

Lava-Liner, Ltd. Ultra-Flex ECO 5000

SECTION 09960 (09 96 00)

HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Environmentally friendly, high-performance coatings for concrete tanks and lagoons used for the containment of wastewater. High-performance coating rapidly cures to form a seamless, abrasion resistant, and chemical resistant waterproof liner. Contains reclaimed polymer from recycled rubber tires and re-refined oils from recycled lubrication oil.

1.2 RELATED SECTIONS

- A. Section 03300 (03 30 00) – Cast-in-Place Concrete (Cast-in-Place Concrete).
- B. Section 09880 (09 97 23) – Coatings for Concrete and Masonry (Concrete and Masonry Coating).
- C. Section 13200 (33 16 00) – Storage Tanks (Water Utility Storage Tank).

1.3 REFERENCES

- A. ACI 201.1R – Guide for Making a Condition Survey of Concrete in Service.
- B. ASTM C836 – High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
- C. ASTM C957 – High Solids Content, Cold-Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface.
- D. ASTM D36 – Softening Point of Bitumen (Ring-and-Ball Apparatus).
- E. ASTM D412 – Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
- F. ASTM D751 – Coated Fabrics.
- G. ASTM D1117 – Evaluation Nonwoven Fabric.
- H. ASTM D1682 – Breaking Load and Elongation of Textile Fabric.

- I. ASTM D2240 – Rubber Property – Durometer Hardness.
- J. ASTM D3786 – Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
- K. ASTM D4060 – Abrasion Resistance of Organic Coatings by the Taber Abraser.
- L. ASTM D4258 – Surface Cleaning Concrete for Coating.
- M. ASTM D4259-88 – Abrading Concrete.
- N. ASTM D4263 – Indicating Moisture in Concrete by the Plastic Sheet Method.
- O. ASTM D4285 – Indicating Oil or Water in Compressed Air.
- P. ASTM E96 – Water Vapor Transmission of Materials.
- Q. ICRI 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymers Overlays.
- R. ICRI CSP2 – Grinding
- S. ICRI CSP1- Acid Etched
- T. OSHA Regulations Permit-required confined spaces. 29 CFR 1910.146

1.4 SUBMITTALS

- A. Comply with requirements of Section 01330 (01 33 00) – Submittal Procedures (Submittal Procedures).
- B. Product Data: Submit manufacturer's product data, including surface preparation, application, and curing.
- C. Samples: Submit 3-inch by 1-inch samples for approval by the Engineer.
 - 1. Cured high-performance coating, 60 mils thick.
 - 2. Reinforcing fabric and joint cover sheet.
- D. Applicator's Project References: Submit list of completed project references.
- E. Certification of Applicator: Submit for applicator a certificate indicating completion of manufacturer's contractor training program or 2 year history of application of equivalent 2 component systems.
- F. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Applicator: Use applicator experienced in the application of the specified high-performance coating for a minimum of 2-years on projects of similar size and complexity. Provide a list of completed projects including project name and location, name of engineer, name of coating manufacturer, and approximate quantity of coating applied.
2. Applicator's Supervisor: Employ a supervisor during all phases of the work that had successfully completed manufacturer's contractor training program.
3. Applicator's Personnel: Employ persons trained for the application of high-performance coating.

B. Regulatory Requirements: Comply with environmental regulations. Specific attention should be given the potential for the requirement of a Confined Space Permit.

C. Pre-Application Meeting:

1. Convene a pre-application meeting 2 weeks before the start of application of the high-performance coating.
2. Require attendance of parties directly affecting work of this section, including the contractor, sub-contractor, engineer, applicator, and manufacturer's representative.
3. Review environmental requirements, materials, protection of adjacent work, surface preparation, application, curing, field quality control, cleaning, and coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver materials to the site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
2. Do not deliver material to site more than one month before use.

B. Storage:

1. Store the material in accordance with manufacturer's instructions.
2. Store materials indoor in an area well ventilated and protected from damage.
3. Do not store material near open flame, sparks, or hot surfaces.
4. Store materials on raised platforms and covered by waterproof covers.
5. Keep material containers closed.

C. Handling: Protect materials during handling and application to prevent damage.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply in wet weather or when rain is imminent.
- B. Apply when the surface is a minimum 50 degrees F (10 degrees C) and a minimum of 5 degrees F (3 degrees C) above dew point. Consult manufacturer for application instructions if the ambient or surface temperature is below 50 degrees F (10 degrees F).
- C. Do not apply to porous substrates when substrate or ambient temperatures are rising.
- D. Do not apply to porous substrates when substrate is in direct sunlight.
- E. Do not apply over substrates that are frozen or contain frost.

1.8 WARRANTY

- A. Provide a 10 year material and 1-year labor warranty. Obtain material warranty from manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Lava-Liner, Ltd., 1550 Tiburon Blvd., Suite G-418, Tiburon, CA 94920 Ph. 415-829-9114, Fax 415-829-9203

2.2 HIGH-PERFORMANCE COATINGS

- A. High-performance coating: ULTRA-FLEX ECO 5000. Two-component, high solids, elastomeric asphalt modified urethane. Designed for spray, squeegee, or roller application.
 - 1. Elastomeric Waterproofing, ASTM C836 and C957: Exceeds all criteria.
 - 2. Solids by volume: 92 percent.
 - 3. Volatile Organic Compounds (VOC): 0.76 pounds per gallon (92 g/L).
 - 4. Tensile Strength, ASTM D412, 100-mil sheet: >3000 pounds per square inch.
 - 5. Extension to Break, ASTM D412: 130 percent.
 - 6. Recovery from 100 Percent Extension:
 - a. After 5-minutes: 98 percent.
 - b. After 24-hours: 100 percent.
 - 7. Coating Performance, Crack Bridging:
 - a. 10 Cycles at minus 15 degrees F (minus 26 degrees C): Greater than 1/8-inch.

- b. After Heat Aging: Greater than 1/4-inch.
 8. Coating Performance, Weathering, ASTM D822: 5000 hours: no cracking.
 9. Softening Point, ASTM D36: Greater than 350 degrees F (177 degrees C).
 10. Deflection Temperature, ASTM D648: below minus 60 degrees (minus 50 degrees C).
 11. Service Temperature: minus 60 degrees F to 220 degrees F (minus 50 degrees C to 105 degrees C).
 12. Hardness, ASTM D2240, Shore A, 77 degrees F (25 degrees C): 60.
 13. Permeability to Water Vapor, ASTM E96, Method E, 100 degrees F (38 degrees C), 100-mil sheet: 0.03 perms.
 14. Abrasion Resistance, Weight Loss, ASTM D4060: <1.0 mg.
 15. Adhesion to Concrete, Dry, Elcometer: 350 pounds per square inch.
 16. Color: Black.
- B. Primer: Ultra-Flex EP-990C Two-component, medium solids, concrete penetrating epoxy primer.
1. Solids by Volume: 65 percent mixed.
 2. Volatile Organic Compounds (VOC): 2.81 pounds per gallon (340170 g/L).
- C. Adhesion Promoter: Ultra-Flex AP174. Adhesion promoter. Bifunctional/Trifunctional organosilane compound dispersed in isopropyl alcohol. Ensures a continuous and uniform bond between surfaces. Use the bonding agent over non-porous surfaces such as steel, except where primer has been installed. Do not use where solvent cleaners are prohibited.
1. Solids by Volume: Less than 1 percent.
 2. Volatile Organic Compounds (VOC): 6.4 pounds per gallon (743 g/L).
Where required, Ultra-Flex AP-174 may be blended to specifications requiring less than 100 g/l, contact Ultra-Flex representative.
- D. Patching Material: ULTRA-FLEX ECO 5000 Trowel Grade. Liquid applied, chemical and corrosion resistant urethane elastomer, chemically thickened to allow trowel application with minimum sag. Use as a crack filler and for application to vertical surfaces and cold joints.
1. Elastomeric Waterproofing, ASTM C836 and C957: Exceeds all criteria.
 2. Solids by volume: >94 percent.
 3. Volatile Organic Compounds (VOC): 0.74 pounds per gallon (88 g/L).
 4. Tear Strength, ASTM624, Die C: 150 pounds per inch.
 5. Tensile Strength, ASTM D412, 100-mil sheet: >3000 pounds per square inch.
 6. Extension to Break, ASTM D412: 130 percent.
 7. Recovery from 100 Percent Extension:
 - a. After 5-minutes: 98 percent.
 - b. After 24-hours: 100 percent.
 8. Coating Performance, Crack Bridging:
 - a. 10 Cycles at minus 15 degrees F (minus 26 degrees C): Greater than 1/8-inch.

- b. After Heat Aging: Greater than 1/4-inch.
 - 9. Coating Performance, Weathering, ASTM D 822: 5000 hours: no cracking.
 - 10. Softening Point, ASTM D36: Greater than 325 degrees F (160 degrees C).
 - 11. Deflection Temperature, ASTM D648: below minus 60 degrees (minus 50 degrees C).
 - 12. Service Temperature: minus 60 degrees F to 220 degrees F (minus 50 degrees C to 105 degrees C).
 - 13. Hardness, ASTM D2240, Shore A, 77 degrees F (25 degrees C): 60.
 - 14. Permeability to Water Vapor, ASTM E96, Method E, 100 degrees F (38 degrees C), 100-mil sheet: 0.03 perms.
 - 15. Abrasion Resistance, Weight Loss, ASTM D4060: 1.2 mg.
 - 16. Adhesion to Concrete, Dry, Elcometer: 350 pounds per square inch.
 - 17. Color: Black.
- E. Reinforcing Fabric and Joint Cover Sheet: Tietex T272 or equivalent. Stitch bonded polyester. Compatible with coating materials.
- 1. Weight: 3 ounces per square yard (100 g/m²).
 - 2. Tensile Strength, ASTM D1682: 57.1 pounds (30 kg).
 - 3. Elongation, ASTM D1682: 62 percent.
 - 4. Mullen Burst Strength, ASTM D3726: 177 pounds per square inch
 - 5. Trapezoid Tear Strength, ASTM D1117: 16.1 pounds (7.2 kg).
- F. Pipe Protrusion Cover and Sealing Gaskets: Jaeger TTC, polyester fabric waterproofed, rubber boot gaskets. Compatible with Coating materials.
- 1. Size: Various to fit tightly around pipes and circular protrusions as required.

PART 3 EXECUTION

3.1 INSPECT

- A. Inspect substrate and adjacent areas where high-performance coating will be applied. Notify the Engineer of conditions that would adversely affect the application or subsequent utilization of the high-performance coating. Do not proceed with application until unsatisfactory conditions are corrected.

3.2 PROTECTION

- A. Protect adjacent work and surrounding areas from contact with high-performance coating.

3.3 SURFACE PREPARATION FOR CONCRETE TANKS AND LAGOONS

- A. Surface Preparation shall be in accordance with ICRI CSP 1 at a minimum
- B. Provide clean, dry, and structurally sound concrete surface.

C. New Concrete:

1. Ensure concrete has a minimum compressive strength of 3,000 psi, is dry, and is free of release agents and curing compounds before application of high-performance coating.
2. Remove surface laitance and release agents.

D. Existing Concrete: Remove existing coating unless adhesion of existing coating will serve as support for the high-performance coating. Patch existing coating as approved by the manufacturer of the high-performance coating. Abrade the existing coating, and apply sample patch in accordance with Manufacturer's specifications to test for suitability and adhesion.

E. Condition Survey: If required by site Engineer, perform a condition survey of existing concrete in accordance with ACI 201.1R.

F. Abrasive Blasting: (Water blasting may be used as an alternative)

1. Prepare concrete surface to receive high-performance coating in accordance with ICRI 03732.
2. Remove dirt, soil, grease, oil, paint, coatings, form release agents, curing compounds, laitance, loose material, unsound concrete, and other foreign materials that would inhibit performance of high-performance coating in accordance with ASTM D4258 and by abrasive blasting.
3. Obtain a firm, sound concrete surface in which bug holes are fully opened or repaired.
4. Remove sharp concrete edges and projections.
5. Perform abrasive blasting in accordance with ASTM D4259-88.
6. Receive approval by Engineer of blasting media.
7. Maintain air supply for abrasive blasting free of oil and water in accordance with ASTM D4285.
8. Abrade surface to obtain a profile of ICRI CSP 1 to 3 in accordance with ICRI 03732.

G. Repair concrete surface to be free of holes. Fully open Bug/B holes before repair. Repair defects in the concrete surface, such as bug holes, air pockets, and honeycomb by filling and smoothing off with patching material, epoxy patching compound, or grout. Abrasive blast repaired surfaces.

H. Ensure substrate is clean and dry in accordance with manufacturer's instructions. Remove surface laitance from concrete surface to obtain a profile of ICRI CSP 1 to 3 in accordance with ICRI 03732.

I. Repair cracks in concrete surface with material suitable for type and width of crack, compatible with substrate and high-performance coating, and approved by the Engineer.

- J. Moisture Tests: Do not apply primer or high-performance coating to concrete surface unless one of the following moisture tests confirm appropriate moisture levels for properly prepared substrates:
 - 1. Plastic Sheet Method (ASTM D4263): Pass/Fail.
 - 2. Relative Humidity Test: Less than 75 percent relative humidity at 70 degrees F.
 - 3. Calcium Chloride Test: Less than 5 pounds per 1,000 square feet per 24 hours.
 - 4. Radio Frequency Test: Less than 5 percent moisture.

3.6 APPLICATION

- A. Apply Ultra-Flex EP-990C (Concrete Penetrating Epoxy) as a primer to concrete surface a minimum of 10-mils wet thickness (200 Sq. ft./gal. A Uniform coating free of holidays or pinholes is necessary to minimize out gassing effects curing the application of the high-performance coating to porous surfaces such as concrete. Surfaces may require additional coats to obtain a pinhole free finish.
- B. Allow primer to cure in accordance with manufacturer's instructions before over coating with the high-performance coating.
- C. Apply high-performance coating in accordance with manufacturer's instructions for a fully reinforced elastomeric membrane system.
- D. Keep material containers tightly closed until ready for use.
- E. Keep equipment, air supplies, and application surfaces dry.
- F. Mix and apply when high-performance coating is above 60 degrees F (15 degrees C).
- G. Do not use adulterants, thinners, or cutback solutions.
- H. Blend and mix 2-component materials in accordance with manufacturer's instructions. Do not hand mix components.
- I. Maintain air supply for material spray application free of oil and water in accordance with ASTM D4285.
- J. Apply high-performance coating directly to a clean and dry epoxy prepared surface as a tack coat of approximately 20 mils wet film thickness.
- K. Imbed reinforcing fabric into tack coat taking care not to entrain air and to keep surface free of folds and wrinkles.

- L. Apply a 3 to 6-inch wide strip of polyester reinforcing fabric over cracks over 1/8-inch wide, non-working joints, and edges by imbedding into a tack coat.
- M. When the polyester fabric can be recoated without movement and the underlying tack coat has 1-4 hours, recoat with high-performance coating.
- N. Apply sufficient high-performance coating to achieve an additional 40-mils wet film thickness for containment.
- O. Joint Lines:
 - 1. Prepare for joint lines should rain or other conditions require work stoppage or extended delay.
 - 2. Install joint lines clean and straight. Install overlap 6-inches minimum to ensure an impervious joint.
 - 3. Severely abrade with wire brush or sandpaper and apply bonding agent to all areas where the high-performance coating has cured beyond its recoat window.
- P. Recoating:
 - 1. Recoat the high-performance coating system within the recoat window to obtain maximum interlayer adhesion to build specific thickness.
 - 2. Immersion Service: Minimize areas to be recoated outside the recoat window, except at joint lines.
 - 3. Non-Immersion Service: Severely abrade with wire brush or surface grinder, apply bonding agent, and recoat, if high-performance coating has cured more than the recoat window. Acceptable adhesion can only be achieved through aggressive abrading.

3.7 CURING

- A. Cure high-performance coating in accordance with manufacturer's instructions.
- B. Curing Time:
 - 1. Allow minimum time of 24-hours to 48-hours at 60 degrees F (15 degrees C) for a 60-wet mil coating thickness.
- C. Receive approval of cured coating by Engineer.

3.8 FIELD QUALITY CONTROL

- A. Provide inspection services by an independent inspection firm throughout all phases of surface preparation, application, and curing of the high-performance coating.
- B. Prior to placing into service, the applicator shall test the containment areas using electric field vector mapping or an equivalent method for testing for breaches in the high-performance coating system. If breaches are identified, the coating in

the affected area shall be abraded and repaired in accordance with the manufacturer's instructions.

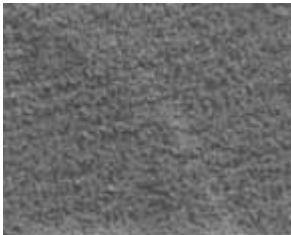
- C. Flood testing may also be used in addition to the foregoing electric field vector mapping to identify potential leak problems but shall not be used as an alternative.

3.9 CLEANING

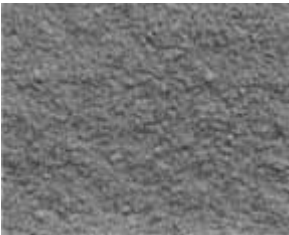
- A. Remove and dispose of all temporary materials used to protect adjacent work and surrounding areas.
- B. Immediately remove and clean high-performance coating materials from surfaces not intended to receive the materials.

END OF SECTION

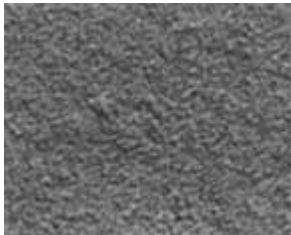
International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) Scale



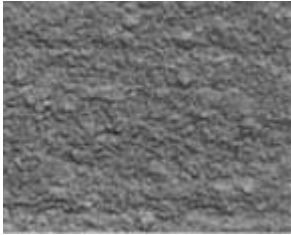
**CSP 1
(acid etched)**



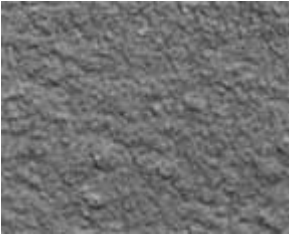
**CSP 2
(grinding)**



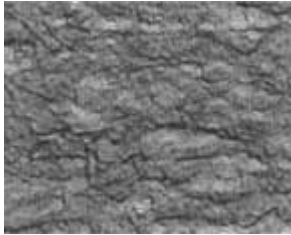
**CSP 3
(light shotblast)**



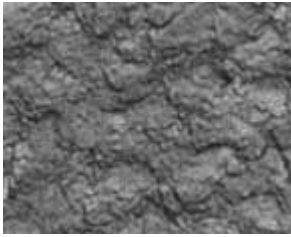
**CSP 4
(medium shotblast)**



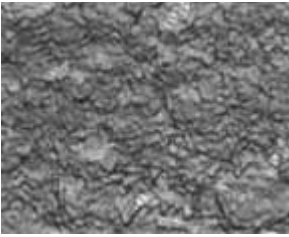
**CSP 5
(medium-heavy shotblast)**



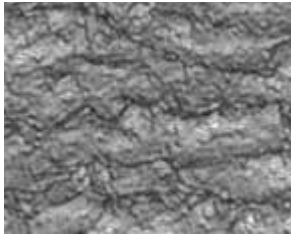
**CSP 6
(heavy shotblast)**



**CSP 7
(heavy shotblast)**



**CSP 8
(extreme shotblast)**



CSP 9