

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

UCARE Research Products

UCARE: Undergraduate Creative Activities &  
Research Experiences

---

2019

## Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials

Murtaza Nalwala

*University of Nebraska-Lincoln*

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/ucareresearch>



Part of the [Construction Engineering and Management Commons](#), [Structural Engineering Commons](#), and the [Transportation Engineering Commons](#)

---

Nalwala, Murtaza; Nsengiyumva, Gabriel; and Kim, Yong-Rak, "Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials" (2019). *UCARE Research Products*. 161.

<https://digitalcommons.unl.edu/ucareresearch/161>

This Poster is brought to you for free and open access by the UCARE: Undergraduate Creative Activities & Research Experiences at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in UCARE Research Products by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.



## 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.

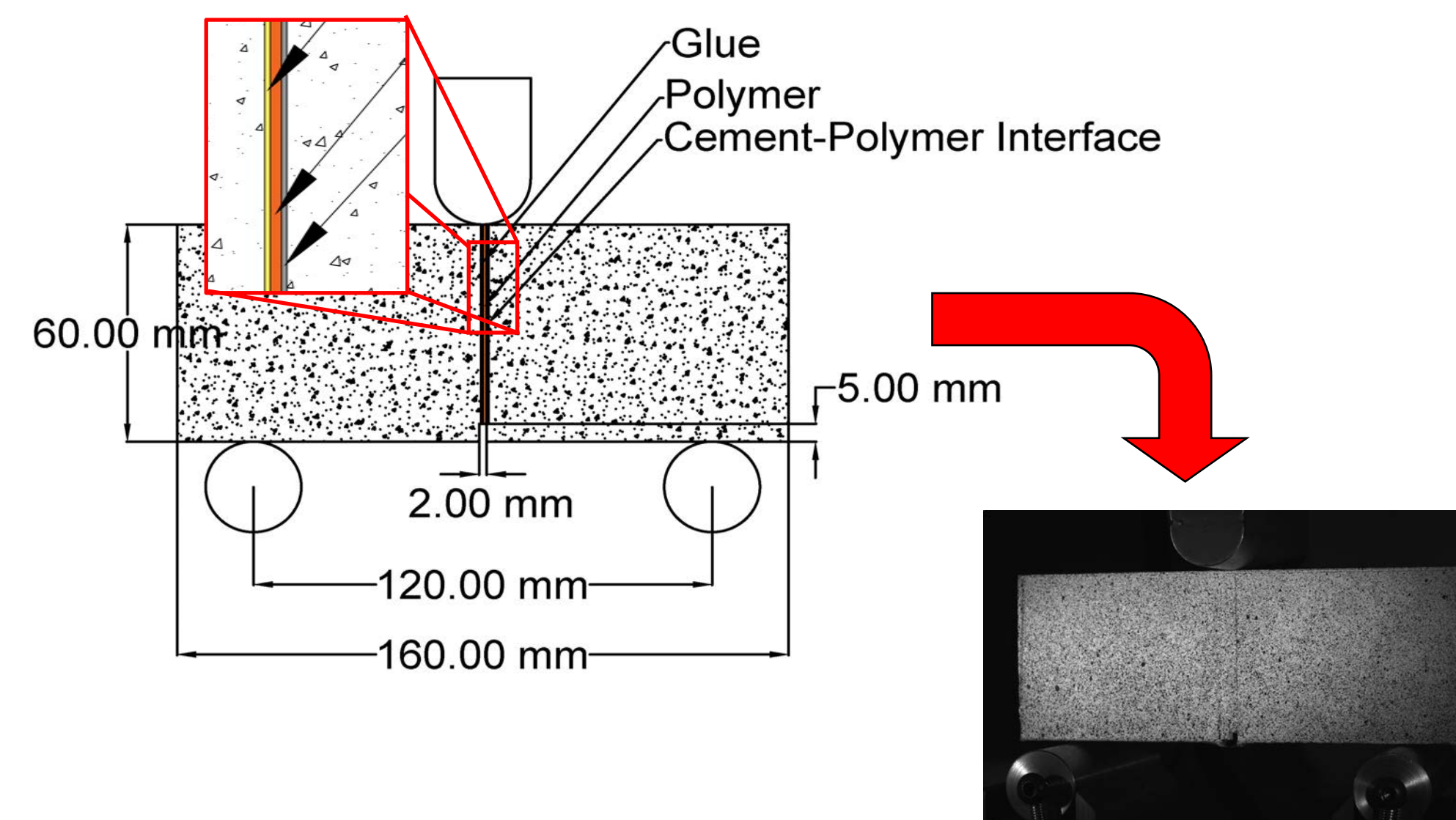
## MATERIALS AND SAMPLE FABRICATION

- ❖ 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 results in corrosion of rebars.
- ❖ The ease of application with high resistance to abrasion is the most advantageous factor of this material.

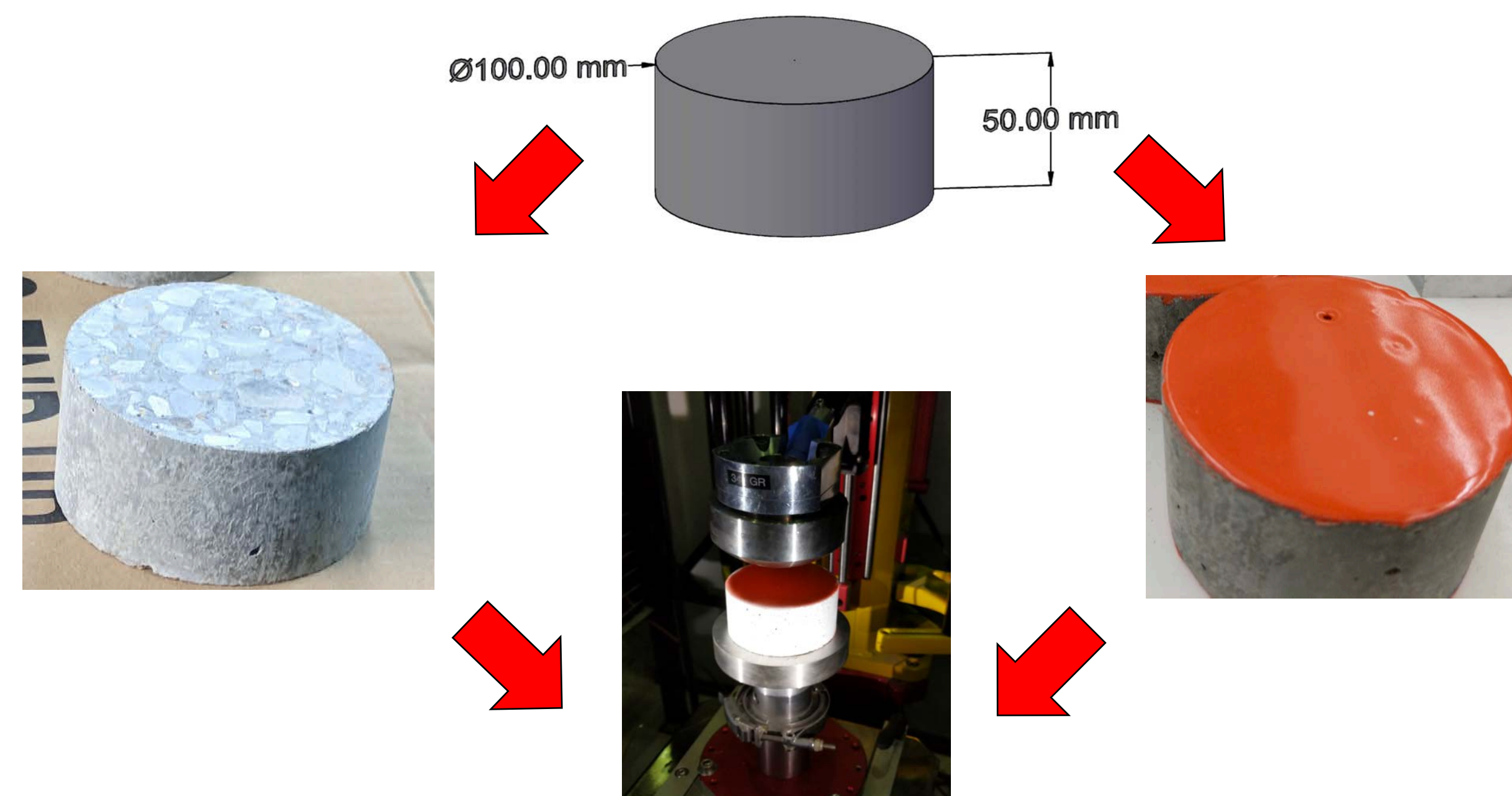


Coating Application: Versaflex Inc. (KC,KS)

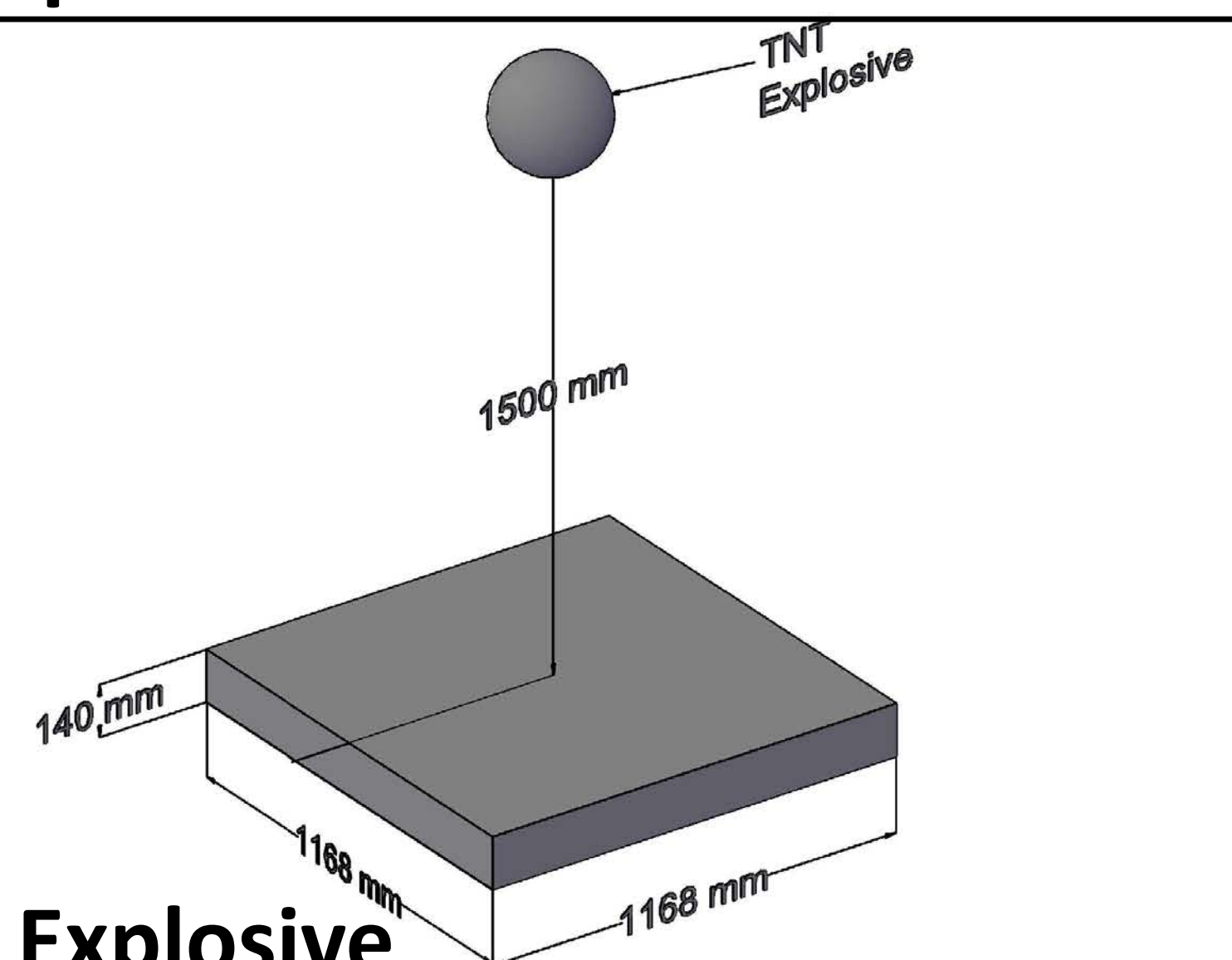
## RESEARCH METHOD



### Adhesion Test: Three-Point Bending

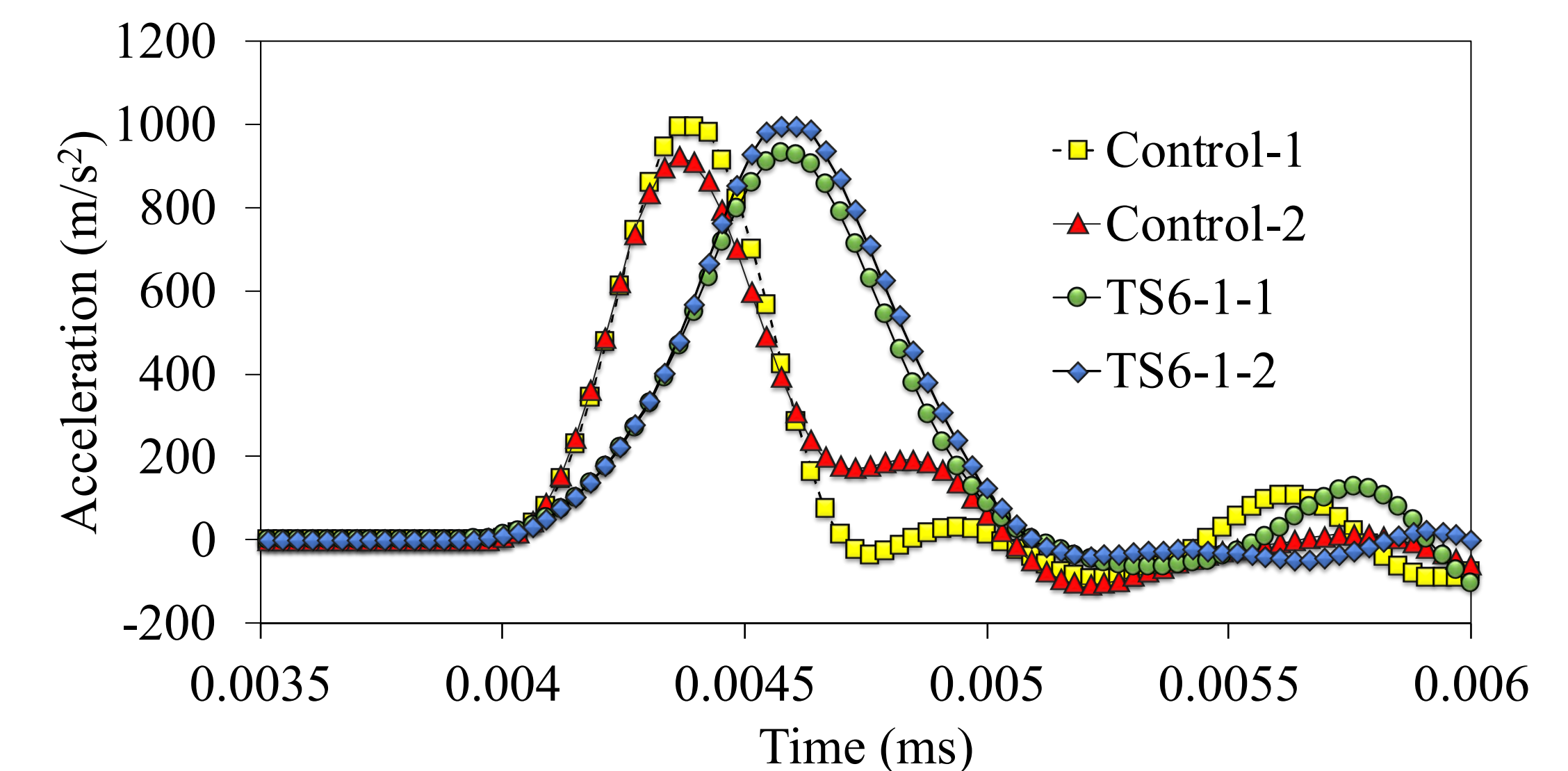


### Impact Test: Drop Tower

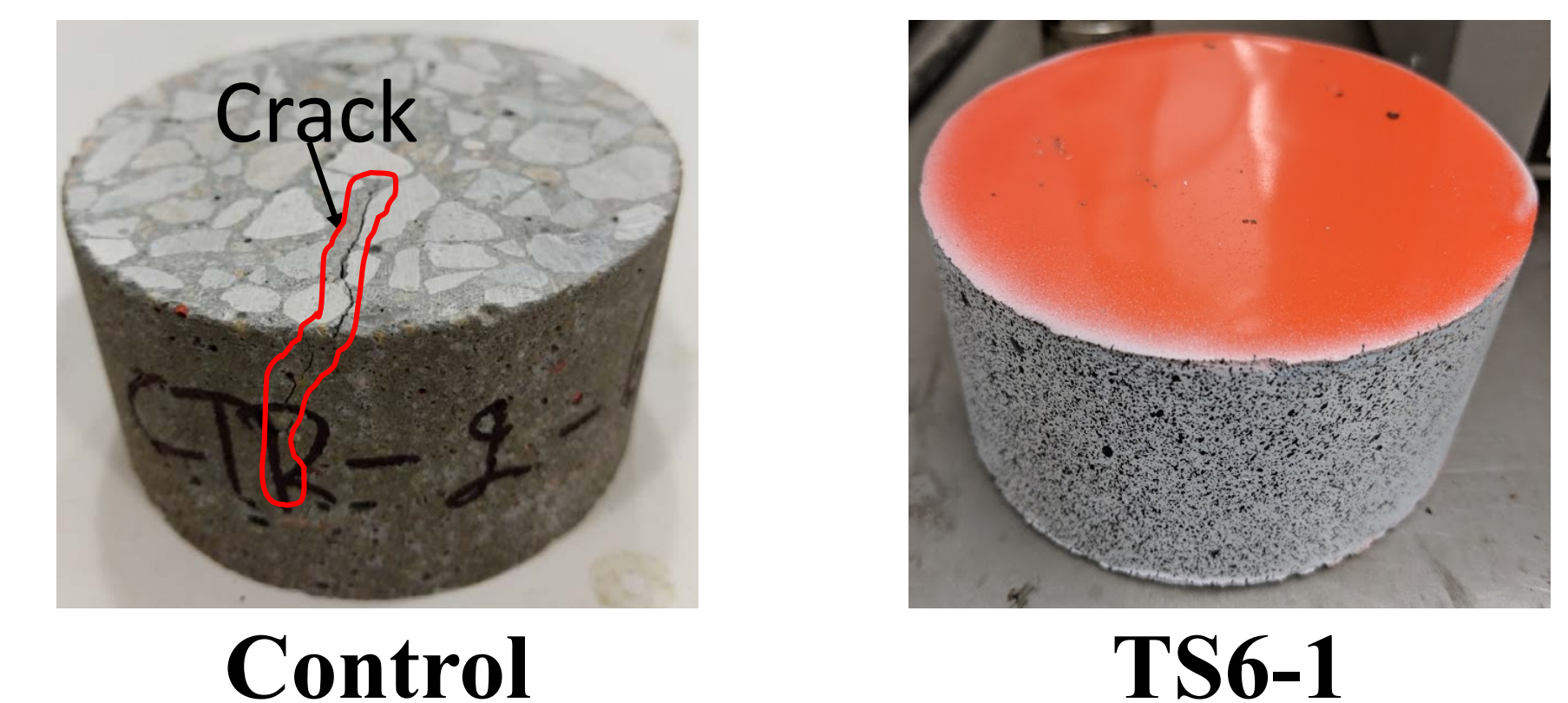


### Blast Test: TNT Explosive

## RESULTS



### Impact Test Results: Acceleration vs Time



### 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.