TRAINING CONSTRUCTION INSPECTORS IN ACCELERATED BRIDGE CONSTRUCTION TECHNIQUES

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INTRODUCTION

In today's rapidly changing world, with innovative techniques to construct bridges and a demand for construction inspectors with bridge experience, the training of inspectors has lagged the innovations. Perhaps the most significant example of this is with Accelerated Bridge Construction.

The training arm of the Federal Highway Administration (FHWA) is the National Highway Institute (NHI), who has historically provided state of the art instructor led training for those new to bridge construction inspection with the NHI Course 130088 Bridge Construction Inspection. The course was popular; however, the material was over a decade old and did not address accelerated bridge construction techniques. The course has been removed from the current course offerings and is undergoing a significant overhaul.

Recently, the FHWA awarded Greenman-Pedersen, Inc. (GPI) a contract to update the existing NHI course. The new course will have both web-based and instructor led components that will not only cover conventional bridge construction but will also encompass accelerated bridge construction techniques such as prefabricated bridge elements and systems, slide in construction and self-propelled modular transport (SPMT's). The course will teach best practices for inspection of ultra-high-performance concrete and grouting of post-tensioned bridge elements. In addition, lessons will include scheduling, decision making, and documentation practices geared towards accelerated bridge construction.

This presentation provides an overview of the revised course, including the technical concepts covered by the lessons, the web-based and instructor led delivery methods and the expected learning outcomes as they relate to accelerated bridge construction. The International Accelerated Bridge Construction Conference is the ideal venue to share this new course offering with ABC stakeholders to demonstrate the value of the course and to generate enthusiasm for this important training opportunity.

SUBJECT MATTER EXPERTS

Mr. Willy Grimmke and Mr. David Hoyne are the subject matter experts tasked with developing the content for the instructor led and web-based training courses respectively. Their work includes the development of the exercises, knowledge checks, end of course assessment and presentation materials to ensure the content is accurate, engaging and relevant to the challenge's inspectors face with bridge construction.

Mr. Grimmke has 30+ years of experience serving in various capacities in the engineering and construction industry including 13 years as the Washington County New York Public Works Superintendent. He is currently an Assistant Vice President at GPI where, he is responsible for supervising construction inspection staff, serving as team leader for underwater inspections, and teaching bridge construction, maintenance, and inspection courses for the National Highway Institute.

Mr. Hoyne is the former Director of Construction and Materials for the Vermont Agency of Transportation where he managed the statewide capital improvement construction program and the materials testing laboratory. Mr. Hoyne retired from VTrans and now serves as a Senior Construction Engineer at GPI where he provides expert advice on developing and managing construction contracts, workforce development programs and teaches bridge inspection and bridge rehabilitation courses for NHI.

THE COURSE

The course was redesigned to provide those involved in bridge construction inspection with the basic knowledge of bridge construction and the overall process of bridge construction inspection to assure conformance to contract requirements. In addition, the course is aimed at developing the knowledge and skills necessary for inspectors to properly inspect, record and provide documentation at each stage of bridge construction.

The target audience includes construction supervisors, transportation department field inspectors, field engineers, resident engineers, structural engineers, materials engineers, and other technical personnel involved in bridge construction inspection. The course is developed for participants with a non-engineering background and limited construction knowledge and begins with six hours of self-guided web-based training as a prerequisite to the instructor led class.

The course focuses on what the inspector needs to look at, why the work needs to be inspected, and what the inspector does as part of their inspection. The course is designed to be very much inspector centric and includes content focused on Accelerated Bridge Construction (ABC).

ACCELERATED BRIDGE CONSTRUCTION

The course material for ABC covers the technical knowledge the inspector must have to properly inspect operations involving post tensioning, prefabricated bridge elements, bridge slides, self-propelled modular transport, and high-performance concrete. The course also explores how ABC projects require the inspection team to adjust their approach to the project schedule, the decision-making process and the documentation of accelerated bridge construction projects.

The following table reflects the technical material presented in the instructor led course:

Post-Tensioning	Prefabricated Bridge Elements	Bridge Slides	Self-Propelled Modular Transport	High-Performance Concrete
Ensure only the correct materials are incorporated in the work	Confirm the elements were fabricated dimensionally correct	Understand the jacking plan	Understand the moving plan	Monitor the batch operation
Monitor the forces throughout the jacking operation	Check for in-transit damage to the elements	Monitor structure during the slide	Path is structurally sound	Understand delivery requirements
Monitor the grouting operation	Confirm the elements can be incorporated in the work	Monitor jacking forces throughout the slide	Path is clear of obstructions	Prepare for on-site testing
Acquire representative samples for testing	Understand the erection plan, pick points, lifting lugs	Continuously check tolerances	Monitor support points for movement or strain	Monitor time constraints

The inspection team assigned to ABC projects is faced with unique challenges in performing inspection activities and managing the project consistent with the goals of ABC. Recognizing these challenges and advance preparation will help to minimize unnecessary delays. For example, the inspector will need to work with the contractor to become intimately familiar with the detailed progress schedule and to identify gaps in their work, sequencing problems, hold points and inspection requirements. ABC projects demand this collaboration upfront so the inspection requirements are built into the process and the entire team is on the same page with how the work will be executed once it begins. Setting and managing clear expectations is a best practice

In construction we plan for obstacles because we know that at some point during the work, an issue will arise that requires a decision based on thoughtful engineering judgement. We don't know in advance what the issue is, but we are confident there will be a challenge that needs to be overcome. And, these issues have a way of presenting themselves on Sunday morning at 3:00 AM!

If an owner requires a contractor to work 24/7 on accelerated construction to deliver a project, then the owner must be prepared to do the same. Owners must develop a non-business hour chain of command so all matters may be addressed in an expedited fashion. There is no limit to the range of issues that can present themselves including alterations to foundations, differing site conditions, traffic related problems, engineering decisions, and anything related to contract time and money. The inspection team needs to know who to contact, and the chain of command is ready to respond during the critical periods of construction. Decisions need to be made quickly to keep the project moving forward.

Documentation has evolved in the last twenty years and is now a significant component of the work. The inspection team is expected to provide comprehensive documentation of all work which can be daunting during accelerated construction. The work is fast pace, involves multiple crews, multiple operations, subcontractors and suppliers. There is only one opportunity to capture the work.

The office engineer position should be considered essential personnel during the portions of accelerated construction. This person can keep the inspector's work products organized, manage last minute revisions to submittals and capture the documentation for all deliveries to the site.

More importantly, when a problem arises, the office engineer can keep the process organized and moving forward by ensuring the decision makers have immediate access to the information without distracting the inspector. Even though a significant problem is unfolding, the inspector's focus should remain with the work, ensuring it meets the contract requirements. Having the support of the office engineer to help facilitate the communication and documentation keeps the problem from becoming an additional burden for the inspector. This approach mitigates the risk of the inspector performing poorly at both the inspection and seeking resolution to problems. The office engineer can play an important role for the project, especially during the accelerated stages of work.

SUMMARY

The NHI web-based and instructor led training courses offer valuable insights for bridge construction and accelerated bridge construction. The new courses will be a tremendous improvement and provide owners a much-needed resource for bridge construction inspection training.

FOLLOW UP

At the time of presentation, these courses are in the final development and review stages. The pilot course is scheduled for April 2020 with the full release to follow. If you have questions or would like more information, please contact Mr. Grimmke or Mr. Hoyne.