ADVANCED GEOPOLYMER TECHNOLOGY

Structural Repair
Safe for the Environment
Effective Large Diameter Rehabilitation

THE SCIENCE OF UNDERGROUND SOLUTIONS.
AN ENVIRONMENTALLY FRIENDLY, PRECISION APPLIED, STRUCTURAL LINING SYSTEM

IPR Leads the Market with EcoCast™, the first “Green” Geopolymer

Historically, the industry has focused on four critical performance physical characteristics for the successful application of a geopolymer liner.

- Excellent Bond Strength
- High Compressive Strength
- Low Permeability
- Efficient Constructability

IPR, along with its development partner, Milliken Infrastructure Solutions, LLC adds a fifth crucial element ... it is sustainable. Together we have introduced a proprietary system that combines the most advanced application equipment with a custom formulated geopolymer, specifically designed for consistent application and long-term performance.

EcoCast will successfully restore your concrete, brick, or corrugated metal storm and sewer pipes. It is particularly effective for large diameter pipe sections starting at 36”.

THE ECOCAST SYSTEM IS A TECHNOLOGICAL BREAKTHROUGH IN THE TRADITIONAL PIPELINE REHABILITATION MARKET

EcoCast was developed with the sole purpose of meeting the market’s demand for a large diameter, precision applied, environmentally friendly, pipe lining solution.

The end result is the first-ever geopolymer coating centrifugally cast through a state-of-the-art, precision controlled spray system. Unlike traditional, manual “pull through” applications, the EcoCast system’s drive train allows the product to be consistently applied to preset coating thickness with each pass. Some of the other features include:

- A true structural repair
- Ability to work with a small footprint (10’-30’)
- Can be used to restore round and non-round infrastructure
- Can rehabilitate any structure, decking or headwall
- Can rehabilitate pipes that have separated
- Extremely cost-effective for short segment repairs
- Advanced sealant can be specified for added corrosion protection

Typical Applications

- DOT projects: highways and bridge overpasses
- Concrete, sanitary and storm sewers
- Corrugated metal pipe is the perfect candidate for EcoCast
- Airports
- Manholes and wet wells
THE ECOCAST ADVANTAGE

- EcoCast liners form an inorganic polymer network for higher resistance to acids and greater surface durability.
- Cures quickly, providing shortened by-pass time and allows flows to be re-established much quicker than Portland cement based mortars.
- EcoCast is exceptionally resistant to environmental factors like heat and cold and allows for extended application environments through batch temperature controls.
- EcoCast is a high strength fiber reinforced geopolymer specially designed for ease of use with mechanical pumping, spraying and application.
- EcoCast is designed to stick and adhere to virtually any surface; unlike traditional cement mortars, the geopolymer is capable of bonding and building to greater thicknesses.
- An engineered, 100% fully manufactured product with no added non-contributing fillers.
- Qualifies for LEED credits and is styrene free.

ECOCAST LINER MATERIAL PROPERTIES

Featuring Milliken Geopolymers

Geopolymers are a high performance fiber reinforced mortar specifically designed for structural rehabilitation. This high strength, ultra-low porosity material is made from natural mineral polymers and recycled industrial waste streams. Geopolymers are designed for use through multiple application techniques including pouring, placing, trowelling, spraying, or centrifugal casting. EcoCast can be used for rehabilitation of pipes and structures in Civil Infrastructure, Oil & Gas and Chemical industries. In addition, it is used to repair tunnels, bridges, and roads as well as to rehabilitate buildings and containment areas.

ECOCAST LINER PERFORMANCE DATA

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Duration</th>
<th>GeoSpray</th>
<th>Conventional Repair Mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>1 Day</td>
<td>Min. 2,500 psi / 17 MPa</td>
<td>5,000 psi / 34 MPa</td>
</tr>
<tr>
<td>ASTM C-39/C-109</td>
<td>28 Days</td>
<td>Min. 8,000 psi / 55 MPa</td>
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<tr>
<td>Flexural Strength</td>
<td>7 Day</td>
<td>1,100 psi / 7.6 MPa</td>
<td>500 psi / 3.4 MPa</td>
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<tr>
<td>ASTM C-78</td>
<td>28 Days</td>
<td>1,500 psi / 10.3 MPa</td>
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<tr>
<td>Modulus of Elasticity</td>
<td>1 Day</td>
<td>3,000,000 psi / 20,700 MPa</td>
<td>3,000,000 psi / 20,700 MPa</td>
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<tr>
<td>ASTM C-449</td>
<td>28 Days</td>
<td>5,800,000 psi / 40,000 MPa</td>
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<tr>
<td>Bond Strength to Concrete</td>
<td>1 Day</td>
<td>Min 900 psi / 6.2 MPa</td>
<td>N/A</td>
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<tr>
<td>ASTM C-882</td>
<td>28 Days</td>
<td>Min. 2,500 psi / 17 MPa</td>
<td></td>
</tr>
<tr>
<td>Set Time ASTM C-807</td>
<td>Initial Set</td>
<td>60 - 75 Minutes</td>
<td>120 Minutes</td>
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<tr>
<td>Final Set</td>
<td>90 - 110 Minutes</td>
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<td>300 minutes</td>
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<tr>
<td>Freeze Thaw Durability</td>
<td>300 Cycles</td>
<td>100% Zero loss</td>
<td>80% to 90% degradation</td>
</tr>
<tr>
<td>ASTM C-666</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Shrinkage</td>
<td>28 Days</td>
<td>0.00% @ 65% R. H.</td>
<td>0.35% to 0.50% Shrinkage</td>
</tr>
<tr>
<td>ASTM C-1090</td>
<td></td>
<td></td>
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<tr>
<td>Tensile Strength</td>
<td>28 Days</td>
<td>Min. 800 psi / 5.5 MPa</td>
<td>400 psi / 2.7 MPa</td>
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<td>ASTM C-496</td>
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<tr>
<td>Abrasion Resistance</td>
<td>5 Cycles @ 28 Day Maturity</td>
<td>2.7% Loss</td>
<td>4.7% Loss</td>
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<td>ASTM C-1138</td>
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<tr>
<td>Rapid Chloride Ion Permeability</td>
<td>28 Days</td>
<td>Very Low</td>
<td>N/A</td>
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<tr>
<td>ASTM C-1202</td>
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</table>
IPR has partnered with Milliken Infrastructure Solutions, LLC to deploy its EcoCast system utilizing Milliken Geopolymers. IPR is the industry’s leading full service provider of trenchless underground solutions across the United States.

www.teamipr.com

IPR Locations

IPR SERVICES ALSO INCLUDE:
• TV Inspection & Cleaning  • CIPP  • Pipe Bursting  • Pressure Pipe Applications

OTHER SERVICES:
• Assessment  • Design Build  • Construction Management  • Emergency Services

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*Patent Pending