



Section 330130 Sanitary Sewer Infrastructure Lining and Rehabilitation

1.00 GENERAL

1.01 Scope:

- A. This specification covers the work necessary to furnish and install a complete lining or rehabilitation system for sanitary sewer structures, as shown on the drawings and as specified herein. Work includes, but is not limited to, the following:
1. Stopping Leaks by repair and sealing of the concrete and/or masonry bench, channel, invert, pipe inlets, walls, cone, chimney and frame of all structures to include removal of unsound materials, preparation, chemical grouting, structural lining, patching, plugging and sealing compounds.
 2. Surface preparation, and installation of Structural Lining, Corrosion Protection Lining, High Build Corrosion Protection Lining, High Strength Corrosion Protection Lining, Corrosion Protection Mortar, High Build Corrosion Protection Mortar, Flexible Corrosion Protection Lining and/or Flexible Chimney Seal to include protection of surfaces not to be treated, touch-up, clean-up, and appurtenant work all in accordance with the requirements of the Contract Documents and this Specification.

1.02 Related Work Specified in Other Sections

- | | | |
|----|---------------|------------------------------------|
| A. | Section 03300 | Cast-in-Place Concrete |
| B. | Section 03251 | Expansion and Construction Joints |
| C. | Section 07194 | Under Slab Vapor Barrier |
| D. | Section 07200 | Exterior Below Grade Waterproofing |
| E. | Section 07900 | Joint Sealants |
| F. | Section 09900 | Painting |

1.03 Referenced Specifications Codes and Standards

- A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section. All references and standards listed shall be the latest revisions. Joint and individual documents are referenced.
1. SSPC – The Society for Protective Coatings
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4643



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(412) 281-2331

2. NACE – National Association of Corrosion Engineers
P.O. Box 218340
Houston, TX 77218-8340
(281) 492-0535
 - a. SSPC-SP 13/NACE No. 6 Surface Preparation of Concrete
 - b. SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment
 - c. SSPC-SP 5/NACE No. 1, White Metal Blast Cleaning
 - d. SSPC-SP10/NACE No. 2, Near White Metal Blast Cleaning
 - e. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning
 - f. NACE RP0892 “Linings over Concrete for Immersion Service”
 - g. NACE Standard RP0591 “Coatings for Concrete Surfaces in Non-Immersion and Atmospheric Service”
 - h. NACE SP0188 “Discontinuity Holiday Testing of Protective Coatings”.
 - i. NACE RP 6F-164 “Curing of Interior Tank Linings”.
 - j. NACE RP 6F-166 “Recommended Practice for Inspection of Linings on Steel and Concrete”

3. ICRI – International Concrete Repair Institute
3166 S. River Rd., Suite 132
DesPlaines, Il 60018
(847) 827-0830
 - a. Technical Guideline No.03372, “Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays”
 - b. Technical Guideline No. 03731, “Guide for Selecting Application Methods for the Repair of Concrete Surfaces”
 - c. Technical Guideline No. 03730, “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion”

4. ASTM – American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
(610) 832-9585
 - a. ASTM E-337: Test Method for Measuring Humidity with a Psychrometer
 - b. ASTM D 4258 “Practice for Surface Cleaning Concrete for Coating”
 - c. ASTM D 4261 “Practice for Surface Cleaning Unit Masonry for Coating”



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- d. ASTM D 4262 "Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces"
 - e. ASTM D 4414 "Standard Practice for Measurement of Wet Film Thickness by Notch Gages"
 - f. ASTM D 4787 "Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates"
5. ACI – American Concrete Institute
Box 19150, Redford Station
Detroit, Michigan 48219
(248) 848-3700
- a. ACI 350-01 "Code Requirements for Environmental Engineering Concrete Structures"
 - b. ACI 350.1 "Testing of Reinforced Concrete Structures for Water Tightness"
 - c. ACI 350.2 "Concrete Structures for Containment of Hazardous Material"
 - f. ACI 503 "Use of Epoxy Compounds with Concrete"
 - g. ACI 504 "Guide to Sealing Joints in Concrete Structures"

1.04 Submittals:

- A. Submit product data for each component specified including data substantiating that the proposed materials comply with specified requirements, and recommendations by the manufacturer covering all materials.
- B. Samples of the cured system as described in Part 3.03.D to include the following
 - 1. Finish texture as determined by the owner or owners' authorized representative.
 - 2. Stepped samples showing stages of multi-layer applications.

1.05 Quality Assurance

- A. Acceptable Manufacturers: The manufacturer of the specified products shall have in existence, for a minimum of three (3) years, a program of training, and technically supporting a nationally organized Approved Contractor Program. Manufacturer must provide five (5) project histories with names, dates, addresses, and phone numbers of contact persons for projects of similar scope, which have been completed at least three (3) or more years ago.
 - 1. Submit manufacturer's representative name, address and telephone number who will be available to provide information and suggestions on the proper use of the products.



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- B. Single Source Supply: All products described in Part 2.01 shall be manufactured by or approved for use by the manufacturer of the sanitary sewer infrastructure linings or rehabilitation system specified herein.
- C. Installer Qualifications: Engage only factory trained, approved applicators that have successfully completed applications using specified materials on projects of similar size and scope.
 - 1. Provide (3) three references with name, address, and telephone number.
 - 2. Provide written approval from the material manufacturer.
 - 3. All of the contractor's jobsite personnel must be trained in the hazards associated with confined space entry. All personnel entering a confine space shall be certified for confined space entry.
- D. Equipment Requirements
 - 1. Application equipment must be approved in writing by Sherwin-Williams Technical Service Group
- E. Substitutions
 - 1. Manufacturers seeking approval of products other than the specified system must supply cured samples, full product information, project histories and references, technical data with specifications, MSDS and certifications regarding conformity of performance properties from an independent testing laboratory. The product being submitted for approval must meet all requirements of the performance properties specified within this specification. Compliance with the above quality assurances must be provided in written form at least fourteen (14) days before bids are received. Omission or non-conformance of any item will result in rejection of the request.
- F. Pre-Installation Conference
 - 1. The contractor, the installation sub-contractor, and the sanitary sewer infrastructure lining and rehabilitation system manufacturer's representative shall meet on site with the owner's representative. Particular emphasis shall be placed on these specifications, safety, weather conditions, surface preparation, material application, and inspection.
 - 2. The contractor shall submit to the owner's representative any revisions or changes agreed upon, reasons thereof, and parties agreeing or disagreeing with them.



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- G. Substrate Conditions: Do not proceed with work until substrate preparation and tolerances have been approved by the owner's representative, sanitary sewer infrastructure lining and rehabilitation system manufacturer's representative, the approved installation sub-contractor, and the contractor.

1.06 Delivery, Storage, and Handling

- A. Deliver products to the job site in manufacturer's original, unopened containers bearing manufacturer's name and label and the following information
1. Product name
 2. Product description (generic product classification)
 3. Manufacturer's lot number
 4. Color
- B. Store materials in sealed original manufacturer's containers. Store materials in a protected area out of direct sunlight. Keep containers clean and undamaged. Adhere to manufacturer's published storage temperature and shelf life recommendations. Protect all materials from freezing.

2.00 PRODUCTS

2.01 Acceptable Manufacturers and Materials

- A. The Sanitary Sewer Infrastructure Lining or Rehabilitation System as manufactured by Sherwin-Williams will consist of, one or more systems for Stopping Leaks, Structural Lining, Corrosion Protection Lining, High Build Corrosion Protection Lining, High Strength Corrosion Protection Lining, Corrosion Protection Mortar, High Build Corrosion Protection Mortar, Flexible Corrosion Protection Lining or Flexible Chimney Seal where specified. All products are specified as the minimum standard of quality, and are manufactured or distributed by The Sherwin-Williams Company, Cleveland, Ohio (800-331-7979). Additional products may consist of one or more systems for infiltration leak stoppage and concrete repair.

(Note to Specifier: Select one or both of the polyurethane grout manufacturers, but we recommend that you leave all products listed to give the applicator the ability to select their material based on the problems with a given structure)

1. **Stopping Leaks** - Infiltration leakage of all concrete and brick structures shall be stopped by trenchless technology method of chemical grouting with polyurethane grouts. Products shall be manufactured by Avanti Grouts and shall be classified as "Hydrophobic Foam", "Hydrophilic Gel" or "Hydrophilic Foam" grouting compounds or a combination of these materials and methods as recommended by the manufacturer.



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- a. Hydrophobic Polyurethane Grouts are hydrophobic polyurethanes that when mixed and makes contact with the water, is designed to fill large voids in rock fissures, gravel layers, and cracks in concrete structures and for the cut-off of gushing water.
Option # 1 – Avanti Grouts AV-280 Hydrofoam with AV-281 Hydrocel
- b. Hydrophilic Polyurethane Gels are hydrophilic polyurethanes designed to react with water and form a water impermeable gel mass. When they come into contact with water, the grout begins to foam and gel, and depending on the temperature and amount of water present, quickly cure to a flexible, impermeable foam or gel mass unaffected by mildly corrosive environments.
Option # 1 – Avanti Grouts AV-202 Multigrout
- c. Hydrophilic Polyurethane Foams are designed to form a flexible gaskets or plug in joints and cracks in concrete. When it comes into contact with water, the grout expands quickly and cures to tough. Flexible, adhesive, closed-cell, foam that is essentially unaffected by mildly corrosive environments.
Option # 1 – Avanti Grouts AV-202 Multigrout
- d. Hydrophobic Polyurethane Grouts that are designed to form flexible gasket or plugs in very tight joints and hairline cracks. When they come into contact with water the grout expands and depending on temperature and the amount of accelerator used quickly cures to a tough, flexible closed cell polyurethane foam that is essentially unaffected by corrosive environments.
Option # 1 – Avanti Grouts AV-248-LV Flexseal LV with AV-249 Catalyst LV

(Note to Specifier: *Select one manufacturer of structural lining repair mortars and the products that you wish to incorporate in the specification)*

2. **Resurfacing Materials** – Designated structures shall receive an application of resurfacing compounds/repair mortar. The resurfacing compounds/repair mortars are classified as Hydraulic Cements, Waterbased Epoxy Cement, Microsilica Repair Mortars or Calcium Aluminate Repair Mortars. Waterbased Epoxy Cement and Microsilica Repair Mortars shall be designated for areas of Mild H₂S content or areas to be topcoated with a corrosion resistant coating or lining as shown on the drawings. Calcium Aluminate Repair Mortars shall be designated for areas of moderate H₂S content or areas to be topcoated with corrosion resistant coating or lining as shown on the drawings. Thickness shall be sufficient to replace lost cross section and fill voids **(Note to specifier:** *The option of using a resinous epoxy repair material can be inserted*



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here. Please contact your Sherwin-Williams representative for recommendations)

- a. Hydraulic Cements shall be cement based, quick setting, hydraulic cement compound which instantly stops weeping water through concrete or masonry walls and floors. They will become harder and more resistant when subjected to constant water pressure. *(Used primarily for filling large voids and stopping minor weeping water leaks)*

A.W. Cook Cement, CEMTEC Hydraulic Cement

Physical Properties (28 day cure)

Compressive Strength ASTM C-109	5,500 psi
Tensile Strength ASTM C-496	650 psi
Bond Strength ASTM C-882 (Modified)	880 psi
Setting Times (Gilmore) "Hot Mix"	65 seconds

- b. Waterbased Epoxy Cement Resurfacer shall be a three component, epoxy modified, cementitious resurfacer containing Portland cement, hydrophobic thixotropes, fiber-reinforcement, graded silica sand and other abrasion resistant aggregates. These will be used for resurfacing, patching and filling bug voids in concrete and masonry surfaces.

Sherwin-Williams Corobond 300, Epoxy Modified Cementitious Resurfacer

Physical Properties (28 days cure)

Compressive Strength ASTM D7234	750 psi
Bond Strength ASTM C882	2,280 psi
Compressive Strength ASTM C109	5,500 psi
Flexural Strength ASTM C580	1,617 psi
Splitting Tensile Strength ASTM C496	874 psi

- c. Rapid Cure Vertical Grade repair mortars shall be a one part, polymer modified, fast setting, silica fume, fiber reinforced mortar designed for vertical and overhead repairs from ¼" to 2" in one lift. The product may be applied by hand trowel or sprayed with a low-pressure pump. *(Used to hand place large voids, bench repair, or hand troweled structural wall linings)*

A.W. Cook Cement, CEMTEC Silatec Rapid Cure Vertical Grade

Physical Properties (28 day cure)

Compressive Strength ASTM C-109	6,800 psi
Flexural Strength ASTM C-293	990 psi
Bond Strength ASTM C-882 (Modified)	1,600 psi
Shrinkage ASTM C-596	0.07%



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Abrasion Resistance – ¼” APCI 1
 Setting Times @ 77°F
 Initial Set – 35 min
 Final Set – 50 min

- d. Microsilica repair mortars shall be a blend of Portland cement, graded silica sand, fibers and silica fume. The mortar may be hand troweled or spray applied, usually from ½” to 1” in depth. Uses include repairing concrete walls, ceilings, lining brick or concrete manholes and lift stations, etc. Microsilica repair mortar provides an extremely dense matrix and will accept coatings at earlier ages than typical Portland cement repair products. *(Used primarily for structural wall linings)*

A.W. Cook Cement, CEMTEC Silatec MSM
Physical Properties (28 days cure)

Compressive Strength ASTM C-109	10,400 psi
Flexural Strength ASTM C-293	1,695 psi
Shrinkage ASTM C-596	0.00%
Freeze/Thaw ASTM C-666 100 cycles	No Effect
Bond Strength ASTM C-882 (Modified)	1,695 psi
Modulus of Elasticity ASTM C-469	4,533,333 psi
Tensile Strength ASTM C-496	750 psi

- e. Calcium Aluminate repair mortars shall be a blend of quartz silica, fibers and calcium aluminate cement. They can be hand troweled or spray applied, usually from ½” to 1” in depth. Uses include repairing concrete wall and ceilings, lining brick or concrete manholes, lift stations, etc. They can be especially useful when coatings are required at early stages of cure. (Consult with coating manufacturer for specific times) *(Used primarily for structural wall linings)*

Option # 1 – A.W. Cook Cement, CEMTEC Silatec CAM
Physical Performance (28 day cure)

Compressive Strength ASTM C-109	12,800 psi
Flexural Strength ASTM C-293	1,360 psi
Shrinkage ASTM C-596	0.03%
Tensile Strength ASTM C-496	650 psi
Freeze/Thaw, 300 cycles ASTM C-666	No Effect
Bond Strength ASTM C-882 (Modified)	1,765 psi

2.02 Performance Criteria



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(Note to Specifier: Sherwin-Williams provides seven different coating/lining systems for application in these environments. This section of the specification shall be edited to include only one of these options)

- A. The Corrosion Protection Lining System shall consist of Sherwin-Williams Dura-Plate 5800 Epoxy (Formerly known as Cor-Cote SC “Sewer-Cote”). This is a ultra high solids, amine cured epoxy designed for the protection of concrete and steel in highly corrosive hydrogen sulfide (microbial induced) environments associated with wastewater applications including lift stations, digesters, aeration basins, manholes and wet wells. The application thickness shall be 40 – 60 mils DFT, when applied to concrete, masonry or structural lining surfaces. The specified film thickness shall be applied via spray application in a single coat with multiple passes.

Physical Properties:

Adhesion – ASTM D4541 - >300 psi, Concrete Failure

Abrasion Resistance – ASTM D4060, 1,000 g, 1000 cycles, CS-17 Wheel – 71 mg loss

Coefficient of Linear Thermal Expansion – ASTM C531 (in/in/°F) – 13×10^{-6}

Compressive Strength – ASTM D695 – 3,070 psi

Durometer Hardness – ASTM D2240 - Shore D –60

Flexural Modulus – ASTM D790 – 101,000 psi

Flexural Strength – ASTM D790 – 2,670 psi

Tensile Elongation – ASTM D638 – 11.2%

Tensile Strength – ASTM D638 – 3,024 psi

Chemical Resistance to Sulfuric Acid - 20% Concentration – No Effect

- B. The High Build Corrosion Protection Lining System shall consist of Sherwin-Williams Dura-Plate 5900 Epoxy (Formerly know as Cor-Cote SC “Sewer-Cote” Plus). This is a ultra high solids, high build, amine cured epoxy designed for the protection of concrete and steel in highly corrosive hydrogen sulfide (microbial induced) environments associated with wastewater applications including lift stations, digesters, aeration basins, manholes and wet wells. The application thickness shall be 80 – 125 mils DFT, when applied to concrete, masonry or structural lining surfaces. The specified film thickness shall be applied via spray application in a single coat with multiple passes.

Physical Properties:

Adhesion – ASTM D4541 - >300 psi, Concrete Failure

Abrasion Resistance – ASTM D4060, 1,000 g, 1000 cycles, CS-17 Wheel – 80 mg loss

Coefficient of Linear Thermal Expansion – ASTM C531 (in/in/°F) – 13×10^{-6}

Compressive Strength – ASTM D695 – 7,500 psi

Durometer Hardness – ASTM D2240 - Shore D –64

Flexural Modulus – ASTM D790 – 87,570 psi



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Flexural Strength – ASTM D790 – 1,950 psi
Tensile Elongation – ASTM D638 – 19.4%
Tensile Strength – ASTM D638 – 842 psi
Chemical Resistance to Sulfuric Acid - 20% Concentration – No Effect

- C. The High Strength Corrosion Protection Lining System shall consist of Sherwin-Williams Dura-Plate 6100 High Physical Strength Epoxy. This is a 100%, high build, high strength, amine cured epoxy designed for the protection of concrete and steel in highly corrosive hydrogen sulfide (microbial induced) environments associated with wastewater applications including lift stations, digesters, aeration basins, manholes and wet wells. The application thickness shall be 80 – 125 mils DFT, when applied to concrete, masonry or structural lining surfaces. The specified film thickness shall be applied via heated, plural component, spray application in a single coat with multiple passes.

Physical Properties:

Adhesion – ASTM D7234 - >2,000 psi, Concrete Failure
Abrasion Resistance – ASTM D4060, 1,000 g, 1000 cycles, CS-17 Wheel – <90 mg loss
Compressive Strength – ASTM D695 – 15,000 psi
Dry Heat Resistance – ASTM D2485 – 300°F
Elongation Percent – ASTM D638 – 4.8%
Flexural Modulus – ASTM D790 – 590,000 psi
Flexural Strength – ASTM D790 – 11,000 psi
Hardness, Shore D – ASTM D2240 – 83
Impact Resistance – ASTM D2794 – 30 in. lbs.
Tensile Strength – ASTM D638 – 5,600 psi
Water Absorption – ASTM D570 – 0.15%
Water Vapor Transmission – ASTM D1653 – 3.0/gms/m² (24 hrs)
Chemical Resistance at 120°F
5% Acetic Acid
5% Ammonium Hydroxide
Diesel
1% Ferric Chloride
Gasoline
10% Hydrochloric Acid
Kerosene
10% Nitric Acid
10% Sodium Chloride
25% Sodium Hydroxide
1% Sodium Hypochlorite
20% Sulfuric Acid

- D. The Corrosion Protection Mortar shall consist of Sherwin-Williams Dura-Plate 5800 Epoxy (Formerly known as Cor-Cote SC “Sewer-Cote” Epoxy) blended with 28 lbs of Type SC Aggregate per 1.5-gallon mix of resin. This is a ultra high solids, amine



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cured epoxy mortar formulated for use in highly corrosive hydrogen sulfide (microbial induced) environments where quick turn around and resurfacing of concrete are required. The application thickness shall be 100 –125 mils DFT. The specified film thickness shall be applied via hand trowel or spray application with a back trowel.

Physical Performance;

Adhesion – ASTM D4541 - >300 psi, Concrete Failure

Abrasion Resistance – ASTM D4060, 1,000 g, 1000 cycles, CS-17 Wheel – 80 mg loss

Coefficient of Linear Thermal Expansion – ASTM C531 (in/in/°F) – 9.38×10^{-5}

Compressive Strength – ASTM D695 – 4,030 psi

Durometer Hardness – ASTM D2240 - Shore D – 60

Flexural Strength – ASTM D790 – 3,050 psi

Moisture Absorption – ASTM C413 - <0.33%

Modulus of Elasticity – ASTM C580 – 3.49×10^5

Tensile Strength – ASTM D638 – 3,024 psi

Chemical Resistance to Sulfuric Acid - 20% Concentration – No Effect

- E. The High Build Corrosion Protection Mortar shall consist of Sherwin-Williams Dura-Plate 5900 Epoxy (Formerly known as Cor-Cote SC “Sewer-Cote” Plus) blended with 28 lbs of Type SC Aggregate per 2-gallon mix of resin. This is a ultra high solids, high build, amine cured epoxy mortar formulated for use in highly corrosive hydrogen sulfide (microbial induced) environments where quick turn around and resurfacing of concrete are required. The application thickness shall be 125 –250 mils DFT. The specified film thickness shall be applied via hand trowel or spray application with a back trowel.

Physical Performance;

Adhesion – ASTM D4541 - >300 psi, Concrete Failure

Abrasion Resistance – ASTM D4060, 1,000 g, 1000 cycles, CS-17 Wheel – 80 mg loss

Compressive Strength – ASTM D695 – 7,050 psi

Durometer Hardness – ASTM D2240 - Shore D – 73

Flexural Strength – ASTM C580 – 675 psi

Moisture Absorption – ASTM C413 - <0.03%

Modulus of Elasticity – ASTM C580 – 15,040 psi

Tensile Strength – ASTM C307 – 1,980 psi

Chemical Resistance to Sulfuric Acid - 20% Concentration – No Effect

- F. The Flexible Corrosion Protection Lining shall consist of Sherwin-Williams SherFlex Polyurethane Elastomer and an approved primer for the environment. This is a 100% Volume Solids, High Build, Aromatic, Polyurethane Elastomer formulated for use in highly corrosive hydrogen sulfide (microbial induced corrosion) environments where a tough, flexible, impact resistant, waterproof, quick turn around protective



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lining is required. The application thickness shall be 80 –125 mils DFT over an approved primer for the environment.

Physical Performance:

Abrasion Resistance – ASTM D4060, 1kg, 1000 cycles, CS-17 Wheel – 106 mg loss
Adhesion – ASTM D4541 – 300 psi, Concrete Failure
Dielectric Strength – ASTM D149-92a, method A – 430 volts/mil
Direct Impact – ASTM D2794 on steel pipe – 160 in./lb, no failures
Durometer Hardness – ASTM D2240 – Shore D 43
Elongation – ASTM D638 – Recoverable 47% at 77°F
Flexibility – ASTM D 1737 – No effect bending 0.5 mm plate coated with 20 mils over mandrel of 8 mm diameter
Permeability – ASTM E-96 – 0.189 grains/ hr ft² Hg U.S. Perms
Thermal Conductivity – ASTM C-177 – 0.133 BTU/HR.ft.°F per ft at 77°F
Tensile Strength – ASTM D638 – 1988 psi at 77°F

- G. The Flexible Chimney Seal shall consist of Sherwin-Williams Envirolastic AR530 Chimney Seal Cartridge System. This is a 100% Volume Solids, High Build, Aromatic, Polyurea formulated for use in highly corrosive hydrogen sulfide (microbial induced corrosion) environments where a tough, flexible, impact resistant, waterproof, quick turn around chimney seal is required. The application thickness shall be 60 –125 mils DFT.

Physical Performance:

Abrasion Resistance – ASTM D4060, 1kg, 1000 cycles, CS-17 Wheel – 5 mg loss
Adhesion – ASTM D4541 – 350 psi, Concrete Failure
Coefficient of Linear Thermal Expansion – ASTM C531 (in/in/°F) – 4×10^{-5}
Impact – ASTM D2794 on steel panels – >160 in./lb, direct and indirect
Durometer Hardness – ASTM D2240 – Shore D 50
Elongation – ASTM D638 – 530%
Mandrel Bend – ASTM D522 – Pass
Tear Strength – ASTM D624 – 525 pli
Tensile Modulus – ASTM D638 – 100% Modulus – 1,400 psi; 300% Modulus – 1,800 psi
Tensile Strength – ASTM D638 – 2440 psi

3.0 EXECUTION

3.01 Surface Preparation

A. Inflow and Infiltrations

1. Active leakage of all concrete and brick structures shall be stopped by trenchless technology method of chemical grouting with polyurethane grouts. Grouts shall be installed per manufacturers directions and could



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include any of the hydrophilic or hydrophobic products listed or combination there of.

B. Concrete

1. The NACE/SSPC Joint Surface Preparation Standards for concrete surface preparation are incorporated in and made part of this specification. All references to SSPC SP-13/NACE No 6 designate the definitions and other requirements in these documents. The International Concrete Repair Institute (ICRI) Technical Guideline #03732, Guide to Surface Preparation of Concrete to Receive Sealers, Coatings and Polymer Overlays shall be used to visually evaluate the concrete surface profile. Refer to Sherwin-Williams' Concrete Surface Preparation Guide.
2. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile CSP-3 to CSP-5
3. Concrete surface defects, such as deteriorated concrete or masonry, hollow areas, bugholes, honeycombs, cracks and voids shall be filled flush and true with the specified structural lining compound in accordance with ICRI Technical Guide No 03730 "Guide for Selecting Application Methods for the Repair of Concrete Surfaces". Fins, trowel marks, and all protrusions or rough edges shall be removed. All active water leaks shall be stopped by use of polyurethane chemical grouting compounds.
4. Concrete Surface Repair: Surface voids and defects
 - a. Areas less than 1/2" deep shall be repaired with Rapid Cure Vertical Grade repair mortars or Hydraulic Cement.
 - b. Areas that are greater than 1/2" deep shall be repaired with specified structural lining repair mortar.
5. Provide a clean, saturated surface dry (SSD) concrete surface with no free standing or moving water, with a minimum surface profile as defined above. All substrates are to be vacuumed, swept and blown down with clean, dry air to remove spent abrasive, dust and other foreign material that might interfere with the adhesion of the primer and lining.
6. Debris resulting from surface preparation and cleaning shall not be allowed to enter any water streams and shall be removed from the structure.

C. Miscellaneous Metals

1. The NACE / SSPC Joint Surface Preparation Standards for abrasive blasting approved in October 1994 are incorporated in and made a part of

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this specification. All references to SSPC-SP6 / NACE No. 3 and SSPC-SP10 / NACE No. 2 designate the definitions and other requirements in these documents. SSPC VIS 1-89 Visual Standard for Abrasive Blast Cleaned steel shall be used to visually evaluate the blast cleanliness.

2. Remove all oil and grease from surface by solvent cleaning per SSPC-SP1. Minimum surface preparation is SSPC-SP10 / NACE No. 2, Near White Metal Blast Cleaning. Abrasive blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2-3 mils). Prime any bare steel the same day as it is cleaned and before flash rusting occurs. Refer to Sherwin-Williams Guidelines Procedures for Surface Preparation of Metals.
 - a. Inspect the surfaces to be lined. All holes in the steel surfaces or pits greater than 1/8 inch shall be repaired in accordance with the owner's repair procedures.
 - b. All substrates are to be vacuumed, swept and blown down with clean, dry air to remove spent abrasive, dust and other foreign material that might interfere with the adhesion of the primer or basecoat.
 - c. The maximum allowable residual salt contamination, as measured with a KTA Scat Kit or equivalent field test method, immediately prior to the application of the first coat is as follows:
 - 5 micrograms per square centimeter (50mg/m²) most commodities up to 120°F
 - d. Corrosion pits in the blasted steel shall be filled flush with the substrate with Steel-Seam FT 910 patching and surfacing compound or FOX Industries FX-472 Epoxy Resurfacer.
 - e. Projections and lap joints on welded plates and on riveted plates to be coated shall be filled with Steel-Seam FT 910 patching and surfacing compound or FOX Industries FX-472 Epoxy Resurfacer in order to smooth out the surface and provide for a smooth transition of the lining over the substrate.

3.02 Application

- A. The contractor shall at all times maintain traffic control measures in cooperation with local police details, property owners and the municipality.
- B. The contractor shall maintain sewer flows in accordance with the contract documents. Diversion of the flow or plugging the flow of sewerage for the purposes of affecting repairs to the structure shall be coordinated at direction of the owner.



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- C. Comply with manufacturers written installation procedures and individual product data sheet application bulletins.
- D. Apply materials in accordance with the following material coverage:

Option # 1: Corrosion Protection Lining System

<u>Products</u>	<u>Thickness (mils dft)</u>
<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed
<u>Primer</u>	
Not Required	
<u>Corrosion Protection Coating</u>	
Dura-Plate 5800 Epoxy	40.0-60.0
<u>Total Targeted Thickness</u>	40.0-60.0

Option # 2: High Build Corrosion Protection Lining System

<u>Products</u>	<u>Thickness (mils dft)</u>
<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed
<u>Primer</u>	
Not Required	
<u>Corrosion Protection Coating</u>	
Dura-Plate 5900 Epoxy	80.0-125.0
<u>Total Targeted Thickness</u>	80.0-125.0

Option # 3: High Strength Corrosion Protection Lining System

<u>Products</u>	<u>Thickness (mils dft)</u>
<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/ Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed



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Primer
Not Required

<u>Corrosion Protection Coating</u> Dura-Plate 6100 Epoxy	80.0-125.0
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<u>Total Targeted Thickness</u>	80.0-125.0
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Option # 4: Corrosion Protection Mortar System

<u>Products</u>	<u>Thickness (mils dft)</u>
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<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed

Primer
Not Required

<u>Corrosion Protection Coating</u> Dura-Plate 5800 Epoxy Mortar	100.0-125.0
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<u>Total Targeted Thickness</u>	100.0-125.0
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Option # 5: High Build Corrosion Protection Mortar System

<u>Products</u>	<u>Thickness (mils dft)</u>
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<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed

Primer
Not Required

<u>Corrosion Protection Coating</u> Dura-Plate 5900 Epoxy Mortar	125.0-250.0
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<u>Total Targeted Thickness</u>	125.0-250.0
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Option # 6: Flexible Corrosion Protection Lining System

<u>Products</u>	<u>Thickness (mils dft)</u>
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<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed
<u>Primer</u>	
Dura-Plate 235 Multi-Purpose Epoxy	3.0-5.0
<u>Corrosion Protection Coating</u>	
SHERFLEX Polyurethane Elastomer	80.0-125.0
<u>Total Targeted Thickness</u>	83.0-130.0

Option # 7: Flexible Chimney Seal System

<u>Products</u>	<u>Thickness (mils dft)</u>
<u>Repair/Patching and Structural Linings</u>	
Epoxy Repair/Resurfacer (Steel)/Resurfacer/Repair Mortars (Concrete)	As Needed
Stopping Leaks	As Needed
<u>Corrosion Protection Coating</u>	
Envirolastic AR530 Chimney Seal	60.0-125.0
<u>Total Targeted Thickness</u>	60.0-125.0

3.03. Inspection and Testing

- A. The owner or owner’s authorized representative may require the services of an independent testing laboratory to test the installed system.
- B. If test results indicate noncompliance with the specification, the following corrective action may be required of the Contractor:
 - 1. Remove non-compliant systems or components.
 - 2. Replace system or components in (1)
 - 3. Assume the testing expenses.
- C. Minimum requirements of the corrosion protection coatings and/or lining system are that it be free of the following:
 - 1. Uncured material
 - 2. Inadequate thickness
 - 3. Pinholes
 - 4. Blisters
 - 5. Delamination



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6. Foreign matter
7. Unspecified materials

3.04. Protection

- A. The corrosion protection coatings and/or lining system shall be protected from damage or detrimental elements during cure and until the time of final acceptance.

End of Section 330130