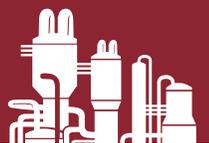


# Petrochemical

# System Guide

Coatings, Linings, and Fireproofing



# Atmospheric Exposures

## Clean to Bare Steel Substrates

PREP	PRIMER	DESCRIPTION	MID-COAT	DESCRIPTION	TOPCOAT	DESCRIPTION
<b>Structural Steel, Piping, and Equipment – Carbon Steel</b>						
<b>Applications – Pipe Racks, reactors, process vessel exteriors, columns, drums, storage tanks, compressors, and other equipment operating up to 250°F (121°C).</b>						
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 635 Series</b> -or- <b>Carboguard 893</b>	Moisture tolerant chemical resistant epoxy -or- Chemical resistant epoxy	<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 615</b>	Surface tolerant aluminum epoxy -or- Inert-flake filled, moisture tolerant, low temp cure epoxy	<b>Carboguard 635 Series</b> -or- <b>Carboguard 893</b>	Moisture tolerant chemical resistant epoxy -or- Chemical resistant epoxy	<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	DESCRIPTION	SPOT PRIMER	DESCRIPTION	TOPCOAT	DESCRIPTION
<b>Structural Steel, Piping, and Equipment – Carbon Steel</b>						
<b>Applications – Pipe Racks, reactors, process vessel exteriors, columns, drums, storage tanks, compressors, and other equipment operating up to 250°F (121°C).</b>						
SP 1 and/or SP 7	<b>Rustbond Series</b>	Penetrating epoxy sealer	<b>Carbomastic 15 Series</b> -or- <b>Carboguard 635 Series</b> -or- <b>Carboguard 890 Series</b>	Surface tolerant aluminum epoxy -or- Moisture tolerant, chemical resistant epoxy -or- Chemical resistant epoxy	<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	DESCRIPTION	TOPCOAT	DESCRIPTION
<b>Uninsulated Piping and Equipment – Steel operating to 300°F (148°C)</b> Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, valves, pumps and equipment operating up to 300°F (148°C).				
SP 3	<b>Carbomastic 15 Series</b>	Surface tolerant aluminum epoxy	<b>Carbomastic 15 Series</b>	Surface tolerant aluminum 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

PREP	PRIMER	DESCRIPTION	TOPCOAT	DESCRIPTION	OPTIONAL THIRD COAT	DESCRIPTION
<b>Uninsulated Piping and Equipment – Steel operating to 450°F (232°C)</b> Applications – Piping, heaters, furnaces, boilers, stacks, columns, drums, vessels, heat exchangers, mufflers, valves and pumps and equipment operating at 250-450°F (121-232°C).						
SP 10	<b>Carbozinc 11 Series</b>	Inorganic zinc primer for maximum corrosion protection	<b>Thermaline 4000 Series</b> -or- <b>Thermaline 4900 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone acrylic	<b>Thermaline 4000 Series</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> 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	<b>Carbozinc 11 Series</b>	Inorganic zinc primer for maximum corrosion protection	<b>Thermaline 4000 Series</b> -or- <b>Thermaline 4700 Series</b>	Inorganic silicate; no heat cure requirement -or- Silicone	<b>Thermaline 4000 Series</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	TOPCOAT	DESCRIPTION
<b>Uninsulated Piping and Equipment – Steel operating to 350°F (176°C)</b> Applications – Apply to hot surfaces for worker protection. Use for thermal insulation to suppress solar heating of fuel storage tanks, ceilings, ductwork, etc. Eliminates sweating surfaces on condenser boxes, cold vessels, etc.						
SP 10	<b>Carbozinc 11 Series</b> -or- <b>Carbozinc 859 Series</b>	Inorganic zinc primer -or- Organic zinc primer	<b>Carbotherm 551</b>	Insulative, durable epoxy coating	<b>(Optional) Carbocrylic 3359 Series</b> -or- <b>Carbothane 133 Series</b>	Weatherable acrylic finish

# Under Insulation

PREP	PRIMER	DESCRIPTION	TOPCOAT	DESCRIPTION	OPTIONAL THIRD COAT	DESCRIPTION
<b>Insulated Piping and Equipment – Steel operating up to 300°F (148°C)</b> Applications – Insulated piping and equipment operating at elevated temperatures.						
SP 3	<b>Carbomastic 15 Series</b>	Surface tolerant aluminum epoxy	<b>Carbomastic 15 Series</b>	Surface tolerant aluminum 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 up to 450°F (232°C)</b> Applications – Insulated piping and equipment operating at elevated temperatures.						
SP 10	<b>Thermaline 450 EP</b>	Epoxy-phenolic	<b>Thermaline 450 EP</b>	Epoxy-phenolic		Good to 400°F (204°C) continuous
SP 10	<b>Thermaline 450</b>	Glass-flake reinforced, epoxy-novolac	<b>(Optional) Thermaline 450</b>	Glass flake reinforced, epoxy novolac		Single coat; good to 450°F (232°C) non-continuous
<b>Insulated Piping and Equipment ranging from cryogenic to 1200°F (650°C) and cycling</b> Applications – Carbon and stainless steel surfaces, shop or field applied.						
SP 10	<b>Thermaline Heat Shield</b>	Reinforced inorganic polymer, cold cure	<b>Thermaline Heat Shield</b>	Reinforced inorganic polymer, cold cure		

# Specialty Applications

PREP	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION	OPTIONAL THIRD COAT	DESCRIPTION
<b>Walkways (Non-Slip Areas) – Steel</b> Applications – For applications where non-slip walking surfaces are required.						
SP 10	<b>Carbozinc 859</b> -or- <b>Carboguard 60</b>	Organic zinc for quick topcoating and additional chemical resistance -or- General purpose epoxy	<b>Carboguard 1209 with filler #47 or #36</b>	Heavy-duty, glass-flake, non-skid epoxy -or- Medium-duty, non-skid epoxy	<b>Carbothane 134 Series</b>	High gloss weatherable acrylic urethane

# Specialty Applications

PREP	1ST COAT	DESCRIPTION	2ND COAT	DESCRIPTION	OPTIONAL THIRD COAT	DESCRIPTION
<b>Galvanized Steel</b> <b>Applications – Over-coating galvanized steel or other surfaces to provide color coordination and UV protection. May be used on stainless, bronze, brass, fiberglass, etc.</b>						
SP 1 -or- SP 7	<b>Galoseal WB</b> -or- <b>Carboguard 60</b>	Acrylic bonding primer -or- Epoxy polyamide for general purpose	<b>Carbocrylic 3359 Series</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>Floating Roof of Storage Tanks – Steel</b> <b>Applications – Exterior surface of the floating roof on storage tanks where standing water might be present.</b>						
SP 6	<b>Carbozinc 859</b> -or- <b>Carbomastic 15 Series</b> -or- <b>Carbomastic 615 Series</b>	Organic zinc primer -or- Surface tolerant aluminum epoxy -or- Cold cure high performance epoxy	<b>Carboguard 60</b>	Epoxy polyamide for general purpose	<b>Carboguard 60</b>	Epoxy polyamide for general purpose
<b>Buried Piping – Steel</b> <b>Applications – External surface of buried pipelines, valves, manifolds, girth weld repair, soil/air transitions, etc.</b>						
SP 10	<b>Bitumastic 300M</b> -or- <b>SP-2888 RG*</b> -or- <b>Carbomastic 615 AL</b>	High build, epoxy coal-tar -or- High performance epoxy cladding -or- Cold cure high performance epoxy				
<b>Fireproofing – Carbon Steel</b> <b>Applications – Structural steel, tank skirts, pipe racks, control buildings requiring passive fire protection.</b>						
SP 6	<b>Carbozinc 11 Series</b>	Inorganic zinc primer for maximum corrosion protection	<b>Pyrocrete Series</b>	Heavy-duty, cementitious fireproofing	<b>(Optional) Carboguard 1340</b>	Clear epoxy sealer
SP 6	<b>Carboguard 60</b> -or- <b>Carbozinc 859</b>	Epoxy Polyamide -or- Organic zinc	<b>Thermo-Lag 3000</b>	Epoxy intumescent	<b>Carboguard 1340 and Carbothane 133 HB</b> -or- <b>Carbomastic 94 Series</b>	Clear epoxy sealer and High-build satin urethane -or- Epoxy topcoat
SP 6	<b>Carboguard 60</b> -or- <b>Carbozinc 858</b>	Epoxy Polyamide -or- Organic Zinc	<b>Pyroclad X1</b>	Jet fire resistant Epoxy intumescent	<b>(Optional) Carbothane 133 Series</b> -or- <b>Carbothane 134 Series</b>	High-build satin urethane -or- Polyurethane topcoat

\*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
Solvent storage		Cycloaliphatic amine epoxy	<b>Phenoline 385</b>	2	12-15 (300-375)
		Epoxy amine	<b>Phenoline Tank Shield Series</b>	1	20-25 (500-625)
Acid, oxidizer, alkali storage		Flake pigment vinyl ester	<b>Plasite 4300</b>	2	35-45 (875-1125)
		Novolac epoxy	<b>Plasite 4550 Series</b>	1	40-50 (1000-1250)
Amine storage		Flake pigment vinyl ester	<b>Plasite 4310</b>	2	35-45 (875-1125)
		Epoxy novolac	<b>Plasite 4550 Series</b>	1	25-30 (625-750)
Brine storage (<150°)		Epoxy amine	<b>Phenoline Tank Shield Series</b>	1	20-25 (500-625)
		Glass-flake novolac	<b>Phenoline 1205</b>	2	12-15 (300-375)
Process water storage	230°F	Epoxy phenolic	<b>Plasite 7159</b>	2	12-15 (300-375)
	200°F	Proprietary epoxy	<b>Plasite 4540</b>	1	20-30 (500-750)
	180°F	Cycloaliphatic epoxy	<b>Phenoline 385</b>	2	10-12 (250-300)
	150°F	Epoxy amine	<b>Phenoline Tank Shield Series</b>	1	20-25 (500-625)
Evaporators		Epoxy amine	<b>Phenoline Tank Shield Series</b>	1	40-50 (1000-1250)
		Novolac epoxy	<b>Plasite 4550 Series</b>	1	40-50 (1000-1250)
		Epoxy phenolic	<b>Plasite 7122 VOC</b>	2	12-14 (300-350)
Scrubbers		Flake pigment vinyl ester	<b>Plasite 4300</b>	2	35-45 (875-1125)
Heat exchangers / Tube bundles		Epoxy phenolic	<b>Plasite 7122 VOC</b>	2	12-14 (300-350)
		Epoxy phenolic	<b>Plasite 7159</b>	2	10-12 (250-300)
Fuel, oil, diesel Gasoline storage		Cycloaliphatic amine epoxy	<b>Phenoline 385</b>	2	12-14 (300-350)
		Epoxy amine	<b>Phenoline Tank Shield Series</b>	1	20-25 (500-625)
Jet fuel (EI-1541)		Cycloaliphatic amine epoxy	<b>Phenoline 385</b>	2	12-14 (300-350)
		Epoxy amine	<b>Phenoline Tank Shield</b>	1	20-25 (500-625)
		Modified epoxy	<b>Plasite 4500 FS</b>	1	20-25 (500-625)

# 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
Ethanol Storage		Epoxy	Phenoline 7159	2	12-14 (300-350)
		Proprietary Epoxy	Plasite 4550 HT	1	20-25 (500-625)
Waste water, fire water, and potable water storage (NSF approved)		Epoxy	Carboguard 891 VOC	2	8-16 (200-400)
		Epoxy amine	Phenoline Tank Shield	1	15-20 (375-500)
Glass fiber reinforced laminate system	Holding primer	Flake-filled, epoxy novolac -or- General purpose epoxy	Phenoline 311 -or- Phenoline Tank Shield FP	1	2-3 (50-75)
	Patching mortar and caulk	Epoxy	Carboguard 163 (spray)	1	As Needed
	Glass laminate	¾ oz. chopped strand fiberglass mat embedded between two 20-30 mil coats of Carboguard 695 CLR			
	Seal coat	100% Solids epoxy	Phenoline Tank Shield Series -or- Plasite 4550 Series	1	20-30 (500-750)
Glass fiber reinforced laminate system restoration method.			Determined by condition based assessment	Consult Carboline to extend the life of your current tank bottom system.	

**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.



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