



***STRONG-SEAL® COMPOSITE SYSTEM SPECIFICATIONS:  
for REHABILITATION of LARGE WASTEWATER STRUCTURES***

**INTENT:** To provide a rehabilitation system for wet wells, lift stations, treatment plants, and other large wastewater structures that will stop inflow, infiltration, and exfiltration, restore structural integrity, and provide protection for structures subjected to hydrogen sulfide and other corrosive gases and acids.

## **1.0 GENERAL**

### **1.1 SCOPE OF SPECIFICATIONS:**

This specification shall govern all work, materials, and equipment required to obtain a structural, monolithic liner eliminating infiltration, providing corrosion protection, repair of voids, and to restore the structural integrity of the substrate as a result of a low pressure, low velocity, wet slurry spray application of Strong-Seal® Profile Plus Mix, a calcium aluminate cementitious mixture to the walls, floor, and ceiling of brick, concrete, or other masonry construction materials and protected against corrosion with Strong-Seal® Epoxy.

Described are procedures for cleaning, substrate preparation, application and acceptance testing. The applicator, certified and trained by the manufacturer, shall furnish all labor, equipment and materials for applying,

- A. The removal of any loose and unsound substrate
- B. Cleaning of the area to be sprayed
- C. The elimination of active infiltration prior to making the application
- D. The repair and filling of voids.
- E. The repair of ceilings and floors.
- F. The spray application of, Strong-Seal® Profile Plus Mix, an acid resistant cementitious material to rebuild the substrate to original dimensions, eliminate infiltration, restore structural integrity and provide the proper surface for application of Strong-Seal® Epoxy.
- G. The spray application of a 100% solids, VOC-free Strong-Seal® Epoxy for maximum corrosion protection.

1.2 DESCRIPTION OF THE STRONG-SEAL® COMPOSITE SYSTEM:

- 1.2.1 Hand applied materials to stop active leaks, fill voids and repair bench and invert
- 1.2.2 Spray-applied, Strong-Seal® Profile Plus Mix cementitious liner material to prevent infiltration, restore structural integrity and provide proper surface for application of Strong-Seal® Epoxy
- 1.2.3 Spray-applied 100% solids Strong-Seal® Epoxy to protect against corrosion.

1.3 SUBMITTALS:

1.3.1 The following items shall be submitted:

- A. A technical data sheet for each product used, including ASTM test results verifying product meets specifications and verifying product is suitable for its intended use.
- B. Material Safety Data Sheets (MSDS) for all products used, including materials used for patching, profiling, leak stoppage and corrosion protection.
- C. Project guidelines and recommendations.
- D. Qualification of Applicator
  - 1. Manufacturer Certification that personnel have been trained and approved in the handling, mixing and application of the products to be used.
  - 2. Certification that the equipment to be used for applying the products has been manufactured or approved by the manufacturer.
- E. Design details for any additional ancillary systems and equipment to be used on site and surface preparation, application, and testing must be approved by Strong-Seal® Systems authorized personnel.

1.4 QUALITY ASSURANCE:

- 1.4.1 Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC procedures together with the manufacturer's recommendations.
- 1.4.2 The Strong-Seal® Profile Plus Mix applicator shall submit test cubes provided by the manufacturer to verify performance of profiling liner material per specifications.

1.4.3 The Strong-Seal® Epoxy applicator shall label two retained plaques with pertinent and unique identification for each project and spray one side of each for submission of the sample to the owner and one sample to Strong-Seal® Systems.

1.5 REFERENCES FOR STRONG-SEAL® EPOXY:

ASTM: The Published Standards of the American Society for Testing and Materials, West Conshohocken, PA

NACE: The Published Standards of National Association of Corrosion Engineers (NACE International), Houston, TX

SSPC: The Published Standards of the Society for Protective Coatings, Pittsburgh, PA

1.6 DELIVERY, STORAGE, AND HANDLING:

1.6.1 Materials are to be kept dry, protected from weather and stored under cover protected from the elements.

1.6.2 Materials are to be stored between 40° F and 110° F. Do not store near flame, heat, or strong oxidants.

1.6.3 All materials are to be handled according to specific material safety data sheets.

1.7 SITE CONDITIONS:

1.7.1 Applicator shall conform to all local, state, and federal regulations including those set forth by OSHA, RCRA, and the EPA, and other applicable authorities.

1.7.2 Method statements and design procedures are to be approved by owner when confined space entry or flow diversion bypass pumping is necessary in order for applicator to perform the specified work.

## 2.0 MATERIALS

2.1 PATCHING MATERIAL (Strong-Seal® QSR):

Strong-Seal® QSR, a quick setting corrosion resistant cementitious material, shall be used as a patching material to fill voids and to repair floors and ceilings and shall be mixed and applied prior to spray applying

Strong-Seal® Profile Plus Mix liner material according to manufacturer's recommendations and shall have the following minimum requirements:

<b>STRONG-SEAL® QSR</b>		
Compressive Strength	ASTM C109	>1800 psi, 1 hr. >2600 psi, 24 hrs. >3000 psi, 28 days
Bond	ASTM C882	>1600 psi, 28 days
Calcium Aluminate Cement		Sulfate resistant
Applied Density		105 pcf ± 5 lbs.
Shrinkage	ASTM C596	0% at 90% R.H.
Placement Time		5 to 10 minutes
Set Time		15 to 30 minutes

## 2.2 INFILTRATION CONTROL MATERIAL (Strong-Seal® Strong-Plug®):

Strong-Plug®, a rapid setting cementitious product specifically formulated for leak control, shall be used to stop minor water infiltration and shall be mixed and applied according to manufacturer's recommendations and shall have the following minimum requirements:

<b>STRONG-SEAL® STRONG-PLUG®</b>		
Compressive Strength	ASTM C109	>1000 psi, 1hr. >2500 psi, 24 hrs.
Sulfate Resistance	ASTM C267	No weight loss after 15 cycles @ 2000 ppm
Freeze/Thaw	ASTM C666 "Method A"	100 cycles
Pull Out Strength	ASTM C234	14,000 lbs.
Set Time		<1.0 minute

## 2.3 GROUTING MATERIAL:

2.3.1 Strong-Seal® Grout 250, a cementitious grout, shall be used for stopping very active infiltration and filling voids and shall be mixed and applied according to manufacturers' recommendations. The cementitious grout shall be volume stable, and have a minimum 28 day compressive strength of 250 psi.

2.3.2 Strong-Seal® Grout 1000, a cementitious grout, shall be used for the same application as Grout 250, but is designed for special soil

conditions, and shall be used per manufacturers' recommendations. The cementitious grout shall be volume stable and have a minimum 28 day compressive strength of 1000 psi.

2.3.3 Chemical grouts may be used for stopping very active infiltration and shall be mixed and applied per manufacturers' recommendation.

2.4 **STRONG-SEAL® PROFILE PLUS MIX LINER MATERIAL:**

Strong-Seal® Profile Plus Mix material is a calcium aluminate, acid resistant cementitious product to be used for building back deteriorated substrates to original dimensions, restoring structural integrity, and providing a uniform surface for applying Strong-Seal® Epoxy and shall have the following minimum requirements:

<b>PROFILE PLUS MIX</b>			
Compressive Strength	ASTM C109	28 days	>9000 psi
Tensile Strength	ASTM C496	28 days	>600 psi
Flexural Strength	ASTM C293	28 days	>900 psi
Shrinkage @90% R.H.	ASTM C596	28 days	0%
Bond	ASTM C882	28 days	>2000 psi
Density, When Applied			134 ± 5lbs/ft3
Freeze/Thaw	ASTM C666	N/A	300 cycles no visible damage

2.5 **WATER:**

Water used to mix product shall be clean and free from contaminants. Questionable water shall be tested by a laboratory per ASTM C-94 procedure. Potable water need not be tested.

2.6 **OTHER MATERIALS:**

No other material shall be used with the mix described in Parts 2.1, 2.2, 2.3, and 2.4 without prior approval or recommendation from Strong-Seal® Systems authorized personnel.

**3.0 EQUIPMENT FOR STRONG-SEAL® PROFILE PLUS MIX**

3.1 Applicator must use approved equipment designed and manufactured by the material supplier specifically for the application of cementitious liners in sanitary systems.

- 3.2 Specially designed machines consisting of a progressive cavity pump and an air system for low velocity spray application of product, shall be used for applying Strong-Seal® Systems cementitious products. Equipment is complete with water storage and metering system. Spray Mate® models 35C and 35D and MiniMate II are approved machines for applying Strong-Seal® Systems products. Other models may be approved after review by Strong-Seal® Systems authorized personnel.

#### **4.0 APPLICATION OF STRONG-SEAL® PROFILE PLUS MIX**

##### **4.1 CONCRETE AND MASONRY SURFACE PREPARATION:**

- 4.1.1 Place covers as required to prevent extraneous material from entering the sewer lines before cleaning.
- 4.1.2 All foreign material shall be removed from the walls, floor, and ceiling using a high-pressure water spray (minimum 3000 psi). If grease, chemicals, previous coatings or other surface contaminants are present, the surface shall be cleaned with steam, chemical cleaning compounds, or surface abrading as necessary to provide a clean substrate (contact material manufacturer for recommendations). Loose and protruding brick, mortar, and concrete shall be removed using a mason's hammer and chisel and/or scraper. Fill any large voids with quick setting patching mix Strong-Seal® QSR (2.1).
- 4.1.3 Active leaks shall be stopped using quick setting, specially formulated mixes, such as Strong-Plug® (2.2) according to manufacturer's recommendations. Some leaks may require weep holes to localize the infiltration during the application. After application the weep holes shall be plugged with the quick setting material Strong-Seal® Strong Plug® (2.2) prior to final coat. When severe infiltration exists, drilling may be required in order to pressure grout using a cementitious grout, such as Strong-Seal® Grout 250 and Strong-Seal® Grout 1000, or chemical grouts (2.3). Manufacturer's recommendations shall be followed when pressure grouting is required.

##### **4.2 STEEL SURFACE PREPARATION:**

- 4.2.1 Steel structures to be coated shall be prepared as follows:
- 4.2.1.1 Remove scale, deposits, and soluble salts.
- 4.2.1.2 Round off rough weld, sharp edges, and any weld splatter.

4.2.1.3 Dry abrasive blast per SSPC Specification SP-10. Use only steel grit (G-40 size), steel shot (S-230 size), graded flint, or black beauty or equal (30-60 mesh).

4.2.1.4 Vacuum sweep surfaces to remove all dust.

4.2.1.5 Apply epoxy immediately after blasting to prevent surfaces from rusting.

#### 4.3 REPAIR AND PATCHING:

4.3.1 Any area exhibiting movement or cracking due to expansion and contraction shall be grouted and patched according to procedures provided by the manufacturer.

4.3.2 All surfaces that show exposed structural steel, spalling greater than 3/4 inches deep, or cracks greater than 3/8 inches wide shall be patched using a quick-setting setting, high strength cement mortar or a high build, non-sagging epoxy grout after sandblasting steel to SP-10 (4.2). Voids to be filled should be done so in lifts according to manufacturer's recommendations.

4.3.3 All concrete that is not sound or has been damaged by chemical exposure shall be removed down to a sound concrete surface.

4.3.4 If, in areas to patched, reinforcing steel is missing and radial cracking from the spall site exists, the steel shall be replaced unless the Project Engineer has determined that the patching material will sufficiently offset the loss of steel.

4.3.5 In masonry structures where loss of mortar has created gaps greater than 1/4 inch in between bricks or blocks, the voids shall be filled with a quick setting patching material, such as Strong-Seal® QSR. If the integrity of the structure is in question, then a high strength cement mortar, such as Strong-Seal® QSR Plus, or an epoxy grout shall be used.

4.3.6 For underground structures, surfaces shall be free of active leaks before coating. Leaks may be stopped with the use of approved quick setting hydraulic cements, such as Strong-Plug®, water reactive gels and grouts, or epoxy grouts.

#### 4.4 MIXING:

4.4.1 For each bag of product, use the amount of water required per manufacturer's recommendations following mixing procedures

noted on product bag and using the approved equipment for mixing and application (3.0).

4.4.2 Strong-Seal<sup>®</sup> Profile Plus Mix material shall be applied at a minimum thickness of 1/2 inch.

4.4.3 Prepared mix shall be discharged into a hopper and another batch prepared to occur in such a manner as to allow spraying continuously without interruption until each application is complete.

#### 4.5 GENERAL APPLICATION:

4.5.1 The surface shall be clean and free of all foreign material and shall be damp without noticeable free water droplets or running water, but fully saturated just prior to the application of material. Materials shall be applied up to one (1) inch thick in one pass from the bottom of the frame; however, minimum total thickness shall not be less than 1/2 inch. The surface is then troweled to a relatively smooth finish being careful not to over trowel.

4.5.2 A coarse brush finish shall be applied to the trowel finished surface. Manufacturer's recommendations shall be followed whenever more than 24 hours have elapsed between applications.

#### 4.6 HORIZONTAL AND VERTICAL APPLICATION:

4.6.1 The surface shall be clean and free of any form of oil or de-bonding agent. If the surface is extremely smooth, the surface shall be abraded by sandblasting, water blasting, or scarified with a wire brush.

4.6.2 Prior to application of Strong-Seal<sup>®</sup> Profile Plus Mix, the surface shall be wetted until saturated. A bonding agent that conforms to ASTM C1059 shall then be applied according to manufacturer's recommendations.

4.6.3 Apply a scratch coat of Strong-Seal<sup>®</sup> Profile Plus Mix by spraying a light coat onto the surface. Refrain from troweling the scratch coat except in areas where an excessive build up of material occurred. Allow the scratch coat to set and cure (preferably) overnight.

4.6.4 Before application of the second coat of Strong-Seal<sup>®</sup> Profile Plus Mix, dampen the substrate until saturated. The material shall be applied up to one (1) inch thick in one pass from the bottom of the frame; however, minimum total thickness shall not be less than 1/2



inch. The surface is then troweled to a relatively smooth finish being careful not to over trowel.

4.6.5 A coarse brush finish shall be applied to the trowel finished surface. Manufacturer's recommendations shall be followed whenever more than 24 hours have elapsed between applications.

## 5.0 CURING OF STRONG-SEAL® PROFILE PLUS MIX

5.1 Caution will be taken to minimize exposure of applied product to quick surface drying and air movement. If time between applications of additional coats is to be longer than 15 minutes, place cover over structure. At no time should the finished product be exposed to sunlight or air movement for longer than 15 minutes before covering or closing access. In extremely hot and arid conditions, the structure shall be shaded while reconstruction is in progress. In environments where humidity level is below 70%, it shall be necessary to keep finished product damp for the first 72 hours.

5.1.1 If the structure is to be put back into service before Strong-Seal® Epoxy is applied, the final coat of Strong-Seal® Profile Plus Mix shall have a minimum cure time of four hours.

<b>HOLD TIMES BEFORE RELEASING FLOW</b>	
Storm Run-off & Surcharge	4 hrs.
Force Main Impact	8 hrs.

<b>HOLD TIMES BEFORE APPLYING STRONG-SEAL® EPOXY</b>	
Application of Strong-Seal® Epoxy	48 hrs.

## 6.0 WEATHER

6.1 No application shall be made if ambient temperature is below 40° Fahrenheit. No application shall be made to frozen surfaces or if freezing is expected to occur within the substrate within 24 hours after application.

6.2 Precautions shall be taken to keep the mix temperatures at time of application below 90° Fahrenheit. Water temperature shall not exceed 80° Fahrenheit. Chill with ice if necessary.

## **7.0 PRODUCT TESTING**

Four 2-inch cubes shall be cast each day or from every pallet of Strong-Seal® Profile Plus Mix material used, and shall be properly packaged, labeled and following manufacturing's instructions and returned to manufacturer for testing in accordance with the owners' or manufacturer's directions for compression strength per ASTM C109 procedure.

## **8.0 APPLICATION OF STRONG-SEAL® PRIMER**

### **8.1 SURFACE PREPARATION**

- 8.1.1 Applicator shall inspect all surfaces specified to receive Strong-Seal® Primer and Strong-Seal® Epoxy prior to application. Applicator shall notify owner of any noticeable disparity in the surfaces that may interfere with the proper application of Strong-Seal® Primer and Strong-Seal® Epoxy.
- 8.1.2 Place covers as required to prevent extraneous material from entering the sewer lines before cleaning.
- 8.1.3 Test structural liner surfaces, using a litmus test, prior to application of Strong-Seal® Primer and Strong-Seal® Epoxy. Rinse thoroughly to achieve a final PH between 8.0 and 11.0. Allow to dry thoroughly prior to coating.
- 8.1.4 If grouting or patching is required allow 24 hrs to dry before applying Strong-Seal® Primer or Strong-Seal® Epoxy.

### **8.2 APPROVED EQUIPMENT**

- 8.2.1 The Model 185 Xtreme plural component machine and Model HSS Spray cartridge gun are both approved application equipment. All equipment must be a 2:1 ratio. Equipment other than the proceeding must be approved by Strong-Seal® Systems personnel.
- 8.2.2 Applicator personnel must comply with all Federal, State and Local safety guidelines, including those for confined space entry. If none are available, contact Strong-Seal® Systems for referrals.

### **8.3 APPLICATION OF STRONG-SEAL® PRIMER**

- 8.3.1 Applicator procedures shall conform to the recommendations of Strong-Seal® Systems including material handling, mixing, safety, spray equipment, and environmental controls during application.

- 8.3.2 The spray equipment shall be specifically designed to accurately ratio and apply the Strong-Seal<sup>®</sup> Primer lining material and shall be regularly maintained and in proper working order, and must be approved by Strong-Seal<sup>®</sup> Systems.
- 8.3.3 Specified surfaces shall be coated by spray application of Strong-Seal<sup>®</sup> Primer as further described herein. The minimum spray application shall be 4 mils.
- 8.3.4 Airless spray application equipment approved by Strong-Seal<sup>®</sup> Systems shall be used to apply Strong-Seal<sup>®</sup> Primer to avoid any potential contamination from compressor oil which may encourage inter-coat delamination.
- 8.3.5 Allow Strong-Seal<sup>®</sup> Primer to become tacky prior to application of Strong-Seal<sup>®</sup> Epoxy.

**9.0 APPLICATION OF STRONG-SEAL<sup>®</sup> EPOXY**

9.1 STRONG-SEAL<sup>®</sup> EPOXY PHYSICAL PROPERTIES:

<b>STRONG-SEAL<sup>®</sup> EPOXY</b>		
Compressive Strength	ASTM D695	>8,800 psi
Tensile Strength	ASTM D638	>7,700 psi
Flexural Strength	ASTM D790	>12,400 psi
Pull off Strength	ASTM D4541	>350 psi
VOC	ASTM D2584	0%
Durometer Hardness Type D	ASTM D2240	Shore D-70
Moisture Absorption	ASTM C413	<0.03%

9.2 SURFACE PREPARATION:

- 9.2.1 Applicator shall inspect the Strong-Seal<sup>®</sup> Profile Plus Mix surface specified to receive the 100% solids epoxy protective lining prior to application. Applicator shall notify owner of any noticeable disparity in the surfaces, which may interfere with the proper application of Strong-Seal<sup>®</sup> Epoxy.
- 9.2.2 Place covers over sump pump structure and plug pipe openings to prevent extraneous material from entering the sanitary sewer system.

10.3 APPROVED EQUIPMENT:

10.3.1 The Model 185 Xtreme plural component machine and Model HSS spray cartridge gun are both approved application equipment. All equipment must be a 2:1 ratio. Equipment other than the preceding must be approved by Strong-Seal® Systems personnel.

10.3.2 Applications must comply with all safety requirements and applicator must wear approved safety equipment as recommended by NIOSH for confined space entry.

#### 10.4 APPLICATION FOR EXISTING STRUCTURES:

10.4.1 Application procedures shall conform to the recommendations of Strong-Seal® Systems specified in the MSDS Epoxy Part A and Part B for material handling, safety, and environmental controls and Specification for Composite System section 9.3.2 for mixing and spray equipment.

10.4.2 The spray equipment shall be specially designed to accurately ratio and apply the Strong-Seal® Epoxy lining materials and shall be regularly maintained and in proper working order, and must be approved by Strong-Seal® Systems authorized personnel.

10.4.3 Specified surfaces shall be coated by spray application of Strong-Seal® Epoxy as further described herein. The minimum dry film thickness shall be 60 mils.

10.4.4 After the application of Strong-Seal® Epoxy is applied, if specified, a broadcasting of sand (i.e. oven dried 20 to 30 gradation) may be applied to the floor while the Strong-Seal® Epoxy is tacky to provide a non-slip surface.

10.4.5 With flow blocked and floor cleared of all debris, Strong-Seal® Epoxy may be applied to floor and ceiling at same time as applied to walls.

#### 10.5 APPLICATION FOR NEW STRUCTURES:

10.5.1 Standard Portland cement or new concrete structures should be cured for 28 days prior to application of Strong-Seal® Epoxy. If earlier application is required, concrete specimens can be tested for compressive and tensile strengths to determine if the structure has properly cured (Note: Bond strength of the coating is usually limited to the tensile strength of the substrate). The Project Engineer may require Elcometer pull tests to determine the suitability of the concrete substrate.

10.5.2 Contact Strong-Seal® Systems if the structure contains a quick setting, high strength concrete with latex or curing compound additives.

10.5.3 Contact Strong-Seal® Systems if the structure contains an existing coating.

## **11.0 LIMITED WARRANTY**

**If the Strong-Seal® Composite System is applied per Strong-Seal® Composite System specifications, installed by Strong-Seal® Systems certified applicators using Strong-Seal® Systems approved equipment and if Strong-Seal® products are used, The Strong Company, Inc. shall offer a 5 year limited warranty with the following limitations:**

**The Strong Company, Inc. warrants that this product was produced in conformity with its standard specification or formulations within recognized tolerances, free of adulteration or contamination, and that the product will perform in accordance with representations in Strong-Seal® Composite Systems literature and Technical Data Sheets when properly applied in strict conformance with the printed instructions on container or bag and as described in technical data instructions and when applied to a properly prepared surface.**

### **DISCLAIMER**

**THE SOLE REMEDY OF THE PURCHASER SHALL BE REPLACEMENT OF THE PRODUCT OR REFUND OF THE PURCHASE PRICE OF THE PRODUCT IF ANY DEFECT IN MATERIAL OR VARIANCE IN THE PRODUCT BEYOND RECOGNIZED TOLERANCES IN THE SPECIFICATIONS IS FOUND TO EXIST.**

**NO OTHER REMEDY INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS SHALL BE AVAILABLE TO THE PURCHASER.**

**THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPHS SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.**

**The Strong Company, Inc.**  
4505 Emmett Sanders Road  
Pine Bluff, AR 71601  
(800) 982-8009 Fax (870) 850-6933  
Website: [www.strongseal.com](http://www.strongseal.com) E-mail: [info@strongseal.com](mailto:info@strongseal.com)