

PROJECT SUMMARY REPORT

0-7271: Assess Approaches to Training and Developing Hydrology and Hydraulics (H&H) Staff in Transportation Agencies

Background

Within the transportation industry, the combined field of Hydrology and Hydraulics (H&H) is of significant importance, yet comprises only a small portion of the staff engineers. High staff turnover in H&H has been challenging in recent years, due to inconsistencies in training practices, lack of routine mentoring, and limited numbers of subject-matter experts to support large scale projects. The research team was tasked with evaluating the current landscape of H&H training across the transportation industry nationwide, with an emphasis on TxDOT, in the context of other departments of transportation (DOTs), businesses/private sector, and city/county departments. A thorough evaluation of formal and informal training practices was sought, in order to ultimately improve training practices within TxDOT, and thus, ensure reliable knowledge transfer so staff are prepared to tackle the wide range of H&H-related issues encountered in the transportation industry.

What the Researchers Did

The research team conducted a survey of H&H staff who work in the transportation industry. Development of the survey was led by the research team with the support of a small team of H&H staff within TxDOT, in order to ensure the questions appropriately encompassed the variety of training practices encountered by staff to adequately evaluate the training and mentoring landscape. Survey recipients included DOTs across the United States, including TxDOT. In addition, the survey was distributed to staff within city/county departments, and to private sector businesses across the state of Texas who carry out various H&H roles to support transportation infrastructure.

A total of 136 survey responses were used for analysis. Findings were evaluated in the context of employment (e.g. DOT vs. business/private, or TxDOT vs. other DOTs) to determine successful strategies for training and explore resource availability and usage between organizations. Additional topics of inquiry included knowledge confidence in various topic areas, prioritization of topic areas within organizations,

knowledge gaps, prevalence vs. preference for knowledge delivery mechanisms, and other features of formal and informal training for staff at various experience levels.

What They Found

Current Training Landscape

The research team found that state DOTs, the National Highway Institute (NHI), and private sector organizations are the primary entities providing H&H trainings. Detention, Stream Stability, Floodplain, and Resilience appear to be the topic areas with the lowest amount of training coverage, as well as the topics where respondents feel the least confident. Storm Drain/Sewer, Floodplain, Detention, and Resilience were the topic areas where respondents reported trainings had the lowest impact (when compared to other topic areas) on their ability to do their job effectively.

Topic Prioritization Areas

Topic area importance was used to narrow down topics where training improvements would be most meaningful. For TxDOT respondents in particular, the top seven ranked topic areas were Basic Hydraulics, Basic Hydrology, Culverts, Hydraulics Modeling, Hydrologic Modeling, Bridge Hydraulics, and Storm

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Drain/Sewer.

Knowledge Gaps

For TxDOT and other DOTs, the top two respondent-identified knowledge gaps were in Hydraulics Modeling and Hydrologic Modeling, followed by Bridge Hydraulics (for TxDOT) and Stream Stability (for other DOTs).

Training Approaches

The survey results indicate that staff prefer live trainings, whether virtual or in-person, with a caveat that flexibility is vital. When comparing training preferences to the existing prevalence of different training methods, in-person training is a potential opportunity for improvement: respondents indicated a high preference for in-person training, but also indicated it was not as common at their organizations. The results also showed that survey takers prefer applied and personalized trainings, and that informal training is the primary method of knowledge transfer among staff across all organization types.

Barriers to Training

“Lack of time” was the top identified barrier to training across all organization types.

Value of Research

The research team calculated the economic value of the work, considering factors such as improved productivity and work efficiency (with improvements to training), expedited project delivery, improvements to engineering design, and increase in confidence in the level of knowledge across H&H staff.

What This Means

The extensive survey and analysis have provided significant insight regarding the H&H training landscape in the transportation industry within TxDOT,

in comparison with other DOTs, private firms, and city/county departments across Texas. Survey analysis has yielded a number of recommendations for TxDOT’s H&H division to consider in regard to continuing to improve their training approaches, and for DOTs and other transportation-focused industries to consider in a climate of high turnover and inconsistent knowledge transfer within organizations. Some of the key takeaways include:

- Prioritize applied trainings and provide in-house trainings where possible.
- Increase live training options with a focus on flexibility.
- Leverage existing trainings (NHI).
- Prioritize topic areas with identified gaps.
- Ensure adequate staff and resources.
- Maximize consistency of informal training.

Information gained from this effort will assist agencies in determining which training practices to continue to support, which areas show room for growth, and how organizations should prioritize time and needs to ensure consistent knowledge transfer for developing excellent H&H staff

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