

2019

Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials

Murtaza Nalwala

University of Nebraska - Lincoln, gabriron01@huskers.unl.edu

Gabriel Nsengiyumva

University of Nebraska-Lincoln, gabriron01@huskers.unl.edu

Yong-Rak Kim

University of Nebraska-Lincoln, yong-rak.kim@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/civilengdiss>



Part of the [Civil Engineering Commons](#), and the [Other Civil and Environmental Engineering Commons](#)

Nalwala, Murtaza; Nsengiyumva, Gabriel; and Kim, Yong-Rak, "Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials" (2019). *Civil Engineering Theses, Dissertations, and Student Research*. 147.
<https://digitalcommons.unl.edu/civilengdiss/147>

This Article is brought to you for free and open access by the Civil Engineering at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Civil Engineering Theses, Dissertations, and Student Research by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.



Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials



Murtaza Nalwala, Gabriel Nsengiyumva and Professor Yong-Rak Kim
University of Nebraska-Lincoln, UCARE 2018-19

RESEARCH MOTIVATION

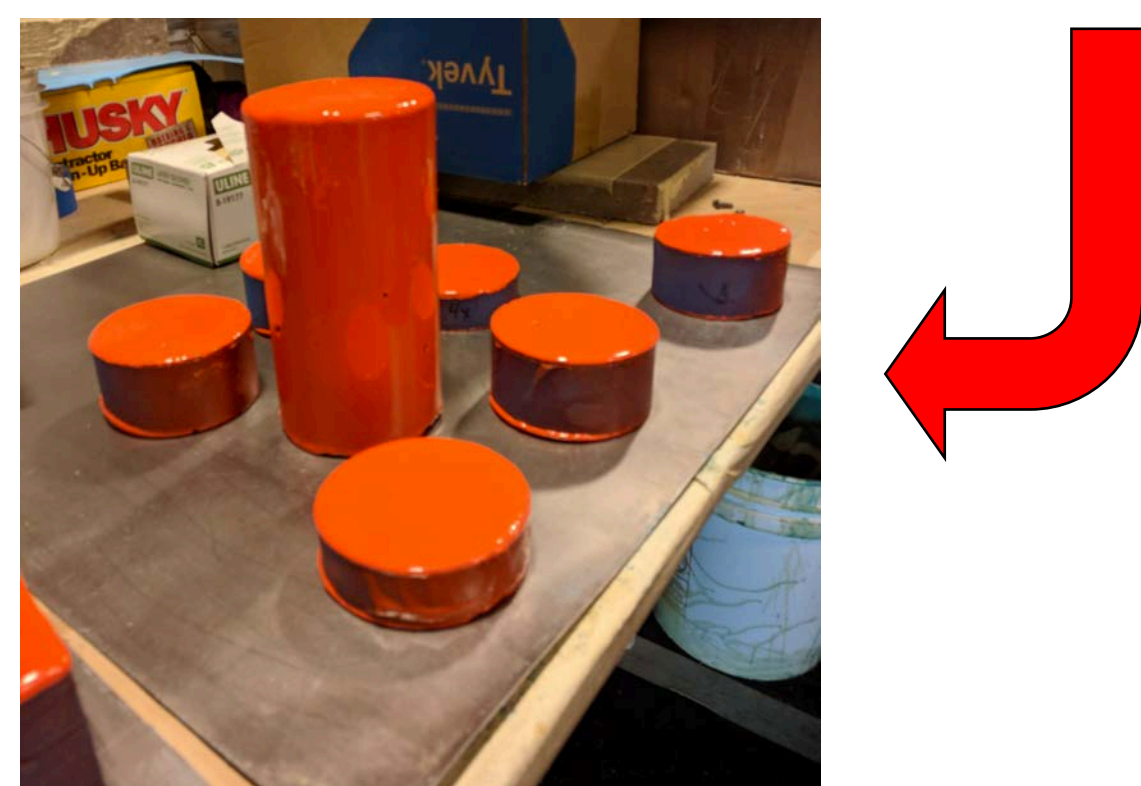
The bridge piers are highly vulnerable to the impact and blast loads. The position in which they are constructed makes it difficult to install protective devices around them. By the current AASHTO standard, it is possible to under-design bridge piers for commercial vehicle impacts and other events such as blast.

OBJECTIVE

- ✓ To improve impact and blast resilience of bridge piers using polymeric coatings.

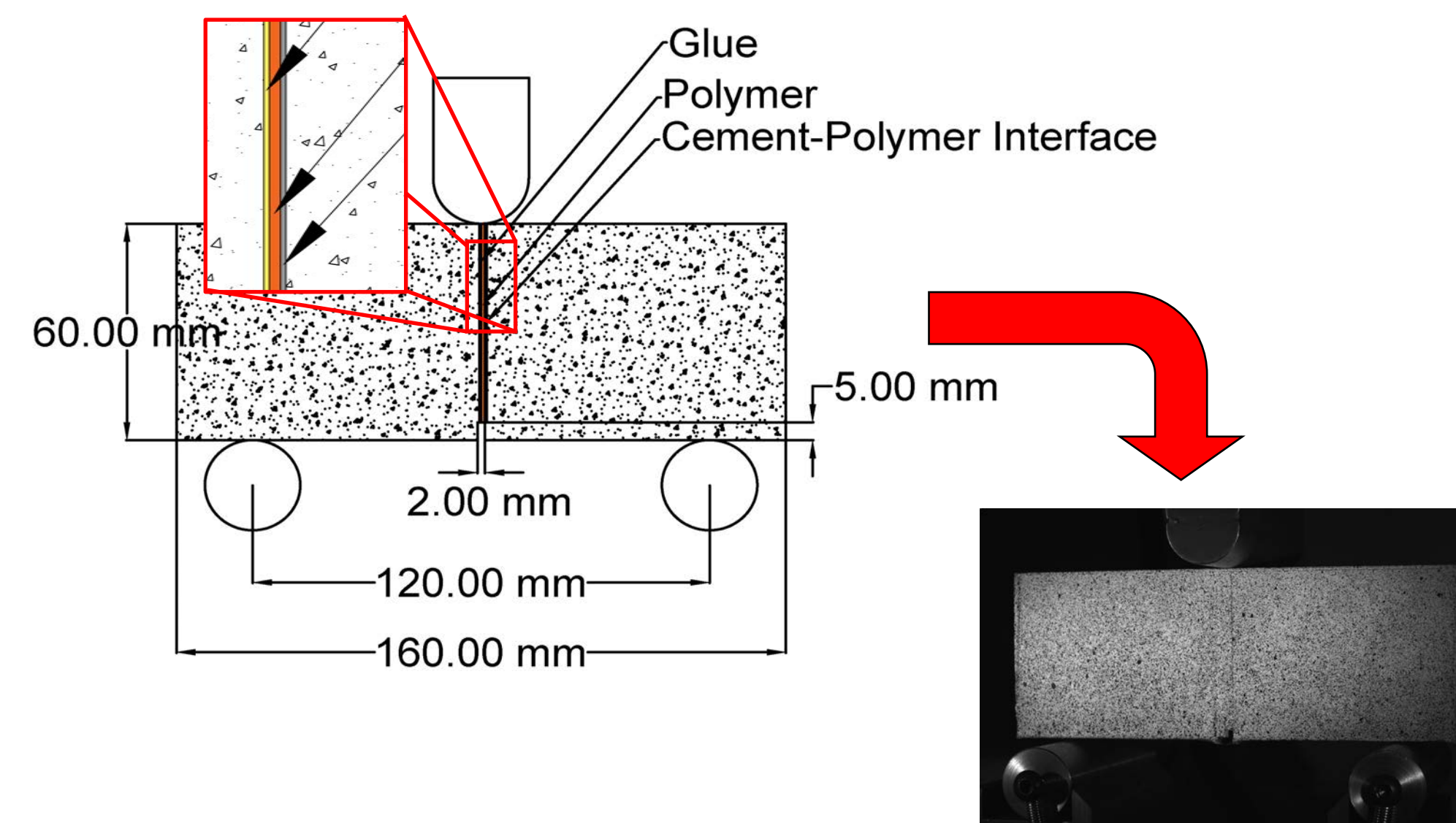
MATERIALS AND SAMPLE FABRICATION

- ❖ Polyurea as Bridge Deck Membrane (BDM) from Versaflex.
- ❖ BDM is typically used for protection of bridge decks against freeze-thaw and moisture damage which could result in corrosion of rebars.
- ❖ The ease of application with high resistance to abrasion is the most advantageous factor of this material.

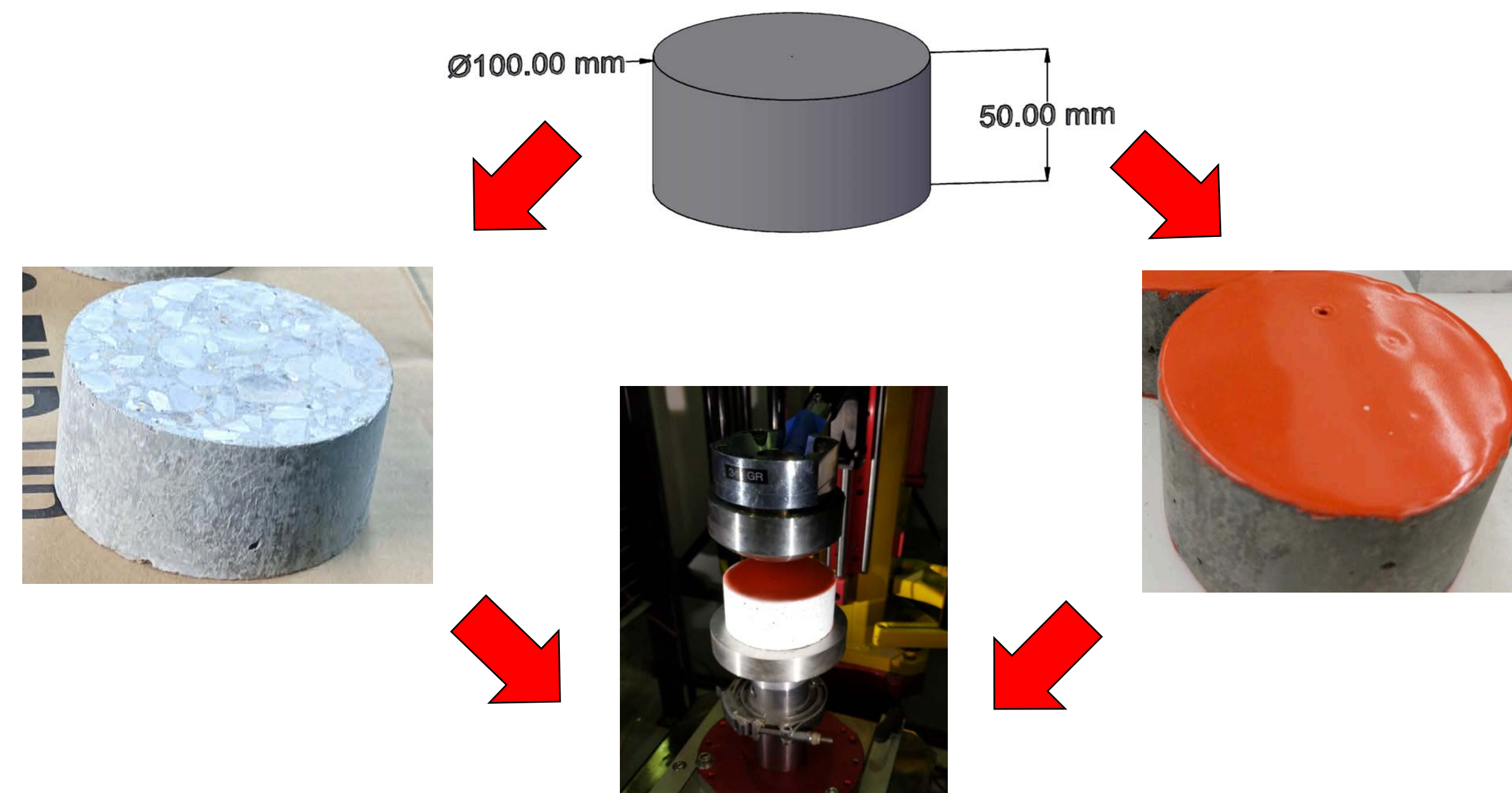


Coating Application: Versaflex Inc. (KC,KS)

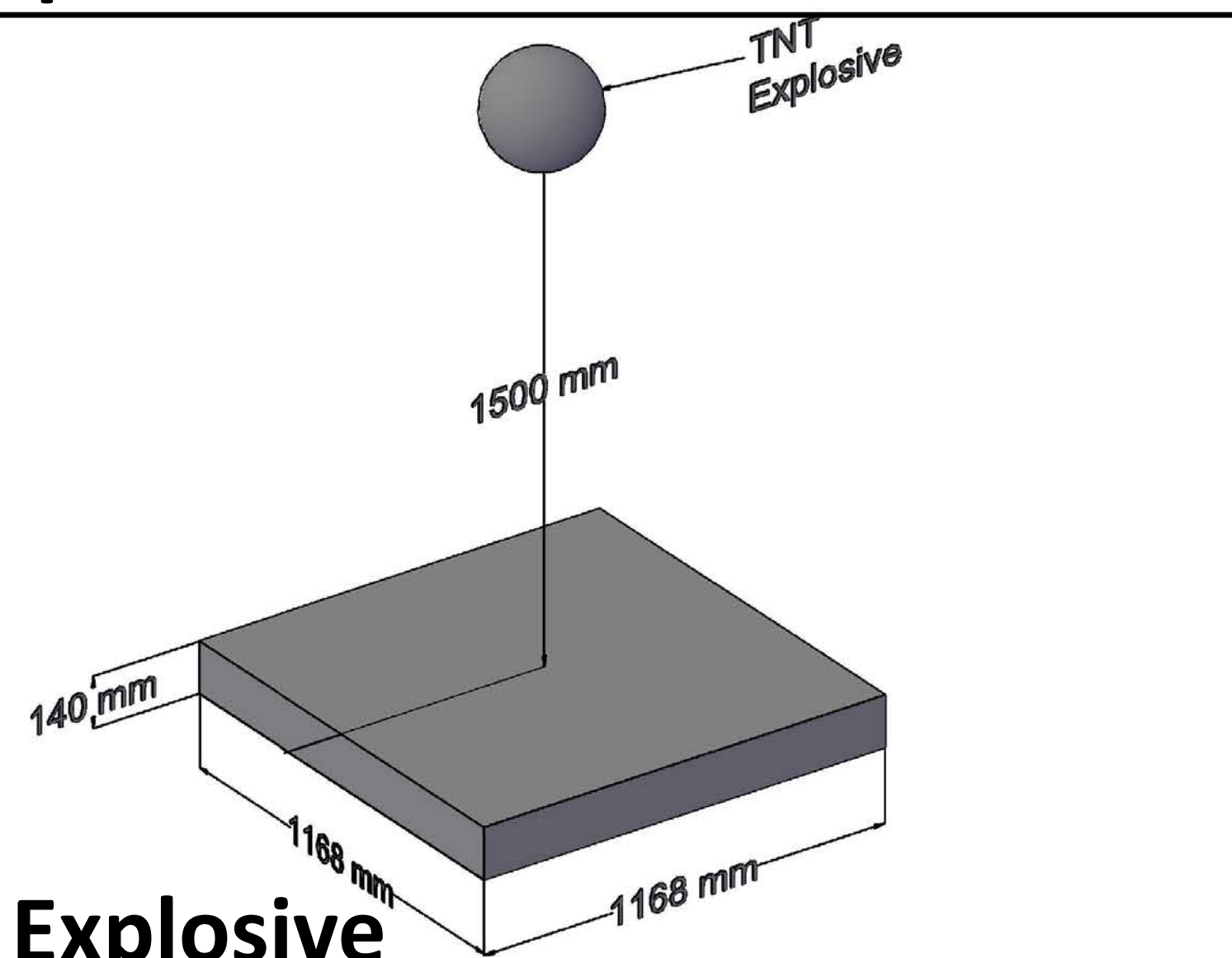
RESEARCH METHOD



Adhesion Test: Three-Point Bending

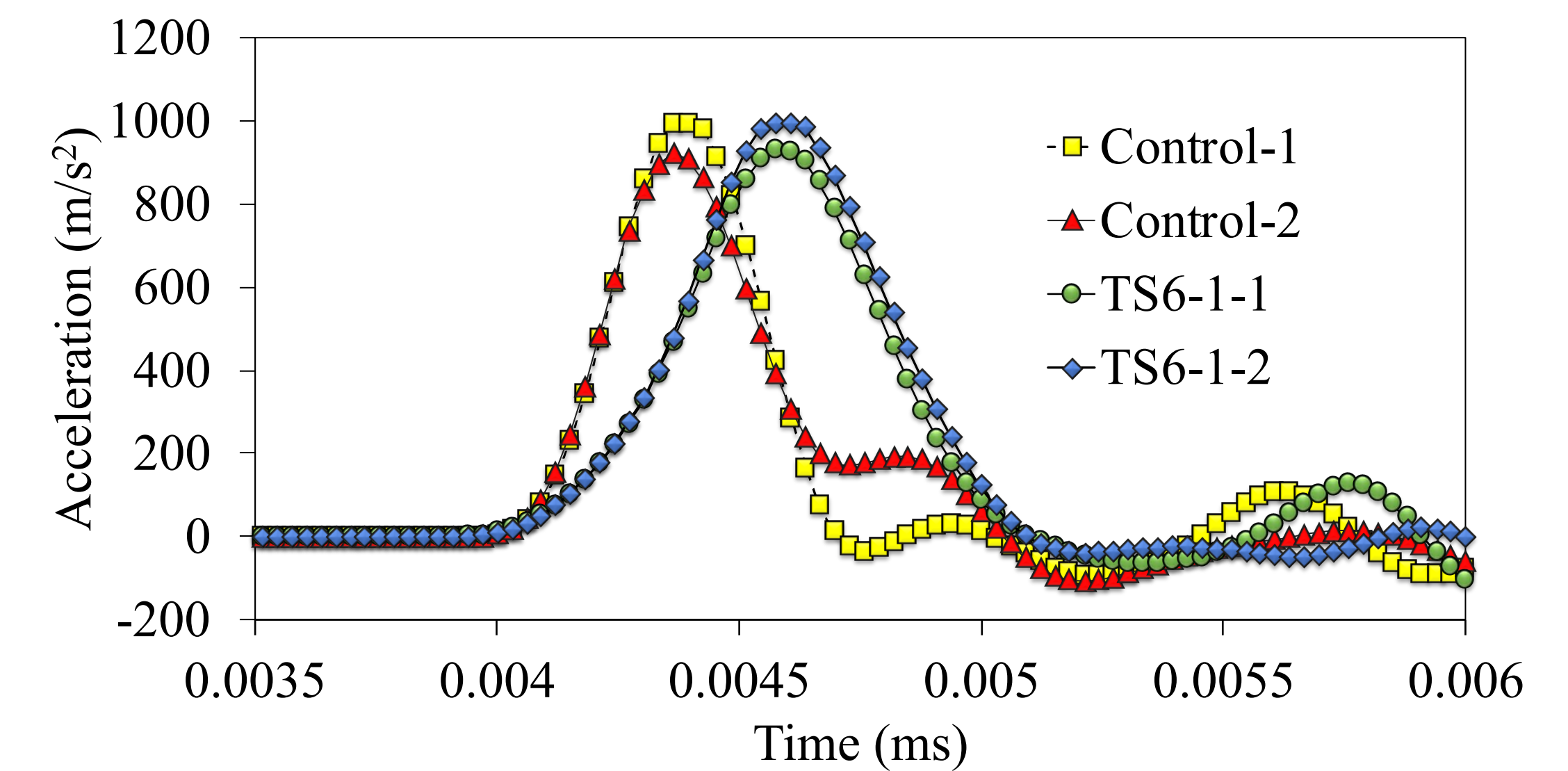


Impact Test: Drop Tower

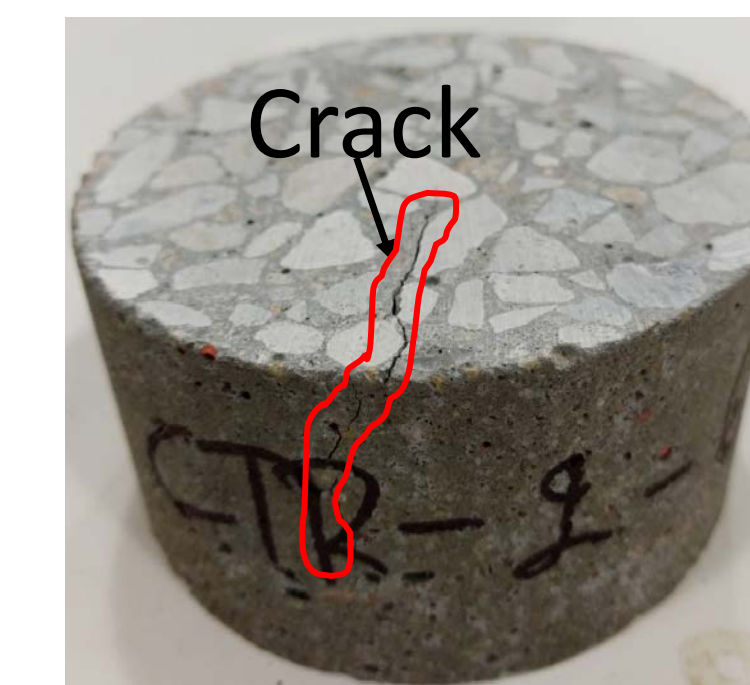


Blast Test: TNT Explosive

RESULTS



Impact Test Results: Acceleration vs Time



Control



TS6-1

Impact Test Results: Specimens After Impact

CONCLUSION

- ✓ Polymer coating of Portland cement concrete can be achieved with a good bonding.
- ✓ The polymeric coating seem to improve impact resilience of Portland cement concrete by increasing absorbed impact energy (i.e., area underneath the curve of acceleration vs time).

FUTURE WORK

- Finish all impact testing and use high-speed digital image correlation to monitor deformations during impact.
- Conduct the adhesion and blast tests.