Oklahoma State Transportation Innovation Council (STIC)

July 29th 2024 Meeting Minutes

2:00 pm – 4:00 pm

Meeting Location: ODOT Commission Room – Ward Bldg.

Welcome and Opening Comments

Joni & Souzan: Welcome and thank you for being here today.

Souzan: Thank you for all your support and efforts in your initiatives. Let's get started.

Standing Committee on Pre-Construction

Develop Strategic Plan & Roadmap for Digital Delivery
(ODOT Champion: Katie Brown & FHWA Champion: James Bui)

Siv: InRoads removed from all design computers. All in-house construction projects will be developed and delivered using OpenRoads/OpenBridge. Construction survey has 15 InRoads users currently receiving OpenRoads training with anticipated InRoads removal date of December 2024. Technical committee meetings 6 and the Implementation plan are completed. In June TX DOT digital delivery peer exchange & Grant Progress report template created. Collaboration with ACEC 3d working group to identify/review needed changes to ORD workspace. The Digital Delivery Team completed ISO 19650 training.

Standing Committee on Construction, Materials, and Maintenance
EDC-7 & STIC Innovation Combined Efforts:

Enhancing Performance with Internally Cured Concrete & Pilot Internal Curing for Bridge Decks
(ODOT Champion: Bryson Ridley, Matt Romero/Walt Peters/Nairi Matevosyan-FHWA Champion: Ralph Nguyen & Waseem Fazal)

Walt*:* The Peer Exchange was attended by Bryson Ridley (ODOT) and Waseem Fazal (FHWA) both had positive reports. Dr. Ley continues to work on Research for Internal Curing. All mixes with the lightweight aggregate have been completed. Long term strength and shrinkage testing is underway. Re-span using E5-nano silicate (liquid) used in Illinois & 3rd span porous aggregate from New Mexico. FHWA to provide tech support if needed. No implementation date, pending results of project first. Start with special provisions with contractors then modify specifications. D6 is making good progress, we're about 6 months out before we start on the deck.

Matt: Once the deck is poured, we plan on having our people there for the nano silicate application, we're interested in those results. Dosage rate is 3 1/2 gallons to 10-yard loads of concrete. Overall, on track, weather dependent. 6 months out to pour the deck.

Standing Committee on Safety, Mobility, and Technology
EDC-7 Innovation:

Next-Generation Traffic Incident Management: Integrating Technology, Data, and Training
(ODOT Champion: Caitlyn Carolus & FHWA Champion: Raghu Kowshik)

Alan: TSMO training is coming up, FHWA to provide additional information on webinars and peer exchanges. 30% reduction of incident clearance time & reduced secondary crashes by 10%. 470 samsara out of 500 installed, they have been integrated through the diagnostic port. Pi-Lits road LED's, several districts are using them. They are being integrated to OK traffic & mobile app. Rekor with Motorola integration has stalled out due to extra cost. Alternate is using API to access their data directly working with Rick Stevens on that. Caitlyn has been working with OTA in allocating Pi-Lits for the turnpike.

Joni: Reach out to Lane McPeak, he'll be able to get some traction going.

Nighttime Visibility for Safety
(ODOT Champion: Marty Farris & FHWA Champion: Huy Nguyen)

Lauren: We're setting up for photo metrics for projects that warrant it, we haven't done that in the past. They were only spot checked periodically. We've been looking at AASHTO warrants for highway lighting for dark zones and higher collision rates. Working with City of Tulsa on a 2 ½ mile span on the BAX with high collision to add additional lights. Letting that project in the next couple of months. Overall status is on track.

STIC Incentive Projects:

Expand Utility Surveying Capabilities
(ODOT Champions: Siv Sundaram & FHWA Champion: Scott Armstrong)

Siv: All funds have been expended. The 1st six months they are looking at other states for guidelines on how the manual should look like. Training is ongoing, the implementation portion is done.

Standing Committee on Special Initiatives
EDC-7 & STIC Innovation Combined Efforts:

Strategic Workforce Development & Pre-Apprenticeship Stakeholder-Focused Training Program
(ODOT Champion: Jennifer Hankins & FHWA Champion: Souzan Bahavar)

Jennifer: 2nd 5-week program converted additional targeted training to meet industry identified needs. STIC funds expended, spent on continued/additional training for graduates of the 1st 5-week course.

Souzan: STIC applications are due next Friday.

FY24 STIC Applications:

- Innovative High-Performance Geotextiles for Stabilization of Problematic Roadway Subgrades
- Transportation AI Projects Team

Lessons Learned & Recommendations for institutionalizing the innovations.

Development of standard drawings for low-cost bridge options for use by Local Public Agencies (LPAs) on low-volume locally owned roads - **Justin Hernandez & Ralph Nguyen**

The standards are now online:
• Abutment: Skeleton type with two rows of H-piles for foundational support and simplistic reinforced concrete detailing.
• Piers (optional): To be designed by licensed engineer (if multi-span). Pile supported concrete bent would likely suffice.
• Bearing Devices: Elastomeric pads with steel reinforcements.

• Superstructure: Six (6) – prestressed concrete beam slab segments, each 4'-9" wide resulting in 26'-0" clear roadway.
• Traffic Rail: Post and standard W-Beam guardrail.

The standard drawings need to be published to the Oklahoma Department of Transportation's (ODOT) website and distributed. The answer to this objective will be determined based on how often these bridges are constructed and if there is an associated cost efficiency.

ODOT was the recipient of a Competitive Highway Bridge Grant (CHBP) very recently. This project included replacing up to thirty-four (34) locally-owned bridges with precast, prestressed concrete slab-beams and Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS) abutments. There were lessons learned on that project such as the need for adequate hydraulic and geotechnical analysis prior to sizing and designing each bridge. There were also lessons learned in the construction and finishing of the precast slab beam elements such as crack mitigation and broom finishing. These lessons were incorporated into the thought process for this project leading to similar analysis and detailing.

Demonstrate Two-Coat Deck Seal System – **Walt Peters/Bruce Arnold & Ralph Nguyen**

The work found that there was no detectable water proofing layer on the surface in three of the four lanes. In the fourth lane, ODOT had previously placed a silane + epoxy application. This material was placed in 2013 or 10y before this study. The silane was found to still be in place. This is expected as previous research on silane has shown that the material is expected to be found 12y after the original placement.

After applying silane in all four lanes of the bridge, the coring identified that silane had penetrated the concrete with an average value of above 0.29". This is significantly more than the ODOT required depth of 0.15". After talking with Walt Peters, it was realized that ODOT required a 0.25" penetration for systems that used silane + epoxy. The results from the testing can be found in Table 1. Also, the reapplication of the silane + epoxy caused the depth of penetration to increase from 0.29" to 0.40". This shows that reapplying silane to an existing treated bridge deck will allow the silane to penetrate deeper. Based on previous testing, this increase in thickness is expected to prolong the life of the silane as the silane degrades from the depth of the concrete towards the surface.
It was expected that salts would penetrate the surface of the samples that did not contain a waterproof layer at the surface. More research is needed to understand why this has occurred. Many lessons were learned from this work.

The most significant lessons include:
• Isobutyl trimethoxy silane with > 90% active ingredients can be reapplied to bridges that have been in service for 41 years and you can obtain a depth of penetration that is more than 2X the depth required by ODOT.
• The same Isobutyl trimethoxy silane with > 90% active ingredients that are then coated with epoxy show a 20% deeper penetration than the samples that used the same silane.
• You can reapply silane + epoxy to previous silane + epoxy coatings that have been in place for 10 years and the depth-of-penetration will increase.
• Both the silane and silane + epoxy coatings showed a deeper penetration than the ODOT specifications so both products are recommended for future usage.

Bridge Deck Cure and Seal for Slip-Formed Parapet Walls and Sidewalks - **Walt Peters/Bruce Arnold & Ralph Nguyen**

The project found a large difference between the cores taken on the side of the sample and from the surface. This is expected as the cores from the side are representative of the bulk of the sample and the surface would be the zone most impacted by curing and application of a product like Silencure. Unfortunately, there was no penetration observed on the cured surface of the concrete. This was puzzling as the parts of the bridge that are not treated with Silencure should allow outside chemicals to penetrate the concrete. After some discussion with the district personnel in Tulsa, it was realized that anti-graffiti and water proofing coatings were placed on the surface of the concrete before the material was cored. These products seem to be keeping the salts out of the concrete.

To investigate this in more detail, work was done to detect the presence of a water proofing layer at the surface of the concrete where Silencure was supposed to be applied and where it was not. Unfortunately, the concrete was not found to have a waterproofing layer. Water drops were also placed on the surface of the concrete to see if the material beads up. This beading of the water shows that there is a high contact angle between the surface and the water. This shows that the surface is hydrophobic. All of the finished surfaces of the concrete were found to be hydrophobic. This aligns with the hypothesis that there is an anti-graffiti or water proofing coating at the surface of the concrete that modified the expected results. It appears that the cores were taken after the anti-graffiti and water proofing coating was applied on the surface of the concrete. Since these materials sealed the surface of the concrete, it was not possible to determine how the control or Silencure performed. This makes it not possible to draw conclusions or recommendations from the work.

More care needs to be taken with the timing of when cores are taken in the field for future projects that investigate Silencure. The work also shows that the combination of Silencure, anti-graffiti, or water proofing and only anti-graffiti or water proofing is sufficient to keep outside chemicals from penetrating the concrete. The work also shows that there does not seem to be any penetration of a water proofing layer into the concrete with Silencure, anti-graffiti, or water proofing. Because of so little penetration into the concrete, this suggests that the water proofing properties of Silencure, anti-graffiti, or water proofing will not provide the same service life as a water proofing material that penetrates the concrete like silane. It is recommended that more work be done to prove the usefulness of Silencure in lab testing where more variables can be controlled with how the product is applied and sampled. This could then be investigated with field applications of Silencure.

The Phoenix method – **Matt Romero & Waseem Fazal**

This had too many inconsistencies in the lab and the field. The Materials Division received a personal training session from the staff at OSU Burt Cooper staff, immediately following the training the Phoenix was implemented for fresh concrete testing. The ability to remove all the material from the mold and spread it onto the pan is crucial. The scale provided with the furnace tended to fluctuate, making it difficult to record accurate mass. As a result, the scale was placed in an enclosed environment.

During testing we found that dryer mixes came out of the mold much easier than the saturated mixes. The process of sampling, weighing the mold and the material as part of the sample preparation took approximately 5 minutes. We placed the sample into the furnace for 15 minutes and recorded our initial mass. The sample was then returned into the furnace for an additional two minutes and the second mass was recorded. The final mass should be within 2 grams of the initial mass, if not the sample would be returned to the furnace for an additional two minutes. The removal of the sample, recording the mass and returning it to furnace took approximately one minute. The overall time it took to perform the test was approximately 25 minutes. The Phoenix was used on 17 mixes conducted in the Structural Laboratory. Apart from two mixes that took place on August 23, 2022 (Hanson Davis and Latimore) the measured w/cm ratio was found to be much higher than the batched w/cm ratio. District 4 and 8 offices are planning on using it on future paving and bridge deck testing. The Materials Division will continue to use the meter on in-house mixes to provide further data to OSU. The bridge division has inquired with the Materials division about using the meter on bridge deck projects.

Demonstration of Fiber Reinforced Asphalt Concrete in Oklahoma Using Aramid Fibers – **Matt Romero/David Vivanco & Waseem Fazal**

While incorporating aramid fibers in asphalt pavements can offer several performance benefits, it's important to note that the upfront cost of the material itself may be higher compared to traditional asphalt mixtures. However, the potential cost savings over the life cycle of the pavement can be significant due to reduced maintenance and longer service life.

Here are some ways in which the use of aramid fibers in asphalt pavements may contribute to cost savings:

- Reduced Maintenance Costs: Aramid fibers enhance the durability and performance of asphalt pavements, leading to reduced maintenance needs over time. With fewer repairs and interventions required, maintenance costs can be significantly lowered.
- Extended Service Life: The improved resistance to cracking, rutting, and fatigue provided by aramid fibers can result in a longer service life for the pavement. This longevity means that the road may not need to be replaced or rehabilitated as frequently, saving on major construction costs.
- Minimized Downtime: Roads that require less frequent maintenance and repair experience fewer disruptions and downtime. This is particularly important in high-traffic areas where road closures for maintenance can lead to traffic congestion and economic losses.
- Improved Performance in Harsh Conditions: In regions with extreme weather conditions, the use of aramid fibers can contribute to better pavement performance. The cost savings arise from a reduction in the need for emergency repairs and maintenance resulting from weather-related pavement damage.
- Enhanced Safety: Aramid fibers can contribute to improved skid resistance and overall pavement stability, reducing the likelihood of accidents and associated costs related to safety incidents.
- Environmental Considerations: While not directly cost saving, there can be indirect cost benefits associated with environmental considerations. For example, if aramid fibers contribute to a longer pavement life, the need for frequent resurfacing or reconstruction may be reduced, resulting in less material usage and waste generation.

It's essential to conduct a comprehensive life cycle cost analysis (LCCA) to assess the economic implications of using aramid fibers in asphalt pavements. This analysis should consider factors such as initial material costs, construction costs, maintenance costs, and the expected service life of the pavement. While the upfront cost of aramid fibers may be higher, the long-term savings in maintenance and extended service life can justify the investment. Additionally, advancements in technology and increased adoption of aramid fibers in the construction industry may contribute to a reduction in material costs over time. The project will be continuously monitored with ODOT's PMS, and performance over time will be evaluated to determine the long-term benefits of using aramid fibers. At this early stage, it is not clear if a benefit will be observed in the short term.

Closing Comments:

Joni & Souzan: STIC applications are submitted yearly, please submit at any time if you have an idea. It'll go towards the next round. Thank you for your dedication and all your hard work and for providing your updates.

Next Meetings/Events:

- October 31st, 2024 STIC Quarterly Meeting - Virtual