Project 3 Task 2 (D&D)

Philip Moore (DOE Fellow)

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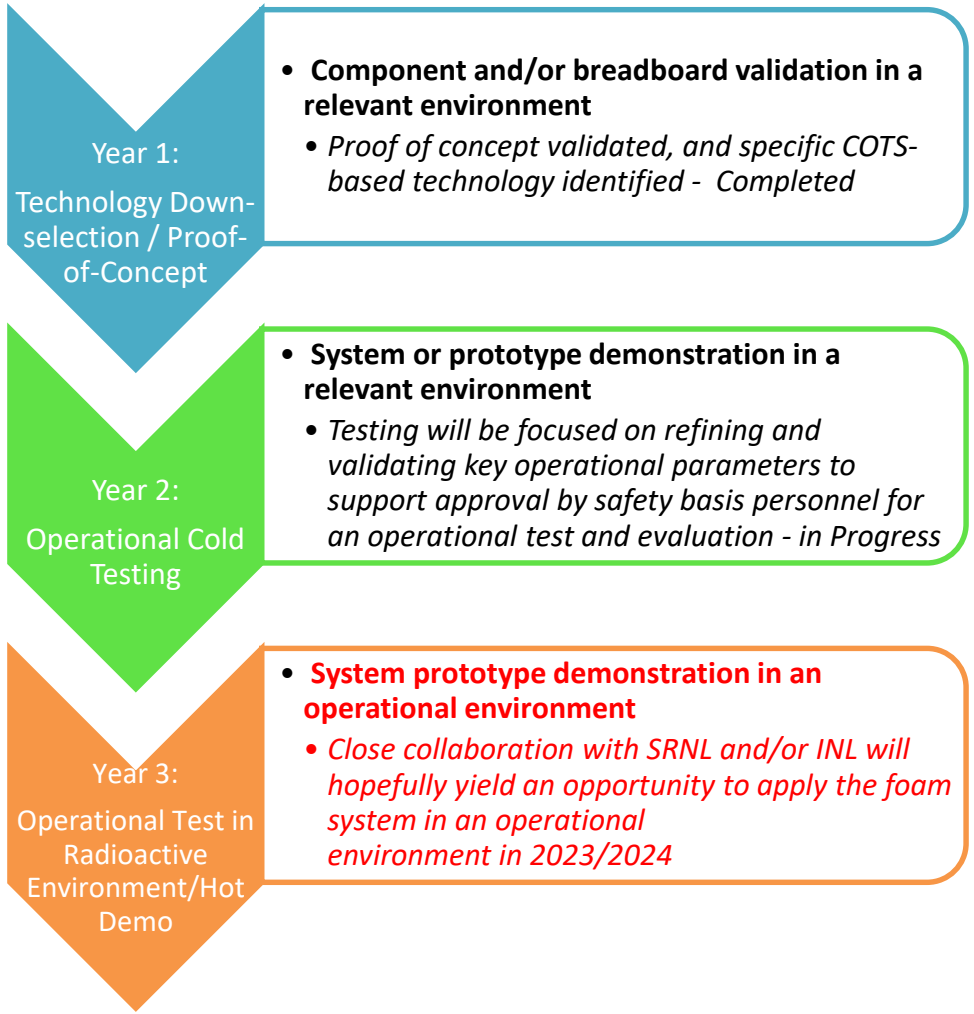
D&D SUPPORT TO DOE EM

Overall Needs:

- fixative technology to immobilize and/or isolate residual contamination within a 3D void space. These fixatives need to remain functional under a number of stressors (thermal, impact, and environmental). This helps mitigate risk of worker / environmental exposure during D&D activity.

Objectives:

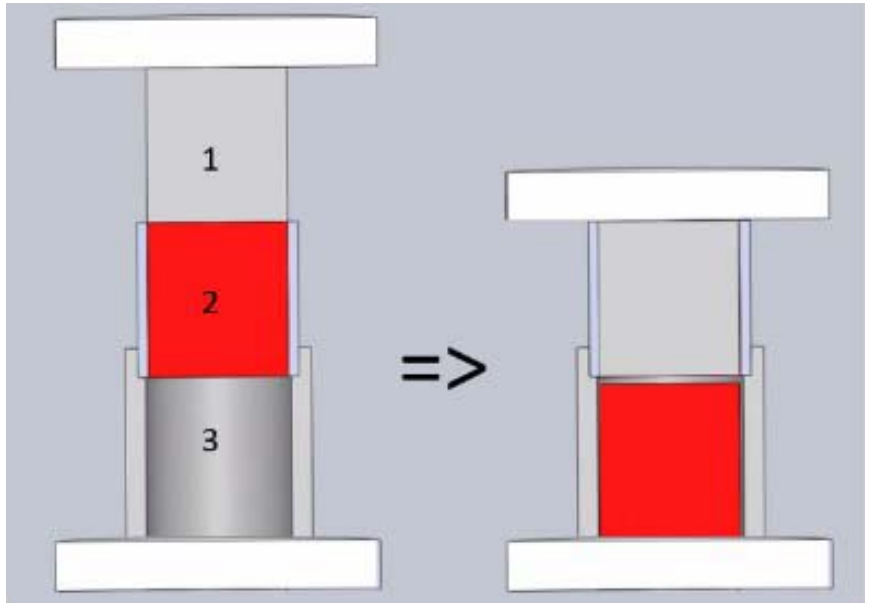
- Identify COTS Technologies
- Down-select technology after lab scale testing
- Cold demo planning in progress
- Onsite demo in radioactive environment



D&D SUPPORT TO DOE EM

FIU Year 1 Highlights:

- Plug strength
  - Effects of stressors is determined by the change in plug strength (the force required to remove the fixative from a steel pipe).
  - Evaluated on MTS tensile tester with a plunger and bucket device.



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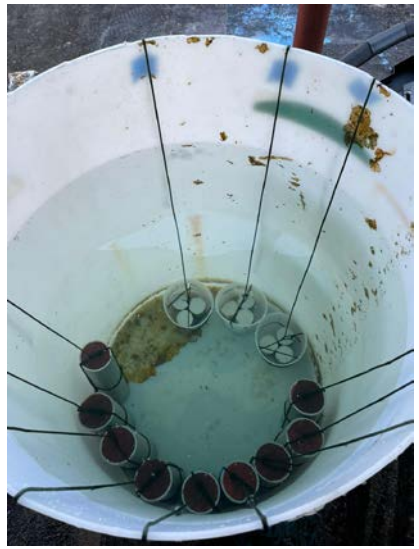
Stressors for Pipe Sample Testing

FIU Year 1 Highlights:

- Water Immersion
  - Samples were submerged in 3 feet of water for 8, 12 and 24 hours.
- Free Drop
  - Drop heights – 4 ft., 8 ft. and 12 ft. onto a stainless-steel plate.
- Direct flame test
  - A propane torch that reaches temperatures greater than 1475 °F was placed at each end of the sample.



a) 4 ft. setup; b) 8 ft. setup; c) 12 ft. setup

Model 9977 Safety Analysis (SRNL) / NRC 10 CFR 71.83

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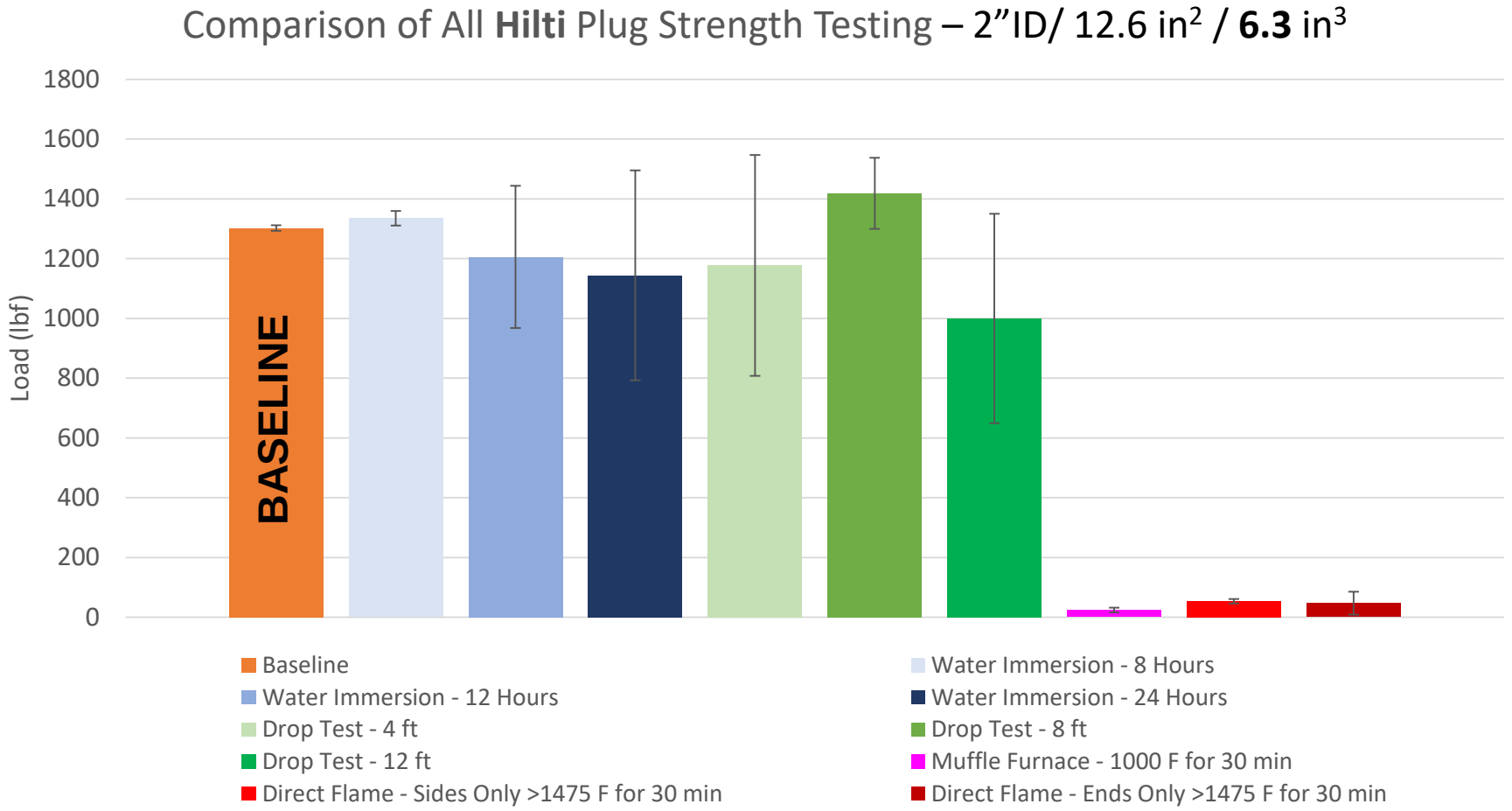
2” Diameter 2” long Hilti Pipe Sample Testing

FIU Year 1 Highlights:



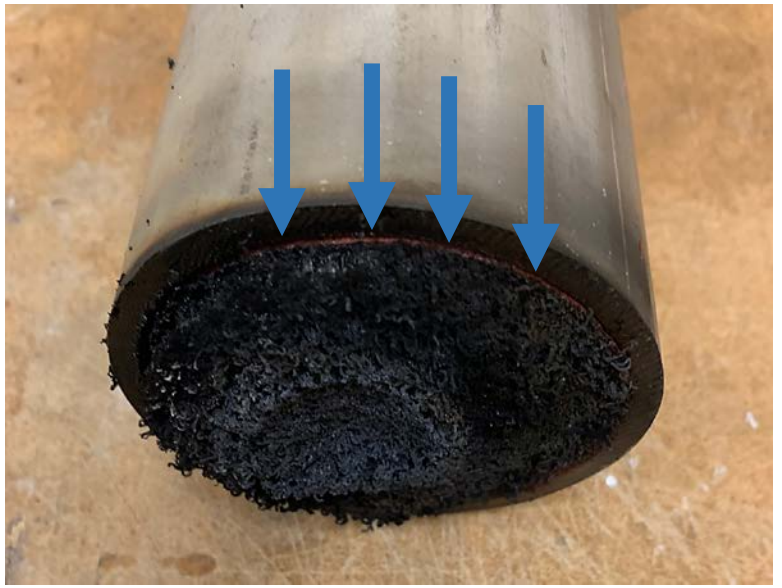
Water and impact stressors had **MINIMAL** impact to plug strength.

Direct flame test results may be misleading due to the small volume used.

3” Diameter 14” long Hilti Pipe Sample Testing

FIU Year 1 Highlights:

- Testing was transitioned to 3” dia. 14” long pipe samples to test a full cartridge of Hilti.
  - This was also to verify formula to calculate adhesive strength of Hilti based on surface are of a steel substate.
- End Centered Flame
  - Propane torches were placed at each end of the pipe.



3” Diameter 14” long Hilti Pipe Sample Testing

FIU Year 1 Highlights:

Center Focused Thermal Stressor

2 propane torches were placed at the center of each sample

All samples exhibited significant off gassing

One sample pushed out ~4in. of foam, likely due to a buildup of pressure at the center.

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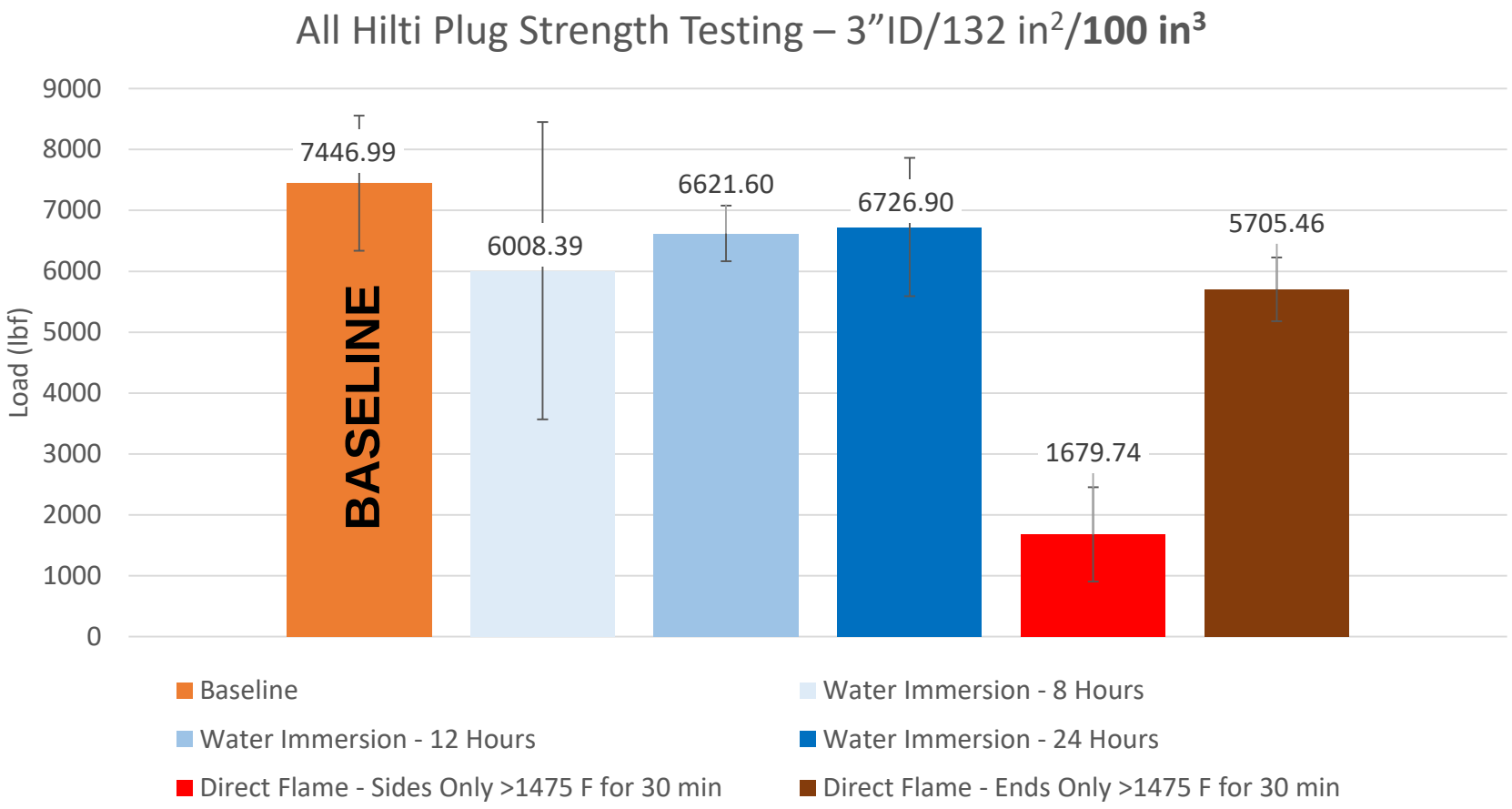
3” Diameter 14” long Hilti Pipe Sample Testing

FIU Year 1 Highlights:



Most stressors had **MINIMAL** impact to plug strength.

Except for direct flame testing at the sides/center of the pipe.

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Summer 2021 Internship

FIU Year 1 Highlights:

- Fellow Philip Moore continued work with polyurethane foams during his internship at SRNL.
  - Foams were cured in an environmental chamber to test response to temperature and humidity outside of manufacturers' ideal conditions.
  - Tested for, "set to touch", "dust free", and "dry to touch" times according to ASTM 1640.
- SRNL is continuing environmental chamber testing on this set of foams.

Future work

- Continued testing of 3” diameter 14” long pipe samples
- Cold demo test plan
  - FIU will simulate an application environment provided by SRNL. The foam fixative will be deployed and observed regularly to determine efficacy.
- Onsite demo in radioactive conditions
  - Vital to understanding fixatives response to actual site conditions.

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Acknowledgments

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Thank You. Questions?