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## Product Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, as described in *The Project Resource Manual—CSI Manual of Practice*.

The section must be carefully reviewed and edited by the Engineer to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the Drawings. Delete all “Specifier Notes” when editing this section.

Section numbers are from *MasterFormat 1995 Edition*, with numbers from *MasterFormat 2004 Edition* in parentheses. Delete version not required.

### SECTION 09960 (09 96 35)

#### CHEMICAL-RESISTANCE COATINGS

Specifier Notes: This section covers C.I.M. Industries Inc. “CIM 2000” chemical-resistance coatings for concrete and steel tanks used for the containment of chemicals. The chemical-resistance coating rapidly cures to form a seamless, abrasion resistant, and chemical resistant waterproof lining.

Edit this section for applications to concrete or steel tanks. Consult manufacturer for assistance in editing this section for specific applications.

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

Specifier Notes: Revise the first sentence as required for the specific application.

- A. Chemical-resistance coating for [concrete] [steel] tanks used for the containment of chemicals. Chemical-resistance coating rapidly cures to form a seamless, abrasion resistant, and chemical resistant waterproof liner.

## 1.2 RELATED SECTIONS

Specifier Notes: Edit the following list as required for the project. List other sections with work directly related to the chemical-resistance coating.

- A. Section 03300 (03 30 00) – Cast-in-Place Concrete (Cast-in-Place Concrete).
- B. Section 09870 (09 97 13) – Coatings for Steel (Steel Coating).
- C. Section 09880 (09 97 23) – Coatings for Concrete and Masonry (Concrete and Masonry Coating).
- D. 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 D412 – Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
- C. ASTM D624 – Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- D. ASTM D1117 – Evaluation Nonwoven Fabric.
- E. ASTM D1682 – Breaking Load and Elongation of Textile Fabric.
- F. ASTM D2240 – Rubber Property – Durometer Hardness.
- G. ASTM D3786 – Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
- H. ASTM D4258 – Surface Cleaning Concrete for Coating.
- I. ASTM D4259-88 – Abrading Concrete.
- J. ASTM D4263 – Indicating Moisture in Concrete by the Plastic Sheet Method.
- K. ASTM D4285 – Indicating Oil or Water in Compressed Air.
- L. ICRI 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymers Overlays.

- M. SSPC-SP10/NACE No. 2 – Near-White Blast Cleaning.
- N. SSPC-SP6/NACE No. 3 – Commercial Blast Cleaning.

#### **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 chemical-resistance 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’s Supervisor: Submit for applicator’s supervisor a certificate indicating completion of manufacture’s contractor training program.
- F. Warranty: Submit manufacturer’s standard warranty.

#### **1.5 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Applicator: Use applicator experienced in the application of the specified chemical-resistance 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 chemical-resistance coating.
- B. Regulatory Requirements: Comply with environmental regulations.

Specifier Notes: Describe requirements for a meeting to coordinate the application of the chemical-resistance coating and to sequence related work.
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C. Pre-Application Meeting:

1. Convene a pre-application meeting [ \_\_\_\_ ] weeks before the start of application of the chemical-resistance 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 waterproofing 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 5-year material and 1-year labor warranty. Obtain material warranty from manufacturer.

## PART 2 PRODUCTS

### 2.1 MANUFACTURER

- A. C.I.M. Industries Inc., 23 Elm Street, Peterborough NH 03458. Phone (603) 924-9481. Toll Free (800) 543-3458. Fax (603) 924-9482.

### 2.2 CHEMICAL-RESISTANCE COATINGS

Specifier Notes: Consult manufacturer for assistance in editing this article for specific applications.

- A. Chemical-resistance coating: CIM 2000. Two-component, 100 percent solids, elastomeric urethane. Designed for spray, squeegee, or roller application.
  - 1. Solids by volume: 100 percent.
  - 2. Volatile Organic Compounds (VOC): 0 pounds per gallon (0 g/L).
  - 3. Mullen Burst Strength, ASTM D751, 50 mils in CIM Scrim: 150 pounds per square inch.
  - 4. Tear Strength, ASTM D624, Die C: 140 pounds per inch.
  - 5. Tensile Strength, ASTM D412, 100-mil sheet: 1200 pounds per square inch.
  - 6. Extension to Break, ASTM D412: 200 percent.
  - 7. Recovery from 100 Percent Extension:
    - a. After 5-minutes: 98 percent.
    - b. After 24-hours: 100 percent.
  - 8. Hardness, ASTM D2240, Shore A, 77 degrees F (25 degrees C): 75.
  - 9. Permeability to Water Vapor, ASTM E96, Method E, 100 degrees F (38 degrees C), 100-mil sheet: 0.03 perms.
  - 10. Adhesion to Concrete, Dry, Elcometer: 350 pounds per square inch.

Specifier Notes: CIM 2000 is initially gray and will darken/color change when exposed to direct sunlight.

- 11. Color: Gray.

Specifier Notes: Specify the text in the first set of brackets when applying the chemical-resistance coating to concrete surfaces. Specify the text in the second set of brackets when applying the chemical-resistance coating to steel surfaces.

- B. Primer: CIM 61 BG Epoxy Primer. Two-component, high solids, epoxy primer. [Use as a primer coat on dry, porous substrates such as concrete.] [Prevents flash rust on blasted steel.]
1. Solids by Volume: 80 percent mixed.
  2. Volatile Organic Compounds (VOC): 1.41 pounds per gallon (170 g/L).
- C. Bonding Agent: CIM Bonding Agent. 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).
- D. Patching Material: CIM 1000 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: 89 percent.
  3. Volatile Organic Compounds (VOC): 0.74 pounds per gallon (88 g/L).
  4. Mullen Burst Strength, ASTM D751, 50 mils in CIM Scrim: 150 pounds per square inch.
  5. Tear Strength, ASTM624, Die C: 150 pounds per inch.
  6. Tensile Strength, ASTM D412, 100-mil sheet: 800 pounds per square inch.
  7. Extension to Break, ASTM D412: 300 percent.
  8. Recovery from 100 Percent Extension:
    - a. After 5-minutes: 98 percent.
    - b. After 24-hours: 100 percent.
  9. 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.
  10. Coating Performance, Weathering, ASTM D 822: 5000 hours: no cracking.
  11. Softening Point, ASTM D36: Greater than 325 degrees F (160 degrees C).

12. Deflection Temperature, ASTM D648: below minus 60 degrees (minus 50 degrees C).
  13. Service Temperature: minus 60 degrees F to 220 degrees F (minus 50 degrees C to 105 degrees C).
  14. Hardness, ASTM D2240, Shore A, 77 degrees F (25 degrees C): 60.
  15. Permeability to Water Vapor, ASTM E96, Method E, 100 degrees F (38 degrees C), 100-mil sheet: 0.03 perms.
  16. Abrasion Resistance, Weight Loss, ASTM D4060: 1.2 mg.
  17. Adhesion to Concrete, Dry, Elcometer: 350 pounds per square inch.
  18. Color: Black.
- E. Reinforcing Fabric and Joint Cover Sheet: CIM Scrim. Stitch bonded polyester. Compatible with coating materials.
1. Weight: 3 ounces per square yard (100 g/m<sup>2</sup>).
  2. Tensile Strength, ASTM D1682: 57.1 pounds (30 kg).
  3. Elongation, ASTM D1682: 61.65 percent.
  4. Mullen Burst Strength, ASTM D3726: 176.8 pounds per square inch (1,215 kPa).
  5. Trapezoid Tear Strength, ASTM D1117: 16.1 pounds (7.2 kg).

## **PART 3 EXECUTION**

### **3.1 INSPECT**

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

### **3.2 PROTECTION**

- A. Protect adjacent work and surrounding areas from contact with chemical-resistance coating.

Specifier Notes: Specify surface preparation for concrete or steel tanks.
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### **3.3 SURFACE PREPARATION FOR CONCRETE TANKS**

- A. Prepare surface in accordance with manufacturer's instructions.
- B. Provide clean, dry, and structurally sound concrete surface.

Specifier Notes: Delete the following paragraphs for surfaces preparation of existing concrete surfaces.

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 chemical-resistance coating.
2. Remove surface laitance and expose the underlying aggregate consistent with ICRI CSP 4 to 6 in accordance with ICRI 03732.

Specifier Notes: Delete the following paragraph for new concrete tanks.

Specify the text in the first set of brackets when removing the existing coating. Specify the text in the second set of brackets when applying the chemical-resistance coating over the existing coating. The Engineer should determine if existing coatings needs to be removed or can be used as a support for the chemical-resistance coating. Consult manufacturer to verify coating compatibility.

- D. Existing Concrete: [Remove existing coating] [Use existing coating as support for the chemical-resistance coating. Patch existing coating as approved by the Engineer. Abrade the existing coating and apply sample patch to test for suitability and adhesion.]

Specifier Notes: Delete the following paragraph for new concrete tanks. Engineer should determine if a condition survey of the existing tank is required.

- E. Condition Survey: Perform a condition survey of existing concrete in accordance with ACI 201.1R.

Specifiers Notes: An alternate to abrasive blasting is water blasting to prepare the concrete surface.

F. Abrasive Blasting:

1. Prepare concrete surface to receive chemical-resistance coating by abrasive blasting.
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 chemical-resistance 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. Expose aggregate to obtain a profile of ICRI CSP 4 to 6 in accordance with ICRI 03732.

Specifier Notes: Holes in the concrete surface that will “burp” air and cause holes or bubbles in the chemical-resistance coating shall be filled. Closed bug holes or bug holes with a “blind” surface shall be opened and repaired.

- G. Repair concrete surface to be free of holes. Fully open bug 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.

Specifier Notes: Surface profile effects, among other things, the appearance of chemical-resistance coating used per unit area, the uniformity of the chemical-resistance coating, and the aesthetics of the project. The performance of a properly installed coating is not affected by the surface roughness. The more of a profile allowed, the more likely the cost of the work will increase. Additional material will be required in order to achieve the minimum thickness.

- H. Ensure substrate is clean and dry in accordance with manufacturer’s instructions. Remove surface laitance from concrete surface to expose aggregate to obtain a profile of ICRI CSP 4 to 6 in accordance with ICRI 03732.
- I. Repair cracks in concrete surface with material suitable for type and width of crack, compatible with substrate and chemical-resistance coating, and approved by the Engineer.

Specifier Notes: Consult manufacturer for more information regarding moisture tests.

- J. Moisture Tests: Do not apply primer or chemical-resistance coating to concrete surface unless two or more 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.

### 3.4 SURFACE PREPARATION FOR STEEL TANK

- A. Prepare surfaces in accordance with manufacturer's instructions.
- B. Provide clean, dry, and structurally sound steel surface.

Specifier Notes: Delete the following paragraph for new tanks.

Specify the text in the first set of brackets when removing the existing coating. Specify the text in the second set of brackets when applying the chemical-resistance coating over the existing coating. Engineer should determine if existing coatings are to be removed or used as a support for the chemical-resistance coating. Consult manufacturer to check coating compatibility.

- C. Existing Steel Tanks: [Remove existing coating.] [Use existing coating as support for the chemical-resistance coating. Patch existing coating as approved by the Engineer. Abrade the existing coating and apply sample patch to test for suitability and adhesion.]
- D. Scarify surface for primed steel.
- E. Abrasive blasting:
  - 1. Prepare steel surface to receive chemical-resistance coating by abrasive blasting.
  - 2. Remove dirt, soil, grease, oil, paint, coatings, loose material, loose rust, rust residue, blistered and flaking steel and other foreign materials that would inhibit performance of chemical-resistance coating by abrasive blasting.
  - 3. Immersion Service: SSPC-SP10/NACE No. 2 – Near-White Blast Cleaning.
  - 4. Non-immersion Service: SSPC-SP6/Nace No.3 – Commercial Blast Cleaning.
  - 5. Maintain air supply for abrasive blasting free of oil and water in accordance with ASTM D4285.

### 3.5 APPLICATION

Specifier Notes: Delete the following paragraph if the primer and bonding agent are not used.

Specify the text in the first set of brackets when applying the chemical-resistance coating to concrete surfaces. Specify the text in the second or third set of brackets when applying the chemical-resistance coating to steel surfaces.

- A. [Apply primer to concrete surface a minimum of 5-mils wet thickness. A Uniform coating free of holidays or pinholes is necessary to minimize

outgassing effects curing the application of the chemical-resistance coating to porous surfaces such as concrete. Surfaces may require additional coats to obtain a pinhole free finish.] [Apply bonding agent in accordance with manufacturer's instructions to cleaned steel surfaces.] [Apply primer to cleaned steel surfaces if chemical-resistance coating cannot be applied before the formation of flash rust.]

- B. Allow primer to cure in accordance with manufacturer's instructions before topcoating with the chemical-resistance coating.
- C. Apply chemical-resistance coating in accordance with manufacturer's instructions.
- D. Keep material containers tightly closed until ready for use.
- E. Keep equipment, air supplies, and application surfaces dry.

Specifier Notes: Chemical-resistance coating may be preheated to facilitate application at low air temperatures, but working time will be reduced. Contact manufacturer for information on cold weather applications.
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- F. Mix and apply when chemical-resistance 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 chemical-resistance coating directly to a clean and dry surface or to reinforcing fabric.
- K. Apply a 6 to 12-inch wide strip of joint cover sheet over cracks over 1/8-inch wide, non-working joints, and edges. Adhere center joint cover sheet over all joints by applying a tack coat of the chemical-resistance coating.
- L. Apply sufficient chemical-resistance coating to achieve 60-mils wet film thickness for containment of wastewater.
- M. 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 chemical-resistance coating has cured beyond its recoat window.

Specifier Notes: The recoat window is 4 to 48 hours at 70 degrees F (21 degrees C). The recoat window is affected by air and substrate temperature. Consult manufacturer for assistance in determining recoat window for specific temperatures.

N. Recoating:

1. Recoat the chemical-resistance 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 chemical-resistance coating has cured more than the recoat window. Acceptable adhesion can only be achieved through aggressive abrading.

### 3.6 CURING

- A. Cure chemical-resistance coating in accordance with manufacturer's instructions.

Specifier Notes: Curing time depends upon chemical-resistance coating thickness and substrate temperature. Consult manufacturer for assistance in determining curing time for specific applications.

B. Curing Time:

1. Allow sufficient time for solvents to evaporate from the cured chemical-resistance coating before placing into service.
2. Allow minimum solvent release 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.

### 3.7 FIELD QUALITY CONTROL

- A. Provide inspection services by an independent inspection firm throughout all phases of surface preparation, application, and curing of the chemical-resistance coating.

### **3.8 CLEANING**

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

**END OF SECTION**