Accelerated Innovation Deployment (AID) Demonstration

Missouri Department of Transportation—Nanocoating Technology for Bridges

1. Project Abstract (5 sentences maximum)

The Missouri Department of Transportation will be rehabilitating the Big Bend Boulevard Bridge over Interstate 270 in east central St. Louis County during calendar year 2017. Currently the superstructure has an NBI rating of 4 and requires recoating of the structural steel. MoDOT's current painting system involves a 3 coat system which would require a lengthy closure time for this busy overpass. MoDOT proposes to use a new product called Tesla Nanocoating which forms a passive corrosion protection system that only requires two coats with the second coat being applied prior to drying. MoDOT is seeking funding for the painting portion of the project in order to accelerate the adoption of this innovative technology which will speed up construction, reduce delays from construction and in the end result in a longer lasting coating system.

2. Project Description

Bridge A0964 was built in 1962 as a 4-span, continuous composite wide flange beam bridge measuring about 256 feet in length by 78 feet in width. Currently the bridge carries about 11,200 vehicles per day on its five traffic lanes and has NBI ratings of 5, 4, and 5 for the deck, superstructure, and substructure, respectively. The bridge spans over I-270 which has 85,000 ADT in the eastbound direction and 101,300 ADT in the westbound direction.

The rehabilitation project (J6I2316) involves preservation work consisting primarily of replacing the deck, end bents and recoating the structural steel. The current coating system (a calcium sulphonate applied in 1999 over the original lead-based primer/topcoat) is in poor condition. MoDOT's current standard practice is a three-coat system made up of an inorganic zinc primer, epoxy intermediate coating and a polyurethane finish. The three coat system is a lengthy process that requires closing of the bridge or parts of the bridge that is being painted as well as disruptions to traffic for the interstate below.

MoDOT has done lab testing to date on the Tesla Nanocoating to determine if the coating passed the required testing. A two coat system consisting of Teslan 1101 Zinc CNT Primer and Teslan 4050 Polyurethane was applied to a steel test panel that had been prepared according to AASHTO M 300. The test panel for salt fog exposure was scribed as specified in ASTM D1654. After 4005 hours of exposure in accordance with ASTM B117, the panel received an 8 rating when rated according to ASTM D1654. MoDOT specifies a rating of 7 or greater after 3000 hours of exposure for System G (inorganic zinc, epoxy, polyurethane) and System I (inorganic zinc, polysiloxane).

While there is an increased cost for the paint, it is anticipated this will be offset by an estimated labor savings of 25 to 50%. This time savings is based on an estimate done for an upcoming project in Kansas City, Missouri. Part of this project would be to document the real world labor savings. In addition to the cost savings of the labor, the disruption to traffic on these busy roads will be greatly reduced. Reduction in closure times will also be documented.

Besides the speed benefits of the two coat system, the Tesla Nanocoating system is formulated with carbon nanotubes that make it both tough and flexible. This toughness and flexibility lead to a scratch resistant coating that should outperform traditional painting systems. The nanocoating also provides a galvanic protection if the coating should suffer damage.

3. Innovation Performance

Cost for the materials and labor will be tracked and compared to MoDOT's traditional methods. Closure times will also be tracked to determine the time savings for the public.   If this trial is successful, as defined by labor and time savings, the product will be added as an option on recoating jobs going forward. It would be in direct competition with the existing 3 coat system.   Since the current coating system would still be an option, contractors will have to evaluate the new system and see if it makes sense for them on a job by job basis. Most likely it will be cost effective on jobs with a lot of traffic control and time constraints. Urban and interstate grade separations would be likely candidates for this new system.

Once construction is completed, MoDOT will write a white paper to share with local agencies and other state DOTs.   MoDOT will also look for opportunities to present at conferences to help disseminate the project and performance goals.

This project is in the current STIP and the job special provisions to include the nanocoating are already under development. The project would be in the February 2017 Letting with work to begin in spring/summer 2017 and construction should be completed by the end of 2016. We will monitor the work to see if the anticipated time and labor savings are realized. The quality of the coating will be evaluated during biannual inspections.

4. Applicant Information and Coordination with Other Entities

This will be strictly a DOT project; no other entities will be involved outside of MoDOT and FHWA.

5. Funding Request

The project estimate for the rehabilitation job is approximately $1,823,000 with the bridge painting estimated at $415,800.

Federal portion of Coating system: $332,640
State portion of coating system: $83,160.
Requested AID funding = $332,640

6.   Eligibility and Selection Criteria

The Missouri Department of Transportation is an eligible entity to apply for the AID initiative. MoDOT has not received an AID grant for federal fiscal year 2016. This project is currently in the STIP and is scheduled for the February 2017 letting so will be ready to obligate within 6 months.   MoDOT will accept full FHWA oversight of the project.

This project aligns with the TDIP goals of accelerating adoption of innovative technologies, results in faster construction which in turn reduces congestion from construction and should result in an improved quality product. The project will improve the service life of the bridge and will help accelerate adoption of the new coating system at MoDOT.

While lab testing has been done at MoDOT (see question 2) it has not yet been used on a bridge in Missouri. Other states are interested in implementing this system but at this time MoDOT is not aware of any states with completed projects. This coating is successfully being used by the oil industry for off shore oil platform recoating near the water line putting this at a Technology Readiness level of 8.

7. Contact Information

Point of Contact: Bill Dunn,
                          William.Dunn@modot.mo.gov
                           573-751-2920