



**LINING  
SYSTEMS**

# THE QUADEX LINING SYSTEM®

Next Generation Infrastructure Renewal

Rev. 02-2020

A Precision-Applied,  
Structural and Corrosion  
Resistant Solution

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A VORTEX COMPANY



**LINING  
SYSTEMS**

The Quadex Lining System®, featuring GeoKrete® geopolymer, represents the next generation of trenchless, structural renewal of raw, storm and wastewater infrastructure.

## THE QUADEX LINING SYSTEM®

The Quadex Lining System® (QLS) is comprised of industry leading materials, equipment, installers and QA/QC procedures assembled to structurally restore large diameter pipes, culverts, tunnels, structures and other raw, storm and wastewater infrastructure.

This unique combination of precision equipment, finely-tuned procedures, well trained installers and the industry's leading geopolymer, GeoKrete®, allows for project metrics to be monitored in real time, to ensure a long-term solution. Understanding that every project presents unique challenges, the system is fully capable of integrating advanced, third-party design and engineering modifications to meet the most stringent structural restoration specifications.

### Typical Applications

QLS is typically specified for large diameter pipes, culverts, tunnels and other infrastructure suffering from corrosion, I/I, and other problems that could lead to catastrophic failure.

- Corrugated metal
- Concrete
- Brick
- Stone

### Other Structures

- Manholes
- Wet wells
- Junction boxes

## ADVANCED TECHNOLOGY

### VERSATILE APPLICATION SYSTEM

QLS is an extremely versatile system engineered to effectively apply GeoKrete onto a variety of shapes, sizes and surfaces. For angular structures, such as wet wells, junction boxes, box culverts, or other infrastructure with edges, corners and obstructions, GeoKrete can be spray-applied and trowel finished to achieve restored structural integrity, elimination of infiltration and corrosion protection.

The equipment design features advanced technology built into the sled, retrieval system, mixer and pump that allows for a controlled rate of retraction and precision spray application.

### Key Benefits

- Fully structural lining solution
- Small construction footprint
- No excavation required
- Significant cost advantages
- Reduced carbon impact compared to other trenchless technologies (cementitious, calcium aluminate, CIPP liners)
- Quality controlled process
- Reduces bypass operation
- Addresses non-round shapes, bends and intrusions
- Conducive to deep pipes through standard manhole access
- Allows for third-party design/engineering







## GEOKRETE GEOPOLYMER IS A GAME CHANGER

### Defining A “True” Geopolymer

A Geopolymer is a formulated mortar comprised of aluminosilicate powder with an alkaline activator to form a monolithic mineral polymer with ceramic properties. A geopolymer is not an epoxy or a plastic blended with aggregate.

GeoKrete Geopolymer cures through a process of polycondensation and possesses proven, high early and long-term compressive strength. Additionally, with superior bond strength, GeoKrete liners can be applied in layers and under multiple mobilizations. The chemical composition of GeoKrete Geopolymer makes it inherently resistant to the microbial induced corrosion prevalent in many sewer environments. Geopolymers contain greatly reduced concentrations of calcium hydroxide, commonly found in typical cementitious mortar, furthering the suitability of GeoKrete in low pH environments.

### Critical Features & Benefits

- Factory blended and mixed material allows for high measures of quality control
- Forms a monolithic, inorganic polymer structure for much higher resistance to acids and greater surface durability
- Cures through polycondensation and bonds to itself — the liner can be applied in layers and under multiple mobilizations
- Easily navigates pipe deformities, deep pipes, pipe bends, non-round pipes, slopes and separated joints
- Independent third party certified Reduced Carbon Footprint compared to other rehabilitation products such as cementitious, calcium aluminate and CIPP liners

## TYPICAL PERFORMANCE CHARACTERISTICS

### Compressive Strength (ASTM C39 & C109)

28 days >8,000 psi | 55.1 MPa

### Flexural Strength (ASTM C78)

28 days >800 psi | 5.5 MPa

### Bond Strength (ASTM C882 Modified)

28 days >3,000 psi | 20.7 MPa

### Modulus of Elasticity (ASTM C469)

28 days =  $5.49 \times 10^6$  psi | 37.8 GPa

### Chemical Resistance (ASTM C267)

0% mass loss in 8 week sulfuric acid @ pH 1.0 immersion

### Chloride Ion Penetration Resistance (ASTM C1202)

28 days < 250 Coulombs (very low)

### Split Tensile Strength (ASTM C496)

28 days >900 psi | 6.2 MPa

### Shrinkage (ASTM C1090)

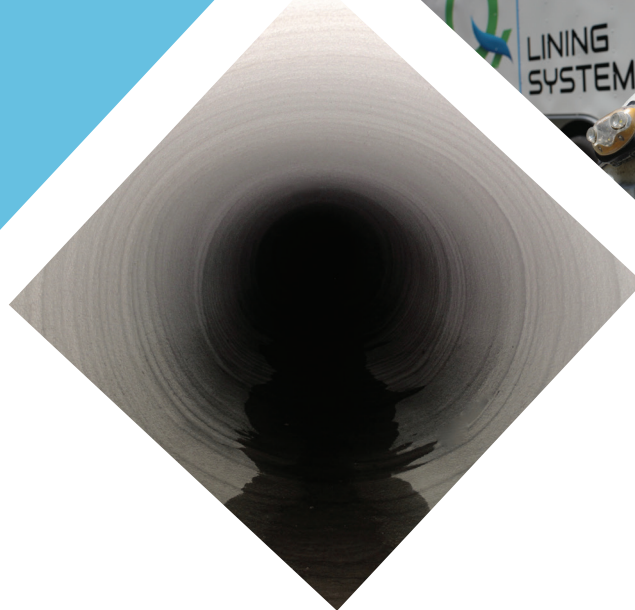
28 days  $\leq 0.02\%$

### Freeze Thaw (ASTM C666)

No visible damage after 300 cycles

### Abrasion Resistance (ASTM C1138)

6 cycles at 28 days – loss <1.0%



## PROVEN IN THE FIELD

### A CLASSIC CASE WHERE QLS WAS THE ONLY SOLUTION

**Project** BWSC Westside Interceptor  
**Problem** Deteriorated and leaking brick sewer interceptor serving Massachusetts General Hospital and located in front of the ER entrance.  
**Owner** Boston Water & Sewer Commission  
**Dimensions** 54" x 36", 1,700 LF

#### Project Criteria

- Trenchless solution only option
- Minimal surface and street disruption
- ER entrances/exits must remain open
- Only environmentally safe method and materials could be used
- Full structural restoration and corrosion protection was required
- Quick return to service

#### Application Solutions

- A) Quadex Lining System/GeoKrete was applied in areas where CIPP could not be performed due to headwalls and other obstructions. The versatile application options of QLS/GeoKrete allow the non-round sections of the interceptor to be fully restored, when there was no other viable option.
- B) Traditional CIPP was installed in rounded sections of interceptor



Deteriorated brick sewer before QLS.



Brick sewer structurally restored utilizing QLS.



Same brick sewer one year after QLS installation.



Compared to Baseline for  
Trenchless Repair Systems for  
Structural Rehabilitation of  
Civil Infrastructure

