996 by KYDOH and Kentucky Transportation Center personnel. Future specifications will entail higher washing pressures to remove weakly bonded paint and the collection and disposal of wastes generated during cleaning.

The appearance of the completed overcoating projects was very good with the exception of the failure (Figures 5 and 6). The high-gloss topcoats used on the projects gave the bridges a pleasing appearance. From the roadway, it was difficult to tell that the bridges had been overcoated. Some bridge bearings and pads had pack rust that was not removed by the pressure washing. Those areas did not hold up well over the winter and future specifications will mandate the removal of pack rust.

Several observations were made concerning specifications and appearance of the completed projects. KYDOH specifications addressing cleaning were in the form of descriptive wording that resulted in some controversies with the painting contractors. That wording will be revised in future projects to eliminate similar problems. The higher pressure water blasting used on the KY-22 and I-64 projects proved more effective than that employed on I-71 work. It provided faster and more thorough cleaning and minimized the need for follow-up hand scrubbing.

The aluminum-pigmented moisture cure paints were considered superior to the aluminum/MIO-pigment paint in terms of penetration and sealing. The latter paint offered a more practical recoat window. The incorporation of an intermediate coat on the KY-22 and I-64 projects was considered to be desirable for several reasons: 1) it furnished additional barrier protection, 2) it provided insurance against incomplete spot priming and 3) it leveled the surface yielding a more uniform appearing topcoat.

Cost differences between the I-64 and I-71 projects indicated that the added expense of an intermediate coat is offset by gains in corrosion protection and cosmetic appearance.

The cookbook/performance specification paint allowed a more extended recoat window than its proprietary counterpart. KYDOH officials also felt that they had better control in evaluating paint furnished to cookbook/performance specification. Therefore, they elected to continue using that specification for future projects.

KYDOH officials encountered some problems with paint provided for the I-71 project. Those problems indicated that the material specifications needed to be revised to establish constituent limits for main paint components. Also, a longer recoat window was needed. KYDOH officials developed a second-generation cookbook/performance specification for the aluminum-pigmented moisture cure primer/acrylic polyurethane topcoat system. It mandated a 5-day recoat window that coatings

manufacturers must permit for future coatings furnished to that specification.

The project costs were low. The unit costs for the KY-22, I-64 and I-71 bridges were \$1.06/ft², \$0.81/ft² and \$1.71/ft² respectively (based upon estimates of surface areas and steel tonnages). Those costs are among the lowest reported for bridges nationwide. The higher cost of the KY-22 project relates to mobilization costs, structure complexity and the poor condition of the existing paint.

CONCLUSIONS

The KYDOH experimental overcoating projects conducted in 1995 were considered successful due to their overall quality and low costs. Knowledge gained from those projects will be incorporated into 1996 KYDOH overcoating specifications. Several large overcoating projects will be let in the Fall of 1996 using the revised specifications.

Currently, KYDOH officials plan to use the second-generation polyurethane cookbook/performance specification for most future overcoating projects. That specification will be revised as experience proves necessary. KYDOH officials are considering the use of this coating system in conjunction with inorganic or organic zinc primers for new construction projects.

Kentucky Transportation Center personnel will continue to assist KYDOH officials in identifying better performing coating systems and more cost-effective maintenance painting practices.