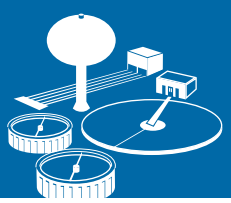
carboline®
Coatings - Linings - Fireproofing

Water & Wastewater

System Guide

Coatings and Linings



Collection Systems

Concrete Repair

CHEMICAL EXPOSURE	PREP	PRODUCT	DESCRIPTION
Restructuring and resurfacing of concrete **Applications – Manholes, wet wells, lift stations, piping, sewer interceptors**			
Moderate to severe	NACE 6 / SSPC-SP13 and surface profile of ICRI CSP 3-6	**Carbocrete 522**	Water based fiber-reinforced cementitous mortar 1/2" - 3 1/2" (1.5 - 9 cm)
Moderate to severe		**Carboguard 510**	Water based epoxy repair mortar Various mixes for voids and bug holes up to 3" (8 cm)
Moderate to severe		**Carboguard 510 SG**	Spray grade epoxy cementitious mortar, <1/4" (6250 microns)
Severe		**Plasite 5371**	Chemical resistant trowel applied aggregate-filled epoxy for severe environments, 125 mils (3125 microns)

Concrete Protection

CHEMICAL EXPOSURE	PREP	1ST COAT (OPTIONAL)	DESCRIPTION	2ND COAT	DESCRIPTION
Collections **Applications – Manholes, wet wells, lift stations, concrete pipe and conduit, sewer interceptors**					
Moderate to severe	NACE 6 / SSPC-SP13 and surface profile of ICRI CSP 3-6	**Carboguard 1340 WB or Carboguard 690**	Water based epoxy primer or Phenalkamine epoxy	**Reactamine 760 Series**	Hybrid polyurethane with flexibility and chemical resistance
Moderate to severe		**Carboguard 1340 WB or Semstone 110**	Water based epoxy primer or Solvent free epoxy primer	**Plasite 4500 Series**	Chemical resistant epoxy 100% solids, meets AWWA C210
Severe				**Plasite 4550 Series**	Highly chemical resistant epoxy novolac 100% solids
Severe				**Plasite 5371**	Chemical resistant epoxy 100% solids, trowel applied

Transportation Systems

Steel Protection

CHEMICAL EXPOSURE	PREP	PRODUCT	DESCRIPTION
Transportation - Exposure of steel, ductile or cast iron pipe **Applications – Interior and exterior protection of submersed valves & pumps, penstocks, piping and sewer interceptors**			
Moderate	Carbon steel: NACE 3 / SSPC-SP6 Ductile iron/cast iron: NAPF 500 (latest edition)-04	**Bitumastic 300M**	Coal-tar epoxy
Moderate to severe		**Polyclad 757, 777 PL**	Structural polyurethane for corrosion and abrasion resistance. Meets AWWA C222.
Moderate to severe		**Polyclad 767**	Structural polyurethane for corrosion and abrasion resistance. Approved for potable water use NSF/ANSI 61. Meets AWWA C222.
Moderate to severe		**Reactamine 760 Series**	Hybrid polyurethane with flexibility and chemical resistance.
Severe		**Plasite 4500 Series**	Chemical resistant epoxy 100% solids. Approved for potable water use NSF/ANSI 61. Meets AWWA C210.

Preliminary Treatment

Steel Surfaces used in Screening, Settling, and Aeration Tanks

CHEMICAL EXPOSURE	PREP	1ST COAT	DESCRIPTION
Immersion - Steel **Applications – Steel surfaces exposed to wastewater for vessels, settling tanks, and buried pipe that connects them**			
Moderate	NACE 2 / SSPC-SP10	**Bitumastic 300 M**	Coal-tar epoxy
Moderate		**Carboguard 890**	Cycloaliphatic epoxy
Moderate to severe		**Reactamine 760 Series**	Hybrid polyurethane with flexibility and chemical resistance
Moderate to severe		**Plasite 4500 Series**	Chemical resistant epoxy 100% solids. Meets AWWA C210.

Concrete Surfaces used in Screening, Settling, and Aeration Tanks

CHEMICAL EXPOSURE	PREP	1ST COAT (OPTIONAL)	DESCRIPTION	2ND COAT	DESCRIPTION
Immersion - Concrete **Applications – Concrete surfaces exposed to wastewater for vessels, settling tanks, and buried pipe that connects them**					
Moderate	NACE 6 / SSPC-SP13 and surface profile of ICRI CSP 4-6	**Carboguard 1340 WB or Semstone 110**	Water borne epoxy concrete sealer or High build epoxy concrete sealer	**Bitumastic 300 M**	Coal-tar epoxy
Moderate				**Carboguard 890**	Cycloaliphatic epoxy
Moderate to severe		**Carboguard 1340 WB or Carboguard 690**	Water borne epoxy concrete sealer or Phenalkamine epoxy	**Reactamine 760 Series**	100% Solids elastomeric polyurethane hybrid
Moderate to severe		**Carboguard 1340 WB or Semstone 110**	Water borne epoxy concrete sealer or High build epoxy concrete sealer	**Plasite 4500 Series**	Chemical resistant epoxy 100% solids. Meets AWWA C210.

Water Treatment & Purification

Water Treatment Tanks

CHEMICAL EXPOSURE	PRODUCT	DESCRIPTION
Immersion- Concrete or steel **Applications - Protection from raw water contact in clarifiers, aeration tanks, treatment tanks, etc.**		
Moderate	**Bitumastic 300M**	Coal-tar epoxy
Moderate	**Carboguard 890**	Cycloaliphatic epoxy
Moderate to severe	**Reactamine 760**	100% Solids elastomeric polyurethane hybrid
Moderate to severe	**Reactamine 760 HB**	High build polyurethane (up to 200 mils/5080 µm)
Severe	**Phenoline Tank Shield Series**	Epoxy 100% solids
Severe	**Plasite 4550 Series**	Highly chemical resistant epoxy novolac 100% solids

Sludge Handling

Steel Surfaces Exposed to Wastewater Sludge

CHEMICAL EXPOSURE	PREP	1ST COAT	DESCRIPTION
Steel - Immersion or partial immersion in wastewater sludge and solids **Applications - Miscellaneous steel surfaces, structural steel, equipment, piping, tanks, etc. exposed to wastewater sludge**			
Moderate	NACE 2 / SSPC-SP10	**Carboguard 890**	Cycloaliphatic epoxy, applied in 2 coats
Moderate		**Bitumastic 300 M**	Coal tar epoxy applied in 1-2 coats
Moderate to severe		**Plasite 4500 Series**	Chemical resistant epoxy, 100% solids, applied in 1 coat. Meets AWWA C210.
Severe		**Phenoline 1205**	Glass-flake reinforced novolac epoxy, applied in 1-2 coats
Severe		**Plasite 4550 Series**	Highly chemical resistant, 100% solids novolac epoxy, applied in 1 coat

Concrete Surfaces Exposed to Wastewater Sludge

CORROSION RESISTANCE	PREP	1ST COAT OPTIONAL PRIMER	DESCRIPTION	2ND COAT	DESCRIPTION
Concrete - Immersion or partial immersion in wastewater sludge and solids **Applications - Miscellaneous concrete surfaces exposed to wastewater sludge**					
Moderate	NACE 2 / SSPC-SP10	**Carboguard 1340 WB or Semstone 110**	Water based epoxy primer or Solvent free epoxy primer	**Bitumastic 300 M**	Coal tar epoxy applied in 1-2 coats
Moderate to severe				**Plasite 4500 Series**	Chemical resistant epoxy, 100% solids, applied in 1 coat. Meets AWWA C210.
Severe				**Phenoline 1205**	Glass-flake reinforced novolac epoxy, applied in 1-2 coats
Severe				**Plasite 4550 Series**	Highly chemical resistant, 100% solids novolac epoxy, applied in 1 coat

Chemical Storage

Storage Tank Linings

CHEMICAL EXPOSURE	PRODUCT	DESCRIPTION	TOTAL THICKNESS
Immersion - Steel **Application - Linings to protect storage tanks carrying various treatment chemicals**			
Polymers	**Plasite 7122 VOC**	Epoxy phenolic, applied in 2 coats	12-14 mils (300-350 µm)
Demineralized, distilled and deionized water to 200°F (93.3°C)	**Plasite 9052**	Epoxy, applied in 2 coats	10-16 mils (250-400 µm)
	Plasite 7159	Epoxy phenolic, applied in 2 coats	10-12 mils (250-300 µm)
Sulfuric acid (5-10%) or Sodium bisulfite	**Plasite 4100 or 4110**	Vinyl ester	35-45 mils (875-1125 µm)
	Plasite 4500 Series	100% Solids epoxy. Meets AWWA C210.	30-35 mils (750-875 µm)
Ferric chloride sodium hypochlorite (100ppm) alum	**Plasite 4300 or 4310**	Vinyl ester	35-45 mils (875-1125 µm)
	Reactamine 760	100% Solids elastomeric polyurethane hybrid	20-125 mils (508-3175 µm)
Caustic: 50% @ 150°F	**Phenoline 385**	Polyamine epoxy, applied in 2 coats	8-12 mils (200-300 µm)
	Phenoline 353 LT	Epoxy novolac, applied in 2 coats	8-12 mils (200-300 µm)

All lining recommendations must be confirmed through Carboline Technical Service Department.

Secondary Containment and Concrete Repair

CHEMICAL EXPOSURE	PRODUCT	DESCRIPTION
Chemical storage - Secondary containment - concrete **Applications - Tank pad, pump pads, grouts & patching mortar, form voids & bug hole fillers, sealants**		
Sulfuric acid (10-98%)	**Semstone 145**	100% solids, highly chemical resistant, epoxy novolac coating
Polymers & ferric chloride	**Semstone 140**	100% solids, chemical resistant, epoxy coating
Sodium bisulfite	**Semstone 145**	Epoxy novolac coating
Sodium hypochlorite alum	**Semstone 870**	Vinyl ester coating
Caustic: 50% @ 150°F (65.5°C)	**Semstone 140**	Epoxy coating
APPLICATION	**PRODUCT**	**DESCRIPTION**
Complimentary products - Concrete **Applications - Tank pad, pump pads, grouts & patching mortar, form voids & bug hole fillers, sealants**		
Concrete restructuring and repair	**Carboguard 510 Series**	Epoxy modified cementitious mortar
Concrete restructuring and repair (severe service)	**Semstone 305**	Epoxy novolac polymer concrete
Concrete restructuring and repair (severe service)	**Semstone 800 Series Primer** **Semstone 884**	Vinyl ester primer Vinyl ester polymer concrete
Expansion joints, chemical exposure	**Semstone 110** **Semstone 806**	Epoxy primer Flexible epoxy
Expansion joints, general use	**Semstone 6325**	Polyurethane sealant

Note: Contact Carboline Technical Service for assistance in designing secondary containment.

Plant Service Areas

Exterior of Buildings

CHEMICAL EXPOSURE	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION	3RD COAT	DESCRIPTION
Exterior weathering - Concrete **Applications – Exterior concrete walls, concrete masonry unity (cmu) and tilt-up facilities**						
Moderate	**Sanitile 120**	Water based acrylic primer	**Carbocrylic 3359**	Water based acrylic	**Carbocrylic 3359**	Water based acrylic
Moderate	**Flexxide elastomer**	Thick film acrylic elastomer	**Flexxide Elastomer**	Thick film acrylic elastomer		
Moderate & CMU	**Sanitile 100**	Water based acrylic block filler for CMU	**Sanitile 255**	Water based epoxy acrylic finish		

Office Space, Process Areas, and Walkways

CHEMICAL EXPOSURE	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION
Interior - Concrete **Applications – Hallways, offices, laboratories, etc.**				
Mild	**Sanitile 120**	Water based acrylic primer	**Sanitile 155**	Water based acrylic
Moderate & CMU	**Sanitile 100**	Water based acrylic block filler for CMU	**Sanitile 555**	Water based epoxy finish
Severe	**Sanitile 755**	Solvent free epoxy	**Sanitile 855**	Polyester urethane
Interior - Concrete flooring **Applications – Service areas, process room floors, walkways**				
Mild to moderate	**Sanitile 555**	Water based epoxy primer	**Sanitile 555**	Water based epoxy finish
Moderate to severe	**Semstone 110**	Clear epoxy sealer	**Semstone 140 SL**	Self leveling epoxy
Severe	Call Carboline Technical Service for Recommendations			
Miscellaneous substrates **Applications – Miscellaneous steel, handrails, steps**				
Mild	**Carbocoat 8215 Series**	Direct to metal, alkyd enamel, also available in non-skid		
Mild	**Carbothane 8845 Series**	Direct to metal, gloss, high-build, polyurethane		

Water Storage

Interior Protection of Potable Tanks

PRODUCT	DESCRIPTION	AWWA D102 SYSTEM	PRODUCT NOTES
Interior steel - Potable water tanks (NSF/ANSI 61)			
Reactamine 760	100% solids elastomeric polyurethane hybrid	ICS-4	Applied in 1 or 2 coats at a maximum thickness of 125 mils (3,175 µm)
Reactamine 760 HB	High-build 100% solids elastomeric polyurethane hybrid	ICS-4	Applied in 1 or 2 coats at a maximum thickness of 300 mils (7,620 µm)
Phenoline 341	Low temperature curing, 100% solids epoxy	ICS-3	Applied in 1 or 2 coats at a maximum thickness of 30 mils (762 µm) per coat. Meets AWWA C210.
Phenoline Tank Shield Plus	100% solids epoxy	ICS-3	Applied in 1 or 2 coats to a maximum thickness of 60 mils (1,524 µm)
Carboguard 891 VOC	Low VOC epoxy	ICS-1, ICS-2	Applied in 2 or 3 coats to a maximum thickness of 20 mils (508 µm). Meets AWWA C210.
Carboguard 61	Epoxy	ICS-1, ICS-2	Applied in 2 or 3 coats to a maximum thickness of 20 mils (508 µm)

Note: Carbozinc 8703 or Phenoline 311 may be used as a primer in NSF potable water tanks if desired.

Exterior Protection of Potable Tanks

PROTECTION LEVEL	AWWA D102 SYSTEM	PREP	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION	3RD COAT	DESCRIPTION
Exterior steel - Protection of steel water tanks								
Good	OCS-1	NACE 3 / SSPC-SP6	**Carbocoat 153**	Universal alkyd primer	**Carbocoat 8215 Series**	Alkyd finish	**Carbocoat 8215 Series**	Alkyd finish
Better	OCS-3	NACE 3 / SSPC-SP6	**Carbozinc 859 Series or Carbozinc 11 Series**	Zinc rich epoxy primer or Inorganic zinc primer	**Carbocrylic 3359 Series**	Water based acrylic	**Carbocrylic 3359 Series**	Water based acrylic
Best	OCS-4	NACE 3 / SSPC-SP6	**Carbozinc 859 Series or Carbozinc 11 Series**	Zinc rich epoxy primer or Inorganic zinc primer	**Carbothane 133 Series**	Aliphatic polyurethane	**Carboxane 950 Series**	Aliphatic fluorourethane finish
Best	OCS-4 Alternative	NACE 3 / SSPC-SP6	**Carbozinc 859 Series or Carbozinc 11 Series**	Zinc rich epoxy primer or Inorganic zinc primer			**Carboxane 2000 Series Or Carboxane 2100 Series**	Hybrid polysiloxane finish
Good	OCS-5	NACE 3 / SSPC-SP6	**Carboguard 60**	Epoxy	**Carboguard 60**	Epoxy	**Carbothane 134 Series Or Carbothane 133 Series**	Gloss aliphatic polyurethane finish or Satin aliphatic polyurethane finish
Better	OCS-6	NACE 3 / SSPC-SP6	**Carbozinc 859 Series or Carbozinc 11 Series**	Zinc rich epoxy primer or Inorganic zinc primer	**Carboguard 60**	Epoxy	**Carbothane 134 Series Or Carbothane 133 Series**	Gloss aliphatic polyurethane finish or Satin aliphatic polyurethane finish
Good	OCS-7	NACE 3 / SSPC-SP6	**Carboguard 553**	Water based epoxy	**Carboguard 553**	Water based epoxy	**Carbothane 134 WB**	Water based, gloss aliphatic polyurethane

Note: Rustbond, a penetrating sealer, may be used as a bonding primer for over existing coatings.

Atmospheric Protection

Steel Structures and Equipment

CORROSION EXPOSURE	PREP	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION	3RD COAT (OPTIONAL)	DESCRIPTION
Steel - Exterior, non-immersion/atmospheric service **Applications – All exterior steel structures, piping, and equipment exposed to atmospheric service only**							
Good	NACE 3/ SSPC-SP6	**Carboguard 60**	Epoxy	**Carboguard 60**	Epoxy finish		
Good	SSPC-SP3	**Carbomastic 15 or Carbomastic 615**	Surface tolerant aluminum epoxy or Inert flake filled, surface tolerant epoxy			**Carbothane 134 Series or Carbothane 133 Series**	Gloss polyurethane finish or Satin polyurethane finish
Better	NACE 3/ SSPC-SP6	**Carboguard 60**	Epoxy	**Carboguard 60**	Epoxy	**Carbothane 134 Series or Carbothane 133 Series**	Gloss polyurethane finish or Satin polyurethane finish
Best	NACE 3/ SSPC-SP6	**Carbozinc 859**	Zinc-rich epoxy primer	**Carboguard 60**	Epoxy	**Carbothane 134 Series or Carbothane 133 Series**	Gloss polyurethane finish or Satin polyurethane finish

Note: Rustbond, a penetrating sealer, may be used as a bonding primer for over existing coatings

NOTES:

1. Carbothane 134 Series includes Carbothane 134 HG, Carbothane 134 LV, Carbothane 134 MC, and Carbothane 134 WB.
2. Carbothane 133 Series includes Carbothane 133 VOC, Carbothane 133 HB, Carbothane 133 LH, and Carbothane 133 LV versions.
3. Reactamine 760 Series includes Reactamine 760 and Reactamine 760 HB.
4. Plasite 4500 Series includes Plasite 4500 and Plasite 4500 S.
5. Carboguard 890 Series includes Carboguard 890 GF, Carboguard 890 VOC, and Carboguard 890 LT.
6. Rustbond Series includes Rustbond and Rustbond FC which are penetrating primer/sealers with excellent wetting properties. They provide good chemical resistance, and accept a variety of topcoats.
7. Carbomastic 15 Series includes Carbomastic 15 and Carbomastic 15 FC.
8. Carbomastic 615 Series includes Carbomastic 615 and Carbomastic 615 AL.
9. Carboguard 510 and Carboguard 510 SG are epoxy patching and surfacing compounds that exhibit excellent bond strength to concrete and other masonry surfaces. Available in a spray grade version.
10. Carbocoat 8215 Series includes Carbocoat 8215 Non-Skid and Carbocoat 8215 VOC: high solids, quick-dry, general purpose air dry alkyd enamel that is used as a self-priming finish coat.
11. Carbothane 8845 Series includes Carbothane 8845 and Carbothane 8845 FC: fast dry, high solids, low VOC, high gloss, high build, two component aliphatic polyurethane coatings.
12. Plasite 4550 Series includes Plasite 4550 and Plasite 4550 S.
13. Phenoline Tank Shield Series includes Phenoline Tank Shield and Phenoline Tank Shield Plus.

CARBOLINE COMPANY
GLOBAL HEADQUARTERS
2150 SCHUETZ ROAD
ST. LOUIS, MO 63146 USA
PH: +1-314-644-1000
WWW.CARBOLINE.COM

12-46-0816-307