carboline®
Coatings - Linings - Fireproofing

Power

System Guide

Coatings, Linings, and Fireproofing

Atmospheric Exposures

Clean to Bare Steel Substrates

PREP	PRIMER	PRIMER DESCRIPTION	MID-COAT	MID-COAT DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION
Structural Steel, Piping, and Equipment – Carbon Steel **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	**Carbozinc 11 Series -or- Carbozinc 858 or 859 Series -or- Carboguard 890 -or- Carboguard 635**	Inorganic zinc primer for maximum corrosion protection -or- Organic zinc for quick topcoating and additional chemical resistance -or- Epoxy primer	**Carboguard 890 Series -or- Carboguard 635 Series**	Chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	**Carbothane 134 Series -or Carbothane 133 Series -or- Carboxane 2000 Series**	High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid -or- Ultra-weatherable siloxane
SP 3	**Carbomastic 15 Series -or- Carbomastic 94 -or- Carbomastic 615 Series**	Aluminum filled surface tolerant epoxy -or- Surface tolerant mastic in colors -or- Inert-flake filled, moisture tolerant, low temp cure epoxy	**Carboguard 890 Series -or- Carboguard 635 Series**	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	**Carbothane 134 Series -or Carbothane 133 Series -or- Carboxane 2000 Series**	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
Structural Steel, Piping, and Equipment – Carbon Steel **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, SP 2, SP 3 and/or SP 7	**Rustbond Series**	High solids penetrating epoxy sealer	**Carbomastic 15 Series -or- Carbomastic 615 Series**	Aluminum surface tolerant epoxy -or- Surface tolerant epoxy phenalkamine	**Carbothane 134 Series -or Carbothane 133 Series -or- Carboxane 2000 Series**	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
Uninsulated Piping and Equipment – Steel operating to 300°F (148°C) **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)**						
SP 3	**Carbomastic 15 Series**	Aluminum filled surface tolerant epoxy	**Carbomastic 15 Series**	Aluminum filled surface tolerant epoxy		
SP 10	**Carbozinc 859 Series -or- Carboguard 890 Series -or- Carboguard 690**	Organic zinc for quick topcoating and additional chemical resistance -or- High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy	**Carboguard 890 Series -or- Carboguard 690**	High chemical resistant epoxy -or- Moisture tolerant, low temp cure epoxy		
Uninsulated Piping and Equipment – Steel operating to 450°F (232°C) **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).**						
SP 10	**Carbozinc 11 Series**	Inorganic zinc primer for maximum corrosion protection	**Thermaline 4000 -or- Thermaline 4900 Series**	Inorganic silicate; no heat cure requirement -or- Silicone acrylic	**Thermaline 4000 -or- Thermaline 4900 Series**	Inorganic silicate; no heat cure requirement -or- Silicone acrylic
Uninsulated Piping and Equipment – Steel operating up to 1000°F (538°C) **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).**						
SP 10	**Carbozinc 11 Series**	Inorganic zinc primer for maximum corrosion protection	**Thermaline 4000 -or- Thermaline 4700 Series**	Inorganic silicate; no heat cure requirement -or- Silicone	**Thermaline 4000 -or- Thermaline 4700 Series**	Inorganic silicate; no heat cure requirement -or- Silicone

Worker Protection and Insulation Needs

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

Under Insulation

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

Fireproofing

RATING	PRIMER COAT	PRIMER DESCRIPTION	FIREPROOFING	DESCRIPTION	FINISH COAT	FINISH DESCRIPTION
Fireproofing – Interior Steel **Applications – Structural steel beams, columns, floor decks, roof decks**						
Up to 3 hours UL 263 / ASTM E119	**Qualified** Carbocoat Series -or- Carbocrylic Series -or- Carboguard Series -or- Carbomastic Series -or- Carbozinc Series***	Alkyd primer	**Firefilm III -or- Thermo-Sorb Series**	Intumescent fireproofing	**Carbocrylic 3350**	High gloss weatherable acrylic urethane
Up to 4 hours UL 263 / ASTM E119	**No priming required***	**A/D Type TC-55* Adhesive/Sealer (per design) -or- Southwest Type DK3 (Spattercoat)***	**Southwest Type 5 or Type 7 Series**	Gypsum or Portland based fireproofing	**Not recommended -or- A/D Type TC-55 Adhesive/Sealer (optional)**	Adhesive/Sealer (Available in clear, white, blue and black)

* Primers are not required or recommended. If a primer is specified, or steel is primed, bond strength must meet minimum UL criteria. A/D TC-55 Sealer is used as a primer/bonding agent to meet this requirement where specified. Southwest Type DK3 spatter coat must be used as a primer/bonding agent on cellular decks and roof decks per UL design requirements. Contact Carboline Technical Service for further information.
Note: Southwest Type 5MD has a bond strength of >430 @ 15 pcf. >1,000 @ 18 pcf, >3, 000 @ 22 pcf.
** Primers and topcoats must be pre-qualified by Carboline in writing prior to use. Existing primers must also be tested and approved by Carboline. If existing primer does not meet criteria, Carboline can recommend an intermediate coat or surface preparation procedures prior to installing system.

RATING	PRIMER COAT	PRIMER DESCRIPTION	FIREPROOFING	DESCRIPTION	FINISH COAT	FINISH DESCRIPTION
Fireproofing – Exterior Steel **Applications – Structural steel beams, columns, floor decks, roof decks**						
Up to 3 hours UL 263 / ASTM E119	**Qualified** Carbocoat Series -or- Carbocrylic Series -or- Carboguard Series -or- Carbomastic Series -or- Carbozinc Series***	Primer system must be prequalified Consult Carboline for appropriate primer	**Thermo-Sorb E -or- Thermo-Lag E100 -or- Thermo-Lag E100 S**	Epoxy based intumescent fireproofing	**Carbomastic 94 -or- Carboguard 1340 + Carbothane 133 Series (optional)**	Polyamide Epoxy -or- Penetrating epoxy sealer/topcoat -or- Penetrating epoxy sealer/topcoat + Satin finish high build urethane
Up to 3 hours UL 263 / ASTM E119	**No priming required***	Primer system must be prequalified Consult Carboline for appropriate primer	**Pyrocrete 239 -or- Pyrocrete 40**	Portland cement based fireproofing	**Carboguard 1340 -or- Carboguard 1340 + Carbothane 133 Series (optional)**	Penetrating epoxy sealer/topcoat -or- Penetrating epoxy sealer/topcoat + Satin finish high build urethane
Cable and Cable Tray Protection **Applications – Electrical cables and cable tray raceways.**						
Factory Mutual Certification	**No priming required**	N/A	**Thermo-Lag 270**	Water-based intumescent cable mastic	N/A	N/A

* Primers are not required or recommended. If a primer is specified, or steel is primed, bond strength must meet minimum UL criteria. A/D TC-55 Sealer is used as a primer/bonding agent to meet this requirement where specified. Southwest Type DK3 spatter coat must be used as a primer/bonding agent on cellular decks and roof decks per UL design requirements. Contact Carboline Technical Service for further information.
** Primers and topcoats must be pre-qualified by Carboline in writing prior to use. Existing primers must also be tested and approved by Carboline. If existing primer does not meet criteria, Carboline can recommend an intermediate coat or surface preparation procedures prior to installing intumescent system.

Concrete Flooring and Secondary Containment

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL TOPCOAT	OPTIONAL TOPCOAT DESCRIPTION
Floors – Concrete **Applications – Control rooms, aisle ways, corridors, mechanical rooms, turbine decks, shower rooms, locker rooms, battery room, laboratory, warehouses.**						
SSPC SP 13 NACE 6	**Carboguard 1340 WB**	Water borne epoxy concrete sealer	**Carboseal 555**	High performance water-based epoxy	**Carboseal 555**	Thin-film floor for light traffic use
SSPC SP 13 NACE 6	**Carboguard 1340 WB**	Water borne epoxy concrete sealer	**Carboseal 985**	High solids polyaspartic	**Carboseal 985**	High solids polyaspartic
SSPC SP 13 NACE 6			**Carbocrete SR, SL, or HF**	Heavy-duty urethane cement	**Carbocrete FCUV**	UV resistant urethane cement sealer

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL TOPCOAT	OPTIONAL TOPCOAT DESCRIPTION
Secondary Containment – Concrete **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	**Semstone 110**	High build epoxy Concrete sealer	**Semstone 140 -or- Semstone 145**	Chemically resistant epoxy -or- Extreme performance epoxy-novolac		Chemical resistant linings with optional aggregate-filled and/or reinforcement options for severe abuse/ heavy duty service
ASTM D4259	**Semstone 800 Series Primer**	Vinyl ester primer	**Semstone 870**	Vinyl-ester for hypochlorite exposure		
ASTM D4259			**Carbocrete HF**	Highly functional, trowel applied urethane cement mortar		

Interior Walls

Concrete, Concrete Masonry Units, and Drywall

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

Specialty Applications

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL THIRD COAT	THIRD COAT DESCRIPTION
Galvanized Steel – Structural, Ductwork, Cable Trays **Applications – Over-coating galvanized steel or other surfaces to provide color coordination and UV protection may also be used on stainless, bronze, brass, fiberglass**						
SP 1 -or- SP 7	**Galoseal WB -or- Carboguard 60**	Acrylic bonding primer for SP1 prep -or- Epoxy polyamide for general purpose for SP7 prep	**Carbocrylic 3359 -or- Carbothane 134 Series -or Carbothane 133 Series**	Industrial, weatherable acrylic finish -or- High gloss weatherable acrylic urethane -or- Satin finish; high build urethane hybrid		

PREP	PRIMER	PRIMER DESCRIPTION	TOPCOAT	TOPCOAT DESCRIPTION	OPTIONAL THIRD COAT	THIRD COAT DESCRIPTION
Galvanized Steel – Transmission Towers and Substations **Applications – Over-coating weathered galvanized steel or other surfaces to provide color coordination and UV protection**						
SP 1	**Carbocoat 2600**	Metallic-filled long-oil alkyd for transmission towers				
SP 1	**Carbocoat 2900 Primer**	Epoxy ester alkyd primer for substations	**Carbocoat 2901**	Metallic-filled epoxy ester		
SP 1	**Carbocoat 2900 Primer**	Epoxy ester alkyd primer for substations	**Carbocoat 2900 Primer**	Epoxy ester alkyd primer	**Carbocoat 30**	Weatherable silicone (30%)-modified alkyd finish
Interior Steel – (less than 200°F, 93°C) **Applications – Structural steel. Turbines, piping, pumps, motors, electrical equipment**						
SP 3	**Carboguard 890 Series -or- Carbomastic 94**	High chemical resistant epoxy -or- Surface tolerant mastic in colors	**Carboguard 890 Series -or- Carbomastic 94**	High chemical resistant epoxy -or- Surface tolerant mastic in colors		
SP 3	**Carbocoat 8215**	Direct-to-metal, fast dry alkyd	**Carbocoat 8215**	Direct-to-metal, fast dry alkyd		
Buried Piping – Steel **Applications – External surface of buried pipelines, valves, manifolds, girth weld repair, etc.**						
SP 10	**Bitumastic 300 M -or- SP-2888 R.G.***	High build, epoxy coal-tar -or- High performance epoxy pipeline coating				

*Specialty Polymer Coatings, part of the Carboline Company

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)
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 230°F	Epoxy Phenolic	Plasite 7159	2	10-12 (250-300)
	Demin water less than 180°F	Cycloaliphatic Epoxy	Phenoline 385	2	12-15 (300-375)
	Raw water	Epoxy	Phenoline 385	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 Tank Shield	1	12-14 (300-350)
		Epoxy	Plasite 4500 Series	1	25-30 (625-750)

NOTES:

1. This system guide often refers to a "series" of products (e.g. Carbozinc 11 Series) where you may select the specific product for your application within this equivalent family. This "series" typically includes product versions that meet regional VOC regulations (e.g. Carbozinc 11 VOC) as well as product versions that offer faster cure (e.g. Carbozinc 11 FC). You can be assured that all the products within a "series" offer the same performance characteristics. Please consult your Carboline Sales Representative for specific recommendations.
2. Please consult your Carboline Sales Representative for specific recommendations to meet regional environmental regulations. Carboline offers many products with reduced VOC and HAPs.

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