

## 1. Scope

This schedule specifies characteristics for the GeoKrete geopolymer pipe, manhole and structure lining system as manufactured by Quadex LLC or its affiliates (including Vortex Europe GmbH) when applied in one or multiple passes on horizontal or vertical surfaces by low pressure hand spraying or spin cast application process. It is applicable to all storm and sanitary sewer and water horizontal and vertical infrastructure of all shapes and sizes, as supported by the manufacturer.

## 2. Product Description

### 2.1 Introduction

GeoKrete is a factory blended, one-component (just add water), eco-friendly, micro-fibre reinforced geopolymer mortar synthesized from reactive SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> from industrial by-products, enhanced with monocristalline quartz aggregate<sup>(1)</sup>. The GeoKrete geopolymer reaction mechanism is alkali-activated polycondensation which yields physical properties and chemical resistance in accordance with the DIN EN codes mentioned in section 3.1 and 3.2

### 2.2 Applicable Standards

No applicable British, European or International Standards have been identified that are applicable to this product.

### 2.3 Approval History

This is the first WRc Approved certification for the Quadex GeoKrete product/system.

## 3. Requirements And Testing

### 3.1 Type Testing<sup>(1)</sup> (EN Testing - M-Stage)

The physical properties of the mixture during application (i.e. identification criteria) shall

meet DIN 19573 Table 4 – Wastewater Coating Mortars, Class B2 and XWW4 as follows:

Test method	Property	Value
EN 1015-6	Bulk Density	Approximately 2.250 kg/m <sup>3</sup>
EN 12190	Dry Bulk Density	Approximately 2.250 kg/m <sup>3</sup> , air void content approximately 3.5%
EN 13395-1	Flow Spread	Approximately 135 mm
EN 12192-1	Maximum Particle Size	<4mm

### 3.2 Type testing (EN testing - I-Stage)

The mechanical properties of the material after curing, (i.e. the performance criteria) shall meet DIN 19573 Table 4 – Wastewater Coating Mortars, Class B2 and XWW4 as follows :

Test method	Property	Value
EN 196-1	Compressive Strength after a 7 day period	≥20 MPa
EN 196-1	Compressive Strength after a period of 28 days	≥45 MPa (Class B2)

## PT/504/1222- AS (March 2023)

### Assessment Schedule for GeoKrete as manufactured by Quadex LLC



*independent certification of your products & services*

EN 196-1	Flexural Strength after a period of 28 days	≥6 MPa (Class B2)
EN 295-3	Abrasion Resistance	≤ 1 mm (Class B2)
EN 1015-17	Chloride Ion Content	≤0.05% (Class B2)
EN 1766	Adhesion of the cured material to concrete	≥2 MPa (Class B2)
EN 13295	Resistance to Carbonation	≤ ref concrete MC (0.45)
EN 13412	Modulus of Elasticity	≥ 20 GPa (Class B2)
EN 13687-1	Freeze Thaw	≥2MPa (Class B2)
EN 13687-2	Resistance to heavy rain	≥ 2,0 MPa (Class B2)
EN 12390-8	Depth of water penetration	<65% @ thinnest point (100kPa for 72hrs)

#### Resistance to chemical attack

When tested in accordance with DIN 19573-A XWW4, the Relative Residual Compressive Strength and maximum corrosion depth shall be as shown below:

pH	Minimum relative residual compressive strength	Maximum corrosion depth [mm]
0	55%	5.2
1	75%	2.7

When tested in accordance with DIN 19573-C, the Sulphate Resistance shall be not more than 0,8 mm/m with no visible cracking observed.

When tested in accordance with DIN EN 12190, the minimum compressive strength at point of first Water Load shall be;

Time	Minimum compressive strength
1 day	10 MPa
2 days	20 MPa

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

#### 3.3 Type Testing<sup>(2)</sup> (ASTM)

Mechanical Characteristic Testing: The mechanical properties of the material after curing in laboratory conditions (i.e. the performance criteria) tested per ASTM methods are listed below:

**PT/504/1222- AS (March 2023)**

**Assessment Schedule for GeoKrete as manufactured by Quadex LLC**



*independent certification of your products & services*

<b>Test Method</b>	<b>Property</b>	<b>Value</b>
ASTM C39/C109	Compressive Strength 1 day	≥2,500psi / 17.2MPa
ASTM C39/C109	Compressive Strength 28 day	≥8,000 psi / 55.1MPa
ASTM C78	Flexural Strength 28 day	≥1100psi / 7.5MPa
ASTM C469	Modulus of Elasticity at 1 day	≥ 3000 ksi / 20.6 GPa
ASTM C469	Modulus of Elasticity at 28 day	≥ 5700 ksi / 39.3 GPa
ASTM C882	Bond Strength 1 Day	≥ 900 psi / 6.2 MPa
ASTM C882	Bond Strength 28 Day	≥ 3000 psi / 20.6 MPa
ASTM C807	Initial Set Time	100 - 160 minutes

ASTM C807	Final Set Time	160 - 240minutes
ASTM C666	Freeze Thaw Durability 300 cycles	No visible damage
ASTM C267	Chemical Resistance Sulfuric Acid at pH 1.0 in 12 weeks	0% mass loss
ASTM C1090	Shrinkage at 28 Day at RH 52 - 95%	≤ 0.02
ASTM C496	Tensile Strength at 28 Day	≥ 900 psi / 6.2 MPa
ASTM C1138	Abrasion Resistance 6 Cycles at 28 Days	≤ 0.67% Loss
ASTM C1543 OR ASTM C1202	Chloride Ion Penetration Resistance at 90 day Ponding OR 28 Day	≤ 0.014%Cl @ 55-65mm  OR ≤250 Coulombs (very low)

## PT/504/1222- AS (March 2023)

### Assessment Schedule for GeoKrete as manufactured by Quadex LLC



*independent certification of your products & services*

#### 3.4 Manufacture

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

- Specification of component materials.
- Verification component materials received are to specification.
- Handling and storage of all component materials and finished material.
- Detailed drawing / schedule for manufacture.
- Manufacture of GeoKrete.
- Quality control of blending of dry mortar mix.

The production of GeoKrete and related quality control procedures shall comply with requirements to ensure the stated performance of the product is reliably achieved.

#### 3.5 Installation

When installed in accordance with the installation documentation<sup>(3)</sup>, GeoKrete shall be reasonably expected to perform as described. Any equipment or process changes different from the GeoKrete Installation Manual should be approved and verified by Quadex in advance of installation.

#### 3.6 Approval

The GeoKrete lining has been audited and successfully met all the requirements stated within this assessment schedule.

Signed:

A handwritten signature in black ink, appearing to read 'J. Lee'.

Valid until: 09 December 2027

#### 4. References

1. Vortex GeoKrete EU TDS-7
2. Vortex GeoKrete TDS-8
3. GeoKrete Installation Manual