AASHTO
AASHTO INNOVATION INITIATIVE

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation

1. Sponsoring DOT (State): Connecticut
2. Name and Title: Edgardo D. Block, PE; Research Program Supervisor

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3. Is the sponsoring State DOT willing to promote this innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? Yes or No: Yes

Innovation Description (10 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

4. Name of the innovation:

3D Scanning System for Bridge Inspection

5. Please describe the innovation. Describe how this innovation transforms your existing "state of play."

Bridge inspections are primarily conducted using visual inspection techniques to evaluate the condition of a bridge. Current bridge inspection techniques are time consuming and qualitative. The data collected at an inspection site includes sketches, hand measurements, and pictures

6. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments here.

Photographs and Diagrams 1 through 7 attached.
FIGURE 1. Equipment required for scanning: (a) Artec Eva scanner; and, (b) Alienware laptop (or tablet)

7. Briefly describe the history of its development.

Using 3D Scanning for bridge inspections was an innovative idea presented to CTDOT by Dr. Arash E. Zaghi at the University of Connecticut (UCONN). The application was extensively tested in laboratory setting. Based on the results, a pilot test was performed in the field. The UCONN

State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

8. How ready is this innovation for implementation in an operational environment? Please check of the following options. Please describe

- ☐ Prototype is fully functional and yet to be piloted
- ☑ Prototype demonstrated successfully in a pilot environment
- ☐ Technology has been deployed multiple times in an operational environment
- ☐ Technology is ready for full-scale adoption

9. What additional development is necessary to enable routine deployment of the innovation? What resources—such as technical specifications, training materials, and user guides—are already available to assist with the deployment effort?

An on-going research project is focused on the 1.) development of a file management plan and workflow for integration of 3D scanning data into current CTDOT practice; 2.) development of

10. Has any other organization used this innovation? Yes or No: No
If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	E-mail

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over other current practice (baseline).

11. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Process improvement/simplification: Collecting data onsite with 3D scanning only requires the scanner itself. No other equipment such as camera, ruler, caliper, D-Meter etc. is needed. 3D scanning also improves the accuracy of the measurements and allows all measurements to be

12. What type and scale of benefits have your DOT realized from using this innovation? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing baseline practice. Please identify the following benefit types:

Check boxes that apply	Benefit Types	Select a rating from the drop down menu
✔	Cost Savings	4-Moderate to High
	Shortened Project/Service Delivery Schedule	Choose an Item
	Improved Customer Service	Choose an Item
✔	Improved Quality	5-High
	Environmental Benefits	Choose an Item
✔	Organizational Efficiency	5-High
✔	Improved Safety	4-Moderate to High
✔	Improved Operational Performance	5-High
	Improved Asset Performance	Choose an Item
✔	Others (please describe)	Choose an Item

Provide an additional description, if necessary:

13. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

The technology can be deployed in any State by the various branches of the government as well as the private industry. Contractors can be easily trained to use the technology in States that contract out the bridge inspection.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

14. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
	Gaining executive leadership support	
	Measuring performance (e.g. benefits documentation)	
	Improving technology understanding	
	Overcoming financial constraints	
	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	
	Acquiring in-house expertise	
	Resolving conflicts with existing regulations and standards	
✔	Other challenges	The States interested in adopting the technology would have an upfront cost of purchasing the

15. What is the estimated cost, effort, and length of time required to deploy the innovation in another organization?

	Please describe:
Cost	If the adopting agency has the staff required to operate the scanner and
Level of Effort	Personnel can be trained to scan objects within 1-2 weeks. Building the
Time	3-5 months

16. To what extent should the implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Using the scanner needs very minimal practice/expertise. Some training will be involved in using the software to analyze data and for calculation of load rating. This can be done by the in-house staff or contractors/consultants

Adaptation of 3D scanning Technology for Bridge Inspection

Photographs and Diagrams

(a) **(b)**

FIGURE 1. Equipment required for scanning: (a) Artec Eva scanner; and, (b) Alienware laptop (or tablet)

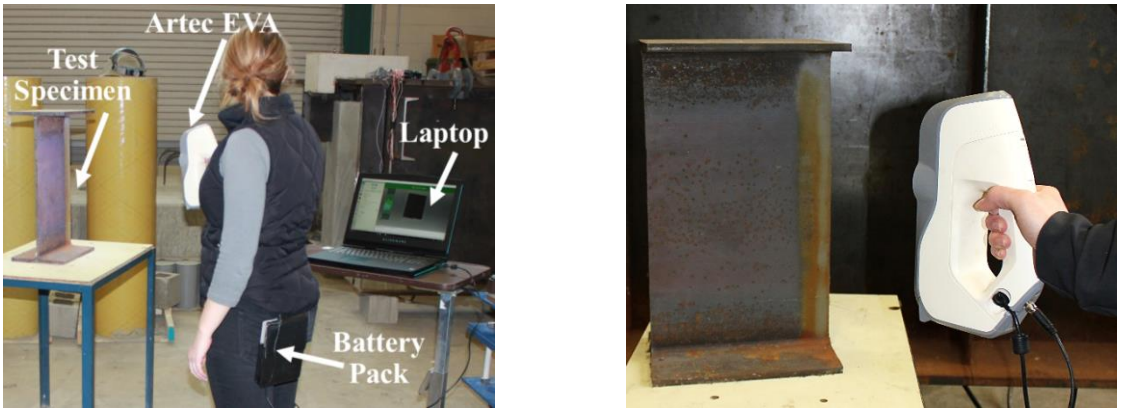


FIGURE 2. Use of the Artec Eva for scanning corroded beam in UCONN Structures Laboratory

(a) **(b)**

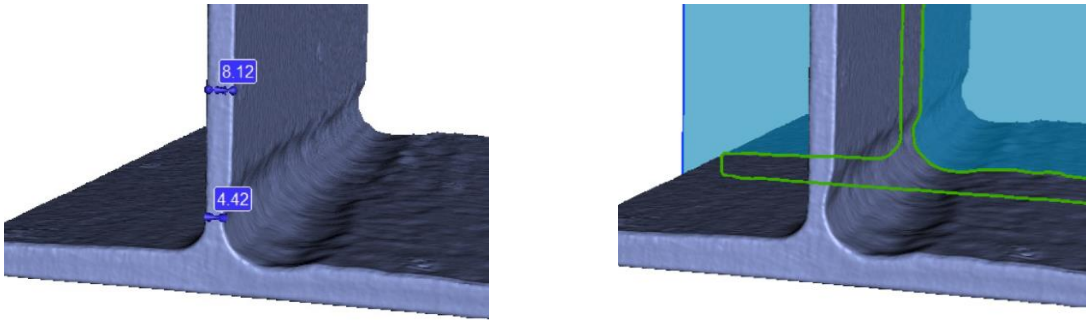
FIGURE 3. Artec field trial showing selected (a) in-service bridge; and, (b) beam end

(a) **(b)** **(c)**

FIGURE 4. Additional field trials using the Artec Eva scanner

(a) (b) (c)

FIGURE 5. Visual of section from laboratory trial: (a) point cloud; (b) 3-D scan with texture; and, (c) picture of actual section



(a) (b)

FIGURE 6. Measurements taken in Artec Studio including (a) linear measurements in mm; and, (b) a section cut

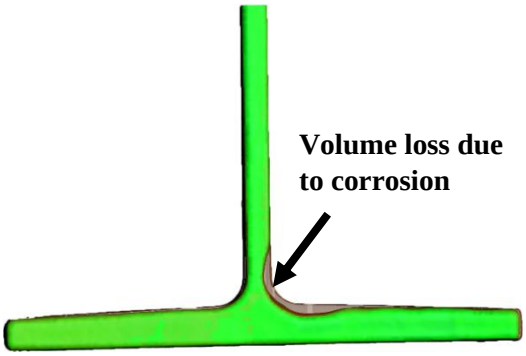


FIGURE 7. Visual representation of intact section overlaid with corroded section in Artec Studio Software