



INDIANA CHAPTER OF THE AMERICAN CONCRETE INSTITUTE ANNUAL AWARDS

INNOVATIVE CONCRETE

Whitley County Bridge Overlay



Bridge Deck Overlay using new experimental materials

This project represents a huge milestone for all levels of infrastructure maintenance, especially in terms of sustainability and resilience in structure longevity. The application of hydro-demolition was removed from the scope, as well as costly surface grooving. Both processes are used by State and Federal Transportation and place traditional costs out of reach for most local municipalities. This places our local governments infrastructure in a perilous decision making process of allowing for structural deficiency until the bridge meets qualification for replacement. The Bridge Deck Overlay process can add crucial years to the life of the structure.

The true magic behind the success of such projects is to blend value engineering in the preparation and construction methods along with revolutionary overlay mix design. Traditional mix designs contain 658lb/cy cement with an additional 50lb/cy of silica fume with a maximum W/C equal to 0.42. Problems encountered with this mix involve decreases in workability, increased susceptibility to evaporation leading to plastic shrinkage, and difficult curing techniques with expanded crew size.

The mix design on this project was designed specifically to counter the temperamental characteristics of a typical bridge overlay mix. The cement content was reduced from 658lb/cy to 580lb/cy. The costly, and inherently dangerous use of silica fume (See OSHA Standards Relating to Silica) was eliminated. Instead, the mix was designed with two revolutionary admixtures that promote internal curing (E5) and SCM replacement (E5 Liquid Fly Ash). The use of the Liquid Fly Ash has shown to be a cement replacement up to 15%. The nature of the Liquid Fly Ash, essentially nano silica particles in a colloidal solution, promotes pozzolanic reaction along with matrix density within the mix. Thus, reducing permeability, while promoting CSH reaction. The mix also utilized the addition of fiber reinforcement to aid in shrinkage control. The addition of E5 Internal Cure controlled evaporation and prevented surface bleeding. The use of internal cure also saved cost in labor as no traditional wet curing methods were used, as well as the elimination of curing compound.

In addition to cost savings, this concrete mix design also reduces carbon footprint. The reduction in cement as well as the elimination of silica fume and the addition of an SCM (E5 Liquid Fly Ash) that does not present itself thru carbon heavy production (i.e. slag from blast furnace, traditional fly ash from coal furnace) makes for the most environmentally friendly mix designs produced. This enhancement is furthered in the use of E5 Internal Cure in preventing excessive water and material usage associated with wet curing techniques.

Owner

Whitley county Highway Department

Architect

Engineering Resources, Inc.

Engineer

Engineering Resources, Inc.

General Contractor

R. L. McCoy, Inc.

Concrete Contractor

R. L. McCoy, Inc.

Ready Mix Supplier

Speedway Ready Mix, Inc.