

## 1. SCOPE

This schedule specifies characteristics for the GeoSpray geopolymer pipe lining system as supplied by GeoTree Solutions.

It is applicable to the renovation of gravity surface water and foul (sewage) applications in a range of horizontal pipe internal diameters above 800mm.

## 2. PRODUCT DESCRIPTION

### 2.1 Introduction

The GeoSpray system uses a high strength, low porosity fibre reinforced mortar for structural renovation of numerous types of structure. This inorganic polymeric material is made from natural mineral polymers and recycled industrial waste streams and adheres strongly to prepared cement surfaces.

The GeoSpray system is designed for use through multiple application techniques including pouring, placing, trowelling, spraying or centrifugal casting.

### 2.2 Relevant Standards

Performance: There are no standards applicable to this renovation technique.

Materials: There are no standards available for the materials.

### 2.3 Approval History

This is the first re-approval of the GeoSpray system.

The previous approval was:

- PT/414/0218.

## 3. TESTING AND REQUIREMENTS

### 3.1 Type Testing

Mechanical Characteristics Testing: The mechanical testing requirements under laboratory conditions are listed below:

- Compressive strength (ASTM C-39<sup>(1)</sup>)
  - 2500 psi – 1 day
  - 8000 psi – 28 day
- Flexural strength (ASTM C-78<sup>(2)</sup>)
  - 1500 psi – 28 day
- Tensile strength (ASTM C-496<sup>(3)</sup>)
  - 800 psi – 28 day
- Bond strength to concrete (ASTM C-882<sup>(4)</sup>)
  - 900 psi – 1 day
  - 2,500 psi – 28 day
- Set time (ASTM C-807<sup>(5)</sup>)
  - Initial set 60-70 Minutes
  - Final set 90-110 Minutes
- Shrinkage (ASTM C-1090<sup>(6)</sup>)
  - 0.00% @ 65% RH - 28 days
- Freeze thaw durability (ASTM C-666<sup>(7)</sup>)
  - Negligible loss 300 cycles

#### Requirements:

The GeoSpray system shall comply with the following requirements.

Appearance: The internal surface of the lining shall be smooth, clean and free from scoring, cavities and other surface defects that would prevent the GeoSpray system from meeting the general fitness for purpose requirement.

**Mechanical Resistance:** The GeoSpray lining system shall be designed in accordance with the methodology in GeoSpray® Mortar Design Guide for Gravity (Non-Pressure) Pipelines and Culverts<sup>(8)</sup>. The GeoSpray thickness calculator<sup>(9)</sup> uses this design methodology for structural applications. These are based on equation 3 from Exploration of Engineering Design Methods for Cementitious Spray Applied Liner Systems<sup>(10)</sup>.

Alternatively, a method that produces a more conservative, thicker design thickness can be used.

### 3.2 Manufacture

To ensure the quality and performance of the GeoSpray mortar, the manufacturing process shall include appropriate systems for:

- Specification of component materials.
- Verification that component materials received are to specification.
- Handling and storage of all component materials and finished material.
- Blending of dry mortar mix.

The production of the GeoSpray mortar and related Quality Control procedures shall comply with requirements to ensure the stated performance of the product is reliably achieved.

### 3.3 Installation

When installed in accordance with the installation documentation<sup>(11)</sup>, the GeoSpray geo-polymer pipe lining system shall be reasonably expected to perform as described. Any equipment or process changes different from the standard manual should be approved and verified by

GeoTree Solutions in advance of installation.

## 4. APPROVAL

The GeoSpray geo-polymer pipe lining system has been audited and successfully met all the requirements stated within this assessment schedule.

Signed:



Valid Until: 8<sup>th</sup> February 2028

## 5. REFERENCES

1. ASTM C39 / C39M – 17a Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
2. ASTM C78 / C78M - 16 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
3. ASTM C496 / C496M – 11 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
4. ASTM C882 / C882M - 13a Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear.
5. ASTM C807 – 13 Standard Test Method for Time of Setting of Hydraulic Cement Mortar by Modified Vicat Needle.

**PT/515/0223 - AS (February 2023)**

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6. ASTM C1090 / C1090M – 15 Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout.

7. ASTM C666 / C666M – 15 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

8. GeoSpray® Mortar Design Guide for Gravity (Non-Pressure) Pipelines and Culverts, Version 1.2, 24<sup>th</sup> March 2023.

9. Geospray Thickness Calculator spreadsheet, Version July 6, 2022.

10. Exploration of Engineering Design Methods for Cementitious Spray Applied Liner Systems, Royer J.R.; Matthews J.C.; ASCE UESI Pipeline 2022, Indianapolis, IN USA.

11. GeoSpray Contractor Training Manuals, 2016 to 2023.