AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. Sponsoring DOT (State): Washington DOT

2. Name and Title: Daryl Blumberg, Maintenance Innovation and Operations Manager

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State: Washington

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Innovation Description (10 points)

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

3. Name of the innovation:

Hytorc Tool use at the Tacoma Narrows Bridge.

4. Please describe the innovation.

Implementation of new tool. The suspender lines that the bridge deck is supported by, attach to the main cables with castings. The castings must be inspected on a cycle of 25% every 10 years. In the past, each

inspection required a lot of equipment and 6 persons. Moving the spider was labor intensive and dangerous. With this wrench, the job now only requires 3 persons and no Spider platform and heavy tooling. With a $15,000 investment, the process to meet a 25% verification that previously took 2 years to complete, now can be done in less than a year. Manpower for this process is reduced by 50% and the labor hours are reduced by 75% from previous efforts. There are two bridge structures. Crew estimates that the cost savings for this 10-year process for each bridge are approximately $108K per bridge and 1,800 man hours. For both structures, total is $216K in savings and 3,600 man-hours. That's 3,600 less hours of exposure to hazards to the crew and the traveling public. There is an average daily count of 90,000 cars per day traveling across the bridges per day. Each man-hour saved reduces exposure to those vehicles.

5. What is the existing baseline practice that the innovation intends to replace/improve?

The use of a combination of various tools including a propane powered spider/work platform to support workers, a hydraulic power unit and wrench to perform routine verification of casting bolts tensions on the Tacoma Narrows cable suspension bridge.

6. What problems associated with the baseline practice does the innovation propose to solve?

Hazards and challenges include **Limited space in the spider** - The Spider basket only has enough room for one person. This person has no escape route if there were to be any type of malfunction. **A propane canister and propane** lines are attached to the spider. **A Hydraulic pump and lines** are used to loosen and tighten the bolts. This unit is also carried by the spider. In a tight area, there is a potential for a hydraulic line bursting, causing injury. **Spider access** - To get the spider from the road deck to the cable, there are several ropes and cables lowered down and pulled up, some of these lines must stay in place, within a few feet from live traffic. Specifically, the vertical lifeline used for the worker riding the basket up to the cable. **Hauling the transfer gear up the main cable** - With the spider near weight capacity, some of this gear must be carried by hand by a worker walking up the cable. Every piece of gear brought up has the potential to fall. **Transferring the spider** - To gain access to the next casting, the spider is transferred in the air, using another rigging point and cable. Every time a rigging connection is made while personnel are being carried, there is risk for a bad connection. With all procedures in place to complete this job safely, it is extremely time consuming.

7. Briefly describe the history of its development.

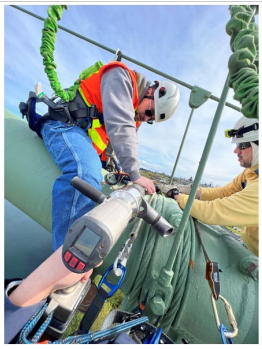
The TNB crew we are always looking for better and safer ways to perform tasks. This past year, the old hydraulic pump started to fail. In the search for a new and better solution, they discovered the Hytorc Wrench, A handheld battery powered unit. The tool looks much like a normal hand drill one might have in their garage. The difference…this wrench has a 5,000lb capacity and a digital interface allowing the user to preset and adjust torque parameters. A single battery will allow the user to perform approximately 100 torque verifications before needing recharged. The TNB crew collaborated with Hytorc to test the tool's ability to perform in the real-world environment, high above the bridge deck and water below.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

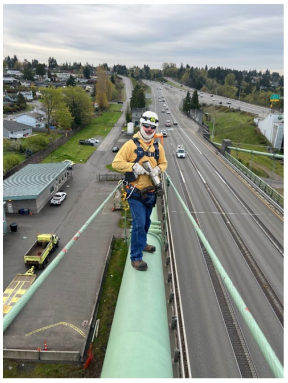
Below is a YouTube link for the submission to our WSDOT Innovations Challenge
https://youtu.be/QG0aP1v8yyM

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.

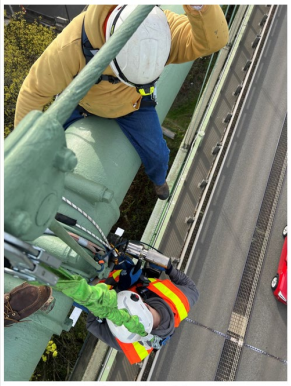
The old way with the spider. 3–4-person team on the cable, 1 operating the spider and 1 ground person.



The new way. 3-person crew on the cable. All the equipment needed is carried by the crew attached with lanyards to their person. Almost everything needed is pictured in this photo.



Transporting the wrench to the operation.



Hytorc Wrench in use.

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.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☐ Prototype is fully functional and yet to be piloted

☐ Prototype has been piloted successfully in an operational environment

☒ Technology has been deployed multiple times in an operational environment

☐ Technology is ready for full-scale implementation

The technology will continue to save time and money while also greatly reducing the risk to our personnel as well as the motoring public as they drive on the bridge deck, far below workers and tools above.

10. What additional development is necessary to enable implementation of the innovation for routine use?

None

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? ☐ Yes ☒ No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
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Potential Payoff (30 points)

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

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

The use of this tool to perform tension testing on the casting bolts on the bridge allows the team assigned to that bridge to perform required, planned maintenance and inspection at a much faster, safer, and less costly rate.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Choose an item.	Significant Safety Benefits
Choose an item.	Significant Time Savings
Choose an item.	Significant Cost Savings

Provide any additional description, if necessary:

Reduces required manpower by 50% and required labor hours by 75%.

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

This innovation could be deployed in all states and municipalities with cable suspension bridges.

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.

15. 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	Click or tap here to enter text.
☒	Communicating benefits	Click or tap here to enter text.
☐	Overcoming funding constraints	Click or tap here to enter text.
☒	Acquiring in-house capabilities	Click or tap here to enter text.
☒	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
☒	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
☐	Other challenges	Click or tap here to enter text.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: The tool cost is $14,500

Level of Effort: Minimal

Time: Minimal

17. To what extent might 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.

Unknown currently.