

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 State Department of Transportation

2. Name and Title: Bijan Khaleghi, State Bridge Design Engineer

Organization: WSDOT

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

3. Name of the innovation:

Concrete filled tube arch for bridge superstructure

4. Please describe the innovation.

The use of concrete filled tube for main arch and vertical members for deck type arch or tied arch bridge superstructures

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

Two completed research projects on concrete filled steel tubes for bridge substructure and bridge foundation. Several bridge in Washington State have benefitted from the implementation.

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

The proposed innovation accelerate the bridge construction by just field installing the prefabricated arches and filling with concrete. This methodology could be used for short or long span bridges.

7. Briefly describe the history of its development.

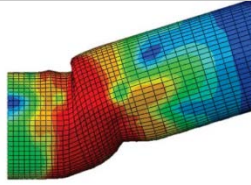
The concrete filled steel tubes are developed in Washington state and tested at the University of Washington. This was used for substructure and foundation of bridges last few years. The concrete filled tube has been used in other countries (China) for the arch and truss bridge superstructures providing more efficient, longer span, while accelerating bridge construction compared to the conventional bridge construction methods and materials.

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.

The WSDOT Bridge Design Manual provide design guidance for concrete filled steel tube applications. <https://www.wsdot.wa.gov/publications/manuals/fulltext/M23-50/BDM.pdf>

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

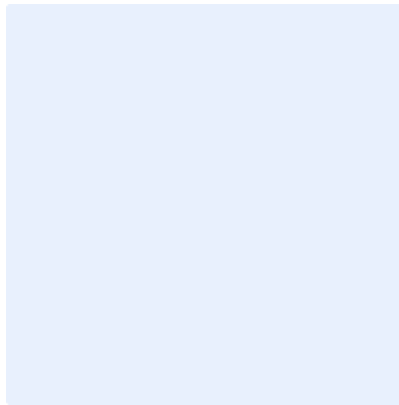
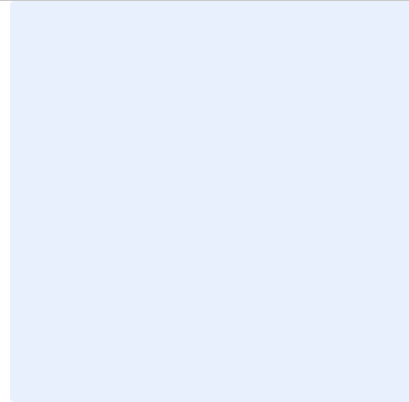




a) Computed Stresses and Strains in Steel Tube



b) Observed Deformations of Steel Tube



State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The All 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

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

Design criteria and specifications for application of concrete filled tubes to arch bridges.

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
WSDOT- Bridge	Mark Gaines	3607057201	GainesR@wsdot.wa.gov
WSDOT-Bridge	Amy Leland	3607057204	LelandA@wsdot.wa.gov
WSDOT-Bridge	Bijan Khaleghi – Contact Person	3607057181	khalegB@wsdot.wa.gov

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?

More efficient, cost effective, durable, and rapid construction

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:
Shorter Schedule	Accelerated bridge construction
Cost Savings	Cost effectiveness and life cycle cost
Improved Asset Performance	Durability and long-term performance

Provide any additional description, if necessary:

The concrete filled tubes are shop fabricated and could be formed in any shape for different types of bridges and buried structures. The tubes are available and customized to bridge demands. Shop

fabrications and painting provide higher quality improved safety as compare to field assembled bridge construction.

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)?

The concrete filled tubes type has potential to be used in many bridge types and buried structures.

Market Readiness (20 points)

The All 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:
<input type="checkbox"/>	Gaining executive leadership support	Click or tap here to enter text.
<input type="checkbox"/>	Communicating benefits	Click or tap here to enter text.
<input type="checkbox"/>	Overcoming funding constraints	Click or tap here to enter text.
<input type="checkbox"/>	Acquiring in-house capabilities	Click or tap here to enter text.
<input type="checkbox"/>	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
<input type="checkbox"/>	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
<input type="checkbox"/>	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: Click or tap here to enter text.

Level of Effort: Click or tap here to enter text.

Time: Click or tap here to enter text.

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.

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