

# Power

# System Guide



# Atmospheric Exposures

## Clean to Bare Steel Substrates

PREP	PRIMER	PRIMER DESCRIPTION	MID-COAT	MID-COAT DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION
<b>Structural Steel, Piping, and Equipment – Carbon Steel</b>						
Applications – Structural steel, inlet air ducts, pipe racks, piping, valves, ladders, handrails, pumps, motors, storage tank exteriors, process vessels, compressors, and other equipment operating up to 250°F (121°C)						
SP 6	<b>Carbozinc 11 Series</b> -or- <b>Carbozinc 858 or 859 Series</b>	Inorganic zinc primer for maximum corrosion protection -or- Organic zinc for quick topcoating and additional chemical resistance	<b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b> -or- <b>Carboguard 60</b>	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy -or- Epoxy polyamide for general purpose	<b>Carbothane 134 Series</b> -or- <b>Carbothane 133 Series</b> -or- <b>Carboxane 2000 Series</b>	High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid -or- Ultra-weatherable siloxane
SP 3	<b>Carbomastic 15 Series</b> -or- <b>Carbomastic 94</b> -or- <b>Carbomastic 615</b>	Aluminum surface tolerant epoxy -or- Surface tolerant mastic in colors -or- Inert-flake filled, moisture tolerant, low temp cure epoxy	<b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b> -or- <b>Carboguard 60</b>	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy -or- Epoxy polyamide for general purpose	<b>Carbothane 134 Series</b> -or- <b>Carbothane 133 Series</b> -or- <b>Carboxane 2000 Series</b>	High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid -or- Ultra-weatherable siloxane

## Systems over Existing Coatings\*

PREP	OVERCOAT SEALER	OVERCOAT DESCRIPTION	SPOT PRIMER	SPOT PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION
<b>Structural Steel, Piping, and Equipment – Carbon Steel</b>						
Applications – Structural steel, inlet air ducts, pipe racks, piping, valves, ladders, handrails, pumps, motors, storage tank exteriors, process vessels, compressors, and other equipment operating up to 250°F (121°C)						
SP 1 and/or SP 7	<b>Rustbond Series</b>	Penetrating epoxy sealer	<b>Carbomastic 15 Series</b> -or- <b>Carboguard 60</b> -or- <b>Carbomastic 615</b>	Aluminum surface tolerant epoxy -or- Epoxy polyamide for general purpose -or- Surface tolerant epoxy phenalkamine	<b>Carbothane 134 Series</b> -or- <b>Carbothane 133 Series</b> -or- <b>Carboxane 2000 Series</b>	High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid -or- Ultra-weatherable siloxane

\*Always determine suitability for overcoating prior to application (see Notes section).

# Atmospheric Exposures

## High Heat Applications

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL THIRD COAT	THIRD COAT DESCRIPTION
<b>Uninsulated Piping and Equipment – Steel operating to 300°F (148°C)</b>						
<b>Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, HRSG steel, valves and pumps and equipment operating up to 300°F (148°C)</b>						
SP 3	<b>Carbomastic 15 Series</b>	Aluminum surface tolerant epoxy	<b>Carbomastic 15 Series</b>	Aluminum surface tolerant epoxy		
SP 10	<b>Carbozinc 859 Series</b> -or- <b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b>	Organic zinc for quick topcoating and additional chemical resistance -or- High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	<b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b>	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy		
<b>Uninsulated Piping and Equipment – Steel operating to 450°F (232°C)</b>						
<b>Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, HRSG steel, valves and pumps and equipment operating up to 250-450°F (121-232°C).</b>						
SP 10	<b>Carbozinc 11 Series</b>	Inorganic zinc primer for maximum corrosion protection	<b>Thermaline 4000</b> -or- <b>Thermaline 4900 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone acrylic	<b>Thermaline 4000</b> -or- <b>Thermaline 4900 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone acrylic
<b>Uninsulated Piping and Equipment – Steel operating up to 1000°F (538°C)</b>						
<b>Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, valves and pumps and equipment operating at 450-1000°F (232-538°C).</b>						
SP 10	<b>Carbozinc 11 Series</b>	Inorganic zinc primer for maximum corrosion protection	<b>Thermaline 4000</b> -or- <b>Thermaline 4700 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone	<b>Thermaline 4000</b> -or- <b>Thermaline 4700 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone

## Worker Protection and Insulation Needs

PREP	PRIMER	DESCRIPTION	INSULATIVE COATING	DESCRIPTION	THIRD COAT	DESCRIPTION
<b>Uninsulated Piping and Equipment – Steel operating to 350°F (176°C)</b>						
<b>Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, valves, pumps and equipment operating up to 350°F (176°C)</b>						
SP 10	<b>Carbozinc 11 Series</b> -or- <b>Carbozinc 859 Series</b>	Inorganic zinc primer -or- Organic zinc primer	<b>Carbotherm 3300</b> -or- <b>Carbotherm 551</b>	Insulative acrylic coating -or- Insulative waterborne epoxy	<b>Carbocrylic 3359 Series</b>	Weatherable acrylic finish

# Under Insulation

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	DESCRIPTION
<b>Insulated Piping and Equipment – Steel operating up to 300°F (148°C)</b>					
<b>Applications – Insulated piping and equipment operating at elevated temperatures.</b>					
SP 3	<b>Carbomastic 15 Series</b>	Aluminum surface tolerant epoxy	<b>Carbomastic 15 Series</b>	Aluminum surface tolerant epoxy	
SP 10	<b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b>	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	<b>Carboguard 890 Series</b> -or- <b>Carboguard 690</b>	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	
<b>Insulated Piping and Equipment – Steel operating above 300°F to 1200°F (148°C to 649°C)</b>					
<b>Applications – Insulated piping and equipment operating at elevated temperatures.</b>					
SP 10	<b>Thermaline 450 EP</b>	Epoxy phenolic; amine cured	<b>Thermaline 450 EP</b>	Epoxy phenolic, amine cured	Good to 400°F (204°C) continuous
SP 10	<b>Thermaline 450</b>	Glass-flake epoxy novolac			Single coat; good to 450°F (232°C) non-continuous
SP 10	<b>Thermoline 4001</b>	MIO reinforced polymer	<b>Thermoline 4001</b>	MIO reinforced polymer	Good to 1200°F (649°C) continuous

# Fireproofing

RATING	PRIMER COAT	PRIMER DESCRIPTION	2ND COAT	2ND COAT DESCRIPTION	FINISH COAT	FINISH DESCRIPTION
<b>Fireproofing – Steel</b>						
<b>Applications – Structural steel, decks, bulkheads, vessel supports, living quarters, control buildings.</b>						
Up to 3 hours UL 263	<b>Carbocoat 150 UP</b>	Latex based or alkyd primer	<b>Firefilm III</b>	Water-based Intumescent fireproofing	<b>Carbothane 133 Series</b>	High gloss weatherable acrylic urethane
Up to 4 hours UL 1709	<b>Carboguard 890</b>	Chemically resistant epoxy primer	<b>Pyrocrete 241 Series</b>	Cementitious, durable fireproofing	<b>Carboguard 1340 and Carbothane 133 HB</b>	Epoxy sealer and High build satin urethane
Up to 4 hours UL 1709	<b>Carboguard 893</b>	Chemically resistant epoxy primer	<b>Thermo-Lag 3000</b>	Epoxy based intumescent fireproofing	<b>Carboguard 1340 and Carbothane 133 HB</b>	Epoxy sealer and High build satin urethane
<b>Cable and Cable Tray Protection</b>						
<b>Applications – Electrical cables and cable tray raceways.</b>						
Factory Mutual Certification	<b>Intumastic 285</b>	Water-based intumescent cable mastic				

# Concrete Flooring and Secondary Containment

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL TOPCOAT	OPTIONAL TOPCOAT DESCRIPTION
<b>Floors – Concrete</b>						
Applications – Control rooms, aisleways, corridors, mechanical rooms, turbine decks, shower rooms, locker rooms, battery room, laboratory, warehouses.						
SSPC SP 13 NACE 6	<b>Carboguard 1340 WB</b>	Water borne epoxy concrete sealer	<b>Sanitile 555</b>	High performance water-based epoxy	<b>Sanitile 555</b>	Thin-film floor for light traffic use
SSPC SP 13 NACE 6	<b>Semstone 110</b>	High build epoxy concrete sealer	<b>Sanitile 945 SL</b>	Self-leveling, chemical resistant epoxy	<b>Sanitile 945 SL</b>	Self-leveling floor for light to moderate duty use
SSPC SP 13 NACE 6	<b>Carboguard 1340 WB</b>	Water borne epoxy concrete sealer	<b>Sanitile 985 PA</b>	High solids polyaspartic	<b>Sanitile 985 PA</b>	High solids polyaspartic
<b>Secondary Containment – Concrete</b>						
Applications – Containment areas for acid/caustic storage, fuel storage, aggressive chemical storage, wastewater containment, sumps, trenches, demin and cooling water treatment area, cooling tower basins, neutralization pits.						
ASTM D4259	<b>Semstone 110</b>	High build epoxy Concrete sealer	<b>Semstone 140 (AFRC)</b> -or- <b>Semstone 145 (AFRC)</b> -or- <b>Semstone 870 (AFRC)</b>	Chemically resistant epoxy -or- Extreme performance epoxy-novolac -or- Vinyl-ester for hypochlorite exposure		Chemical resistant linings with optional aggregate-filled and/or reinforcement options for severe abuse/heavy duty service
ASTM D4259	<b>Carboguard 1340 WB</b>	Water-based epoxy primer/sealer for concrete	<b>Reactamine ET</b>	Elastomeric polyurea		High abrasion resistant, 350% elongation membrane to bridge cracks for cooling water basin and others

## Interior Walls

### Concrete, Concrete Masonry Units, and Drywall

SUBSTRATE	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL THIRD COAT	THIRD COAT DESCRIPTION
<b>Poured Concrete, Concrete Masonry Units, Drywall – Occasional to Frequent Washdown</b>						
Applications – Hallways, shower rooms, control rooms, storage rooms, etc.						
Drywall	<b>Sanitile 120</b>	Drywall sealer	<b>Sanitile 155</b> -or- <b>Sanitile 555</b>	Satin acrylic finish -or- High performance water-based epoxy	<b>Sanitile 155</b> -or- <b>Sanitile 555</b>	Satin acrylic finish -or- High performance water-based epoxy
Concrete or CMU	<b>Sanitile 100</b> -or- <b>Sanitile 500</b>	Water-based acrylic block filler -or- Water-based epoxy block filler	<b>Sanitile 155</b> -or- <b>Sanitile 555</b>	Satin acrylic finish -or- High performance water-based epoxy	<b>Sanitile 155</b> -or- <b>Sanitile 555</b>	Satin acrylic finish -or- High performance water-based epoxy

# Specialty Applications

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL THIRD COAT	THIRD COAT DESCRIPTION
<b>Galvanized Steel – Structural, Ductwork, Cable Trays</b>						
<b>Applications – Over-coating galvanized steel or other surfaces to provide color coordination and UV protection may also be used on stainless, bronze, brass, fiberglass</b>						
SP 1 -or- SP 7	<b>Galoseal WB</b> -or- <b>Carboguard 60</b>	Acrylic bonding primer for SP1 prep -or- Epoxy polyamide for general purpose for SP7 prep	<b>Carbocrylic 3359</b> -or- <b>Carbothane 134 Series</b> -or- <b>Carbothane 133 Series</b>	Industrial, weatherable acrylic finish -or- High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid		
<b>Galvanized Steel – Transmission Towers and Substations</b>						
<b>Applications – Over-coating weathered galvanized steel or other surfaces to provide color coordination and UV protection</b>						
SP 1	<b>Carbocoat 2600</b>	Metallic-filled long-oil alkyd for transmission towers				
SP 1	<b>Carbocoat 2900 Primer</b>	Epoxy ester alkyd primer for substations	<b>Carbocoat 2901</b>	Metallic-filled epoxy ester		
SP 1	<b>Carbocoat 2900 Primer</b>	Epoxy ester alkyd primer for substations	<b>Carbocoat 2900 Primer</b>	Epoxy ester alkyd primer	<b>Carbocoat 30</b>	Weatherable silicone (30%)-modified alkyd finish
<b>Interior Steel – (less than 200°F, 93°C)</b>						
<b>Applications – Structural steel. Turbines, piping, pumps, motors, electrical equipment</b>						
SP 3	<b>Carboguard 890 Series</b> -or- <b>Carbomastic 94</b>	High chemical resistant epoxy -or- Surface tolerant mastic in colors	<b>Carboguard 890 Series</b> -or- <b>Carbomastic 94</b>	High chemical resistant epoxy -or- Surface tolerant mastic in colors		
SP 3	<b>Carbocoat 8215</b>	Direct-to-metal, fast dry alkyd	<b>Carbocoat 8215</b>	Direct-to-metal, fast dry alkyd		
<b>Buried Piping – Steel</b>						
<b>Applications – External surface of buried pipelines, valves, manifolds, girth weld repair, etc.</b>						
SP 10	<b>Bitumastic 300M</b> -or- <b>Polyclad 975</b> -or- <b>Polyclad 975 H</b>	High build, epoxy coal-tar -or- Hybrid epoxy pipeline coating -or- Hand applied hybrid epoxy pipeline coating				

# Linings for Storage Tanks and Vessels

All tank lining recommendations must be reconfirmed through Carboline Technical Service Department.

SERVICE CONDITIONS		GENERIC TYPE	PRODUCT	# OF COATS	Mils (µm) TOTAL
98% Sulfuric Acid		Epoxy Novolac	Plasite 4550	1	40-50 (1000-1250)
		Epoxy Novolac	Plasite 4550 S	1	40-50 (1000-1250)
50% Caustic (Sodium Hydroxide)		Epoxy	Phenoline 353	2	12-15 (300-375)
		100% Solids Epoxy Novolac	Plasite 4550 Series	1	25-30 (625-750)
Fly Ash or Coal Silos		100% Solids Elastomeric Polyurethane Hybrid	Reactamine 760	1	30-40 (750-1000)
Neutralization Tanks	More caustic	Flake Pigment Vinyl Ester	Plasite 4100	2	35-45 (875-1125)
	More acidic	Flake Pigment Vinyl Ester	Plasite 4300	2	35-45 (875-1125)
Water Storage or Exposure	Demin water up to 210°F	Epoxy Phenolic	Plasite 7159	2	10-12 (250-300)
	Demin water less than 150°F	Cycloaliphatic Epoxy	Plasite 9133	2	12-15 (300-375)
	Raw water	Epoxy	Carboguard 891 HS	2	12-15 (300-375)
	Circulating water; water screens	Coal-tar Epoxy	Bitumastic 300M	1-2	24 (600)
	Water boxes, circulating water pipe, penstocks, dam gates	Epoxy -or- Polyurethane Hybrid	Plasite 4500 Series -or- Reactamine 760	1 -or- 1	40-50 (1000-1250) -or- 30-40 (750-1000)
Lime Slurry Tanks		High Abrasion Resistant Epoxy Phenolic	Plasite 7122 VAR	2	12-14 (300-350)
		High Abrasion Resistant Vinyl Ester	Plasite 4110	2	35-45 (875-1125)
Gypsum Tanks		Epoxy Novolac	Plasite 4550 Series	2	40-80 (1000-2000)
Absorber Towers (Scrubbers) Outlet Ductwork and Stacks		Abrasion-Resistant Flake Pigment Vinyl Ester	Plasite 4310	2	35-45 (875-1125)
Diesel Fuel, Oil, Gasoline Storage		Cycloaliphatic Amine Epoxy	Phenoline 385	2	12-14 (300-350)
		Epoxy Phenalkamine	Phenoline 341	1	12-14 (300-350)
		Epoxy	Plasite 4500 Series	1	25-30 (625-750)

**NOTES:**

1. Carbozinc 11 Series consists of four inorganic zinc products designed to meet every need:
  - > Carbozinc 11: Standard high performance inorganic zinc silicate.
  - > Carbozinc 11 VOC: High performance inorganic zinc silicate designed to meet local VOC limits of 3.2 lbs./gal. (389 g/l)
  - > Carbozinc 11 HS: High performance inorganic zinc silicate designed to meet local VOC limits of 2.4 lbs./gal. (288 g/l)
  - > Carbozinc 11 WB: A water-based inorganic zinc with a VOC of zero.
2. Carbothane 134 Series include several choices of high gloss acrylic urethanes to meet your needs:
  - > Carbothane 134 HG: Superior performance polyurethane exceeding the requirements of SSPC Paint 36 Level 3.
  - > Carbothane 134 VOC: Same performance as 134 HG but with a VOC limit of <200 g/l.
  - > Carbothane 134 MC: Same performance as 134 HG but with a VOC limit of <100 g/l.
  - > Carbothane 134 WB: A water-borne urethane exceeding the requirements of SSPC Paint 36; Level 3 and VOC <100 g/l.
3. Carbothane 133 Series may be used in lieu of 134 Series when a satin finish and higher film build characteristics are desired. Carbothane 133 Series includes 133 HB, 133 VOC, 133 MC, 133 LH and 133 LV used where VOC regulations dictate.
4. Thermaline 4900 VOC and Thermaline 4700 VOC may be substituted for Thermaline 4900 and Thermaline 4700, respectively, as local VOC regulations dictate.
5. Heavily pitted steel can make coating application more complicated. Please consult your Carboline Sales Representative for specific advice.
6. The application technique of stripe coating edges and weld lines will improve coating system performance.
7. Surface Cleaner 3 is a water based cleaner that is effective in cleaning and degreasing surfaces prior to painting.
8. Where surface preparation designations of SSPC SP 10, SP 6, SP 7, SP 3, and SP 2 are used the ISO designations of Sa 2 ½, Sa 2, Sa 1, St 3, and St 2 (respectively) are also applicable.
9. Plasite 4500 Series and 4550 Series includes versions that can be sprayed using standard airless equipment or plural-component equipment. Always check with Carboline's Technical Service Department for the most appropriate version for the specific application.



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