

Enriching SIPP for Structural Applications

through **Foam** and **Carbon Fiber**

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Benefits of SIPP

Building Upon The Good

- Quick Cure
- Trenchless
- Mechanical vs. Manual
- Safer - Reduced Man Entry

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SIPP Failure Modes

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Failure Modes

SIPP

Cracking

- Thermal Cure
- Water Hammer/ Surge

Creeping

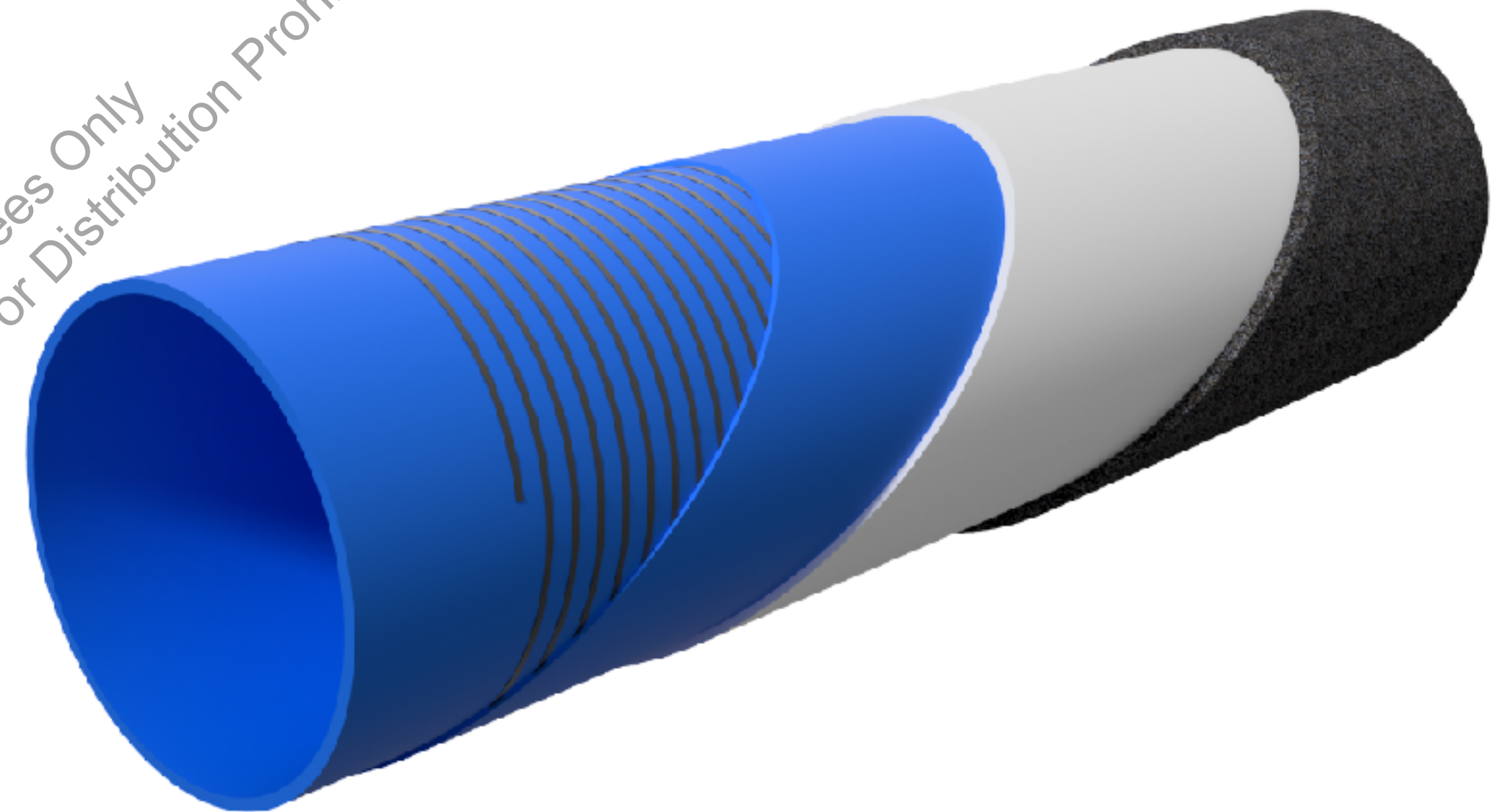
- 50% reduction over 50 years
- PRF = 4

****NOTE**** SIPP alone cannot be a structurally independent solution (class IV)*

Manufactured In-place Composite Pipe (MICP)

- Foam Polymer
- Rigid Polymer
- Carbon Fiber Reinforcement

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Foam

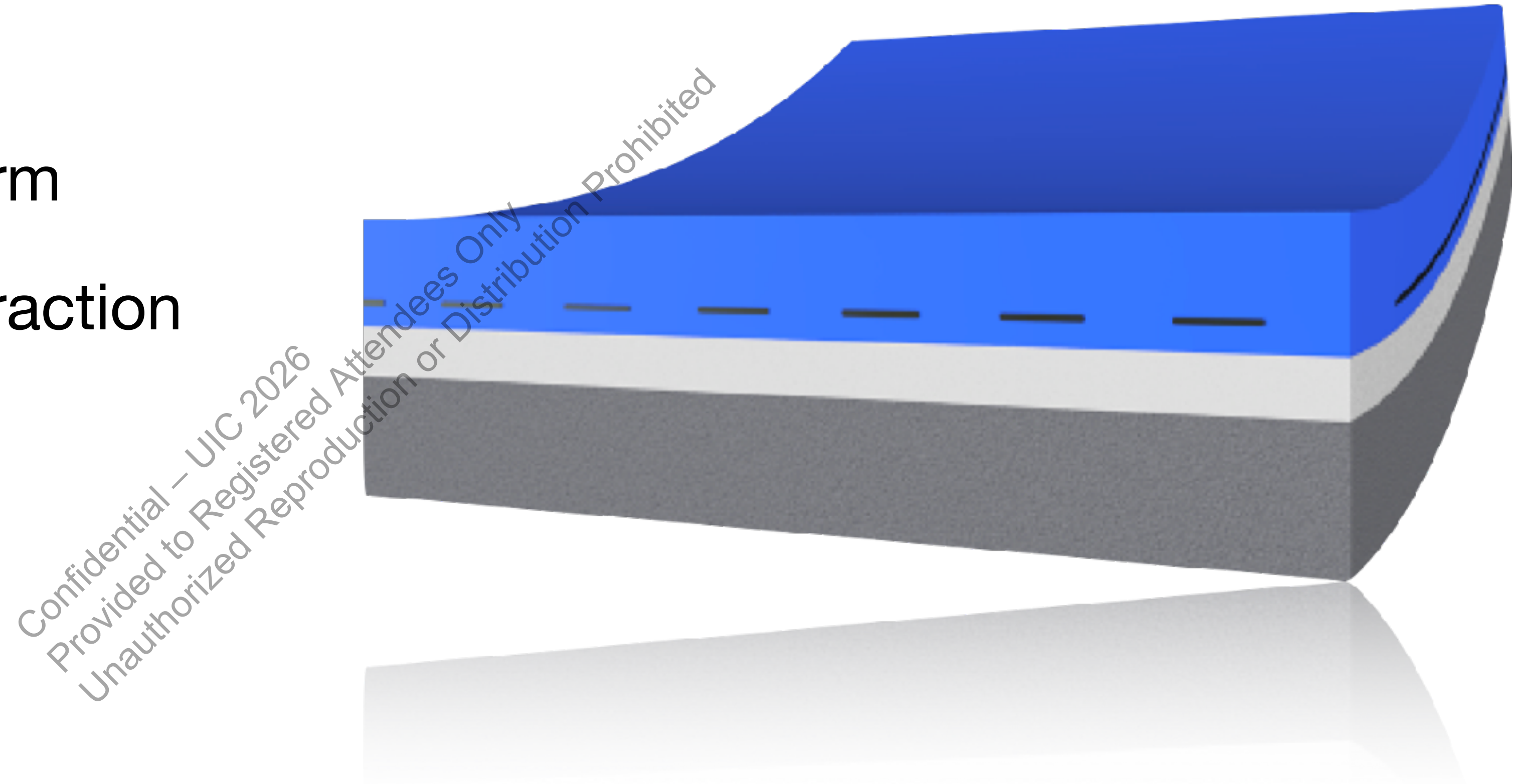
Prevents Cracking

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Foam

Prevents Cracking

- Consistent Adherable Form
- Thermal Expansion/Contraction
- Strain Isolation Barrier



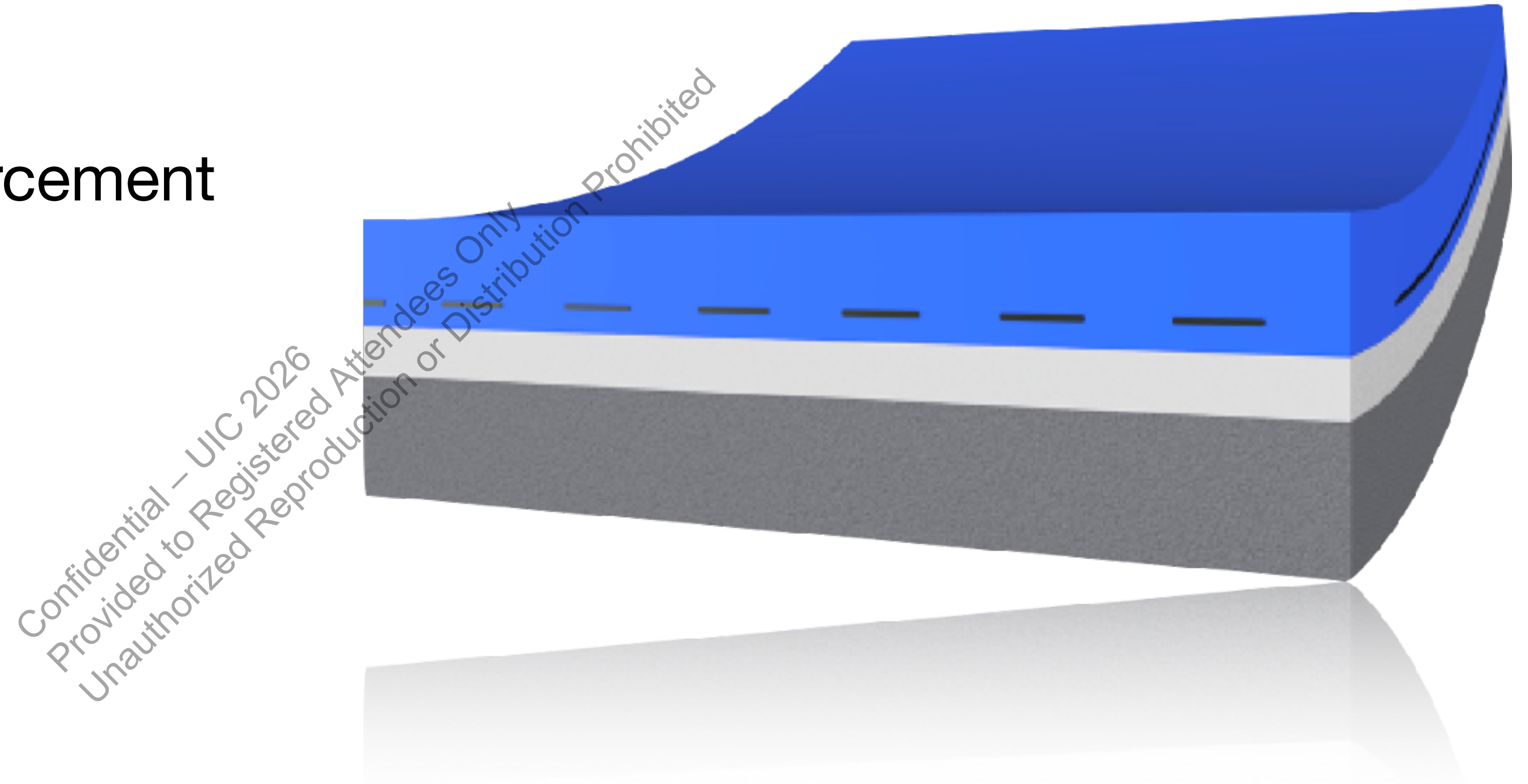
Carbon Fiber

Prevents Creeping

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Carbon Fiber MICP System

- Composite Rebar Reinforcement
- Hoop Strength
- High Modulus



Testing

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Component Testing

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Testing the System

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Installations

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Example Installations

SippTech



Culvert Repair

Proved robotic functionality



Reduced Manual Labor



Higher Quality

Urban Main

208'; 48" diameter; 125 psi

Footprint blocked just 2 driveways
vs. 15 driveways + 2 intersections



Less Disruption



Structurally Independent

Water Treatment Plant Transmission Line

240'; 48" diameter; 150 psi

Non-navigable by sliplining
Plant infrastructure prohibited
remove & replace



Improved Pipe Navigation



Minimal Hydraulic Loss

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Research

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Establishing New Standards

Fully Reinforced SIPP



- ASTM MICP Standard
- AWWA MICP Standard
- Standardized Testing Research

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