

Advances in Evaluating Weld Quality



Image courtesy of NCHRP

Advances in welding technology in other industries may have promising applications for transportation agencies.

SCAN FOCUS

Welding innovations in other industries, such as ship building and heavy equipment, may have applications for highway bridges such as in-process weld inspections and quality assurance. These innovations, categorized as data systems or visual systems, could potentially offer real-time feedback to identify and prevent defects, and data monitoring to assess weld compliance. Adoption of these welding advances could lead to an increase in weld quality and a decrease in inspection costs for agencies. To better understand the current processes and controls available, Domestic Scan 23-03 sought to evaluate state-of-the-art welding practices.

PERSON-TO-PERSON RESEARCH

The team invited one state transportation agency and eight additional organizations and businesses to participate in a two-part workshop in the summer and fall of 2024 to share their methods for utilizing data and visual systems to enhance welding quality and performance. The scan team members then synthesized the themes and findings to provide recommendations for possible future research to maximize the use of the technological advancements.

NEXT STEPS Put It into Practice

EXPLORE NEW IDEAS

The strategies that have worked well for other public and private organizations may suit your agency's needs as well.

GET INVOLVED

Help problem-solve with AASHTO's Committee on Bridges and Structures at transportation.org/bridges.

READ MORE

The full Scan 23-03 report is available at domesticscan.org/scans/23-03.

SUGGEST FUTURE SCANS

What topic do you have for an NCHRP Domestic Scan? See domesticscan.org/.

PRELIMINARY FINDINGS

During the workshop, which included presentations and in-person demonstrations, industry leaders shared the uses and capabilities of data and visual welding systems. Innovations included data feedback to target causes of surface defects and evaluate weld quality, and visual scanners that identify improper fitups and joint dimensions. The team found that while these advanced technologies could eventually reduce or prevent defects in real-time, improve compliance monitoring and detect defects in welds made with older technology, they may be incompatible with current common bridge welding practices and not ready for widespread implementation by bridge owners.



While advances in welding technology exist, none of the systems presented during the scan seem ready for broad implementation in the steel bridge industry at this time.

Image courtesy of NCHRP

PUTTING IT TO WORK

Based on the findings, the team did not have any recommendations for implementation, but did identify additional research opportunities on topics such as:

- Determining and clarifying the specific issues for bridges that need solutions.
- Specifying data collection needs and processes to detect defects.
- Adding additional data types, such as electrical, optical and sound, into machine learning models.
- Detecting subsurface defects.

SHARING THE RESULTS

Scan team members have presented their findings at a variety of regional and national gatherings of transportation, bridge building and welding professionals.

ABOUT THE PROGRAM: The NCHRP U.S. Domestic Scan Program (NCHRP Project 20-68, domesticscan.org) recognizes the value of firsthand sharing of new technologies and practices. Launched in 2006, the program typically sponsors two or three scans per year, putting state and federal DOT practitioners who need solutions in touch with innovative peers around the country, speeding the transfer of technology and know-how. During the intense experience of the scan (typically one to two weeks), participants see how a new technology or practice works in the real world. They also develop close professional relationships that remain readily available to them years later.

SCAN PARTICIPANTS



Image courtesy of U.S. DOT

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