GREENHECK

Fan Application

FA/110-04R4

Updated 0611

PRODUCT APPLICATION GUIDE

A technical bulletin for engineers, contractors and students in the air movement and control industry.

Performance Coatings for Ventilation Products

Coatings are a very important consideration when meeting the requirements of a particular application. Coatings are primarily required because of corrosive environments and/or for a decorative appearance. Greenheck supplies an extensive range of high quality coatings to meet the demands of all commercial and industrial applications; the range offers a choice of either protective or decorative coatings for many products.

Protective Coatings

Protective coatings are most widely used for corrosion control. They are used to provide long-term protection under a broad range of corrosive conditions, extending from atmospheric exposure to the most demanding chemical processing conditions. They can be either a powder or liquid coating. Protective coatings provide little or no structural strength, yet they protect other materials to preserve their strength and integrity.

Decorative Coatings

For projects where the exterior appearance is important and additional chemical resistance is not required, customers can choose from standard or custom decorative colors. A decorative coating is a baked enamel that is applied as liquid paint or electrostatic powder.

Baked enamel is available in a variety of colors and typically composed of polyester or alkyd-amino resin systems. They display excellent hardness and resistance to marring and their flow and leveling properties are very good. Baked enamel offers good color and gloss retention in exterior applications. Baked enamel has reasonably good to excellent chemical resistance properties, similar to Greenheck's Permatector™ powder coating. *Baked enamels are decorative coatings and are not included in our relative resistance chart.*

Performance Coatings

In the ever changing world of finishing, more and more quality equipment manufacturers are turning to powder coating as their primary finishing system.

There are many coating choices that provide a good to excellent level of protection at an economical cost. Greenheck has been applying coatings in-house since 1974. We recommend that you consider an in-house applied "electrostatic powder" coating as your first choice and use liquid coatings when a suitable powder coating is not available.

Epoxy finishes, for example, offer excellent mechanical and chemical resistance properties when used on interior applications. This finish should be used where inherent toughness, corrosion resistance, flexibility, and adhesion are required. An epoxy finish has excellent moisture resistance qualities and can also be used on exterior applications where color, gloss, and appearance are not required because epoxy tends to fade and chalk in sunlight. (*Chalking will only have minor affects on the protective qualities.)* The primary limitation of epoxy based coatings is its poor weathering.

Greenheck coatings are not limited to powder. Traditionally, liquid coatings were widely used for industrial duty applications. Today, liquid coatings are still available for special applications but are being replaced by equally suitable, but more economical and environmentally friendly, powder coatings.

GREENHECK
Building Value in Air.

P.O. Box 410 • Schofield, WI 54476 • 715.359.6171 • Fax 715.355.2399

Powder Coating

Powder coating is a dry finishing process, using finely ground particles of pigment* (color) and resins* (glue) that are electrostatically charged and sprayed onto a metal or alloy substrate to be coated. The coated component is electrically grounded neutral so that the charged powder particles projected at them adhere to the metal part and are held there until melted and fused into a smooth coating in the curing oven. The results are a high quality, continuous, uniform coating that is durable, and has no porosity. With powder coatings, primers are not necessary and the sags, runs, or drips that are typically noticed with a liquid coating are gone. The usual powders used in the ventilating industry are polyester, epoxy, and polyurethane.

**Pigment provides properties such as color, corrosion inhibition, gloss control, sag resistance, and film thickness.*

**Resin is the component that binds the pigment together. As the resin cures, a dry film is formed. The pigment and resin together contain the film-forming solids of a cured paint film. Performance of a cured paint film depends heavily on the resin. Properties imparted by the resin include curing time, hardness, flexibility, chemical resistance, and abrasion resistance. Some common resins are polyurethane, acrylic, and epoxy.*

Why Powder Coatings?

Powder coatings are the best choice for most applications. Powder coatings offer two major advantages over most vendor-applied liquid coatings — a superior finish because of its uniform coverage and thickness and better pricing.

Powder coating pricing is often far lower than liquid coating, because it may be applied in-house. The price of an in-house application reflects reduced shipping costs (product to and from an outside vendor) and reduces the product's lead time. Most liquid coatings are applied by custom paint vendors and subjected to their vendor lead times and prices. Some liquid paints require 10 to 14 days to cure completely. This drying time results in longer lead times. *Greenheck has an in-house powder paint line. A typical application takes approximately 3-1/2 hours to power wash, apply the coating, and cure the paint. These in-house benefits alone outweigh the advantages of most liquid coatings.*

Another advantage of powder paint is that it is solvent free and highly protective of our environment. There are no Volatile Organic Compounds (VOC's) to flash off and pollute the atmosphere. In addition, disposal of the solid waste can be treated as a non-water soluble material that poses few problems. In addition, most powder coating over-spray that does not adhere to the part can be retrieved and reused, virtually eliminating the waste commonly found in liquid finishing processes.

Liquid Coating

Liquid coatings require multiple coats to bring mil thickness to vendor specification because there is a large amount of Volatile Organic Compounds (VOC's) that must flash off as the paint dries between coats. The VOC's are the reducers that allow the solid material to flow onto the coated surface. Once the paint covers the surface, the VOC's evaporate allowing the paint to dry. Multiple coats require extra labor, which in turn is an added cost.

Thinner mil coatings generally exhibit good chemical resistance and maintain excellent mechanical properties in such areas as impact resistance and flexibility. Thicker coatings exhibit higher abrasion resistance, but less ability to resist impact and remain flexible.

Coating Recommendation

Identifying, selecting, and specifying the right coating for the corrosion protection you require is a complex and demanding process. The corrosion rate for any application depends to a large extent on the concentration of fumes, their temperature, and the amount of moisture associated with them.

Greenheck's sales and engineering people can assist in the quoting process and recommend the proper coating for an application. However, in

order to complete the coating selection, you will need to know the following information about the customer's job:

- Specific chemicals involved
- Chemical concentration levels
- Temperatures to be handled
- Moisture levels (% to full immersion)
- Exposure duration (ranging from occasional to continuous)
- Abrasive materials (size and quantity of the particles in airstream)
- What other coatings are being used on job
- Decorative requirements.

Key benefits of specifying a powder coating as an alternative to a liquid coating are:

- Powder coatings offer uniform coverage and thickness, durability, and high quality finish
- Powder coated surfaces are more resistant to chipping, scratching, fading, and wearing than other finishes
- Powder coating is a one-coat process applied over a phosphatized surface. This system meets or exceeds the corrosion resistance of a comparable liquid coating system.

The following are some of the most common reasons to apply a protective coating:

- Corrosion protection from acids and alkalis
- Weather protection elements (rain and UV)
- Abrasion and physical wear protection
- Process contamination protection.

Coating Descriptions

1. Permatector™ (Polyester Urethane) (Powder)

Greenheck's standard powder coating for steel products is Permatector™. This outstanding thin film polyester urethane powder offers good mechanical and chemical resistance properties in indoor and outdoor applications. It also exhibits excellent mar and chip resistance and toughness along with long-term resistance to humidity and corrosion.

Polyester powders can be used for both indoor and outdoor applications. Permatector™ is also used as a general-purpose primer and can be formulated for many desired physical properties. This high performance powder will outperform most liquid paint finishes.

2. Perma-Z (Powder)

Perma-Z combines Greenheck's Permatector™ coating with a superior zinc-rich epoxy basecoat. This protective coating system provides all the benefits of the Permatector coating but with double the total coat thickness for additional durability and protection from air and water. In addition to outstanding corrosion protection, the zinc-rich epoxy basecoat provides chemical protection to steel in the event that bare steel becomes exposed.

3. Hi-Pro Polyester (Used in Lieu of Air Dry Heresite) (Powder)

Hi-Pro Polyester powder coating meets or exceeds the performance characteristics of Air Dry Heresite and Heresite Baked Phenolic. It has been formulated for exterior durability, color and gloss retention. This coating is resistant to salt water, chemical fumes and moisture in more corrosive atmospheres. It has superior chemical resistance, excellent abrasion and outdoor UV protection.

4. Hi-Pro-Z (LabCoat™) (Powder)

Hi-Pro-Z combines Greenheck's Hi-Pro Polyester Super Durable coating with a superior zinc-rich epoxy basecoat that meets or exceeds the performance characteristics of Air Dry Heresite and Heresite Baked Phenolic. This protective coating system provides all the benefits of the Hi-Pro Polyester Super Durable coating but with double the total coat thickness for additional durability and protection from air and water. In addition to outstanding corrosion protection, the zinc-rich epoxy basecoat provides chemical protection to steel in the event that bare steel becomes exposed.

5. High Temperature Silver (Powder)

High Temperature Silver powder coating is applied to Greenheck's high temperature fans and is suitable for continuous operation up to 500° F; 260° C.

6. Epoxy (Powder)

Greenheck's Epoxy powder coating is a one part polyamide activated epoxy resin coating, which has excellent moisture resistance and very good chemical resistance. Its light tan color resists fading and chalking when exposed to sunlight. This high performance powder resin system can be formulated for many desired physical properties and will outperform most liquid paint finishes.

7. Industrial Epoxy (Powder)

This high performing epoxy powder coating has excellent chemical resistance to a wide variety of chemicals including acids, caustic, solvents, and high moisture. Although outdoor applications of epoxy are typically not recommended due to chalking, Industrial Epoxy showed minimal color changes in exterior applications. This powder coating's chemical resistance properties meets or exceeds Baked Phenolic and Plasite coatings.

8. High Temperature (Sherwin Williams Kem® Hi-Temp) (Liquid)

A high performance heat resistant liquid coating that consists of a specially modified silicone alkyd* resin**. The coating air dries to a tough, hard weather and heat resistant finish. Special pigments are utilized to achieve maximum heat resistant properties up to 850° F; 450° C.

**Alkyd: Alkyd's are coatings produced by reacting to a drying oil acid with an alcohol. Drying of the surface occurs by the evaporation of a solvent; curing of the resin occurs by oxidation.*

***Resin: A synthetic or natural material used as the binder in coatings. Examples: Acrylic, alkyd, epoxy, polyurethane, polyvinyl chloride, silicone.*

9. Coal Tar Epoxy (Sherwin Williams Hi-Mil Sher-Tar® Epoxy) (Liquid)

Coal Tar, or asphalt based epoxy, is a black bituminous material produced by the destructive distillation of coal. This coating exhibits excellent water resistance for immersion and below grade conditions; suitable for marine and petroleum installations. Coal Tar Epoxy coatings are extremely tough, durable, and highly resistant to chemicals, abrasion, moisture, and alcohol.

10. Anti-Condensate (Rust Free) (Liquid)

A highly abrasion resistant, rust preventative sealant. This rust inhibiting sealant is a blend of petroleum based materials and complex products dispersed in petroleum solvents. It combines high abrasion resistance and excellent anti-corrosion capabilities.

11. Epoxy Phenolic (Two component; Plasite 7122H) (Liquid)

Epoxies require a catalyst to bring about the cross-linking that gives the coating its many desirable properties. The most commonly used catalysts are the reactive amines* and polyamide resins. A cross-linked epoxy-phenolic is cured with an alkaline curing agent.

This coating is a modified phenolic coating created by blending phenolic resins with epoxy resins. It has excellent chemical resistance to a wide range of acids, alkalis, and solvents.

**Amines are a compound derived from ammonia.*

12. Polyurethane (Sherwin Williams Polane® S Plus) (Liquid)

Polyurethane is a modified aliphatic* acrylic urethane that is resistant to mild acids, alkalis, and solvents. It has excellent color retention and is a very good topcoat for epoxies and vinyls. Custom colors and gloss are available upon request.

**Aliphatic: A descriptive name applied to petroleum products derived from paraffin base crude oil. Gasoline, mineral spirits, Naphtha and kerosene are typical aliphatic hydrocarbons.*

13. Baked Phenolic (Heresite P413 or Plasite 3070) (Liquid)

Baked Phenolic is a heat cured, synthetic protective coating. It is a very thin film synthetic plastic compound. This is used for severely corrosive environments or for process ventilation up to 400° F; 204° C operating temperature to provide protection against abrasion. This coating will withstand exposure to most corrosive atmospheres with the exception of strong alkalis such as Potassium and Sodium Hydroxide.

14. Modified Epoxy Phenolic (Plasite 9570) (Liquid)

Modified Epoxy Phenolic is cured at a low temperature. It is a high solid coating modified with epoxy or other additives to obtain additional chemical resistant characteristics. It is cured with an amine-curing agent. It has excellent resistance to all caustic solutions up to 200° F; 93° C. It has good chemical resistance to a wide range of acids, solvents, and water solutions.

15. Fluorocarbon (DuPont™ Teflon *S*) (Liquid)

Fluorocarbon is a solvent-based liquid coating that is formulated with special blends of Teflon and other high performance resins to improve toughness and abrasion resistance. Because the film components stratify during baking, most of the fluoropolymer properties (such as low friction and non-stick character) are retained.

Surface Preparation

It is very important that surface preparation is done correctly. Surface preparation is the foundation upon which a coating is applied. Without suitable substrate cleanliness and anchor profile, the best coating system will quickly fail due to lack of adhesion. The objective of surface preparation prior to applying a coating is to create proper fusion of the coating to the basic substrate. There are a wide variety of surface preparation methods available, such as solvent cleaning, power-tool cleaning and abrasive blast cleaning. The method chosen depends on many factors, including the desired cleanliness, vendor specifications, the material, the ease of accessibility to the work surface, and/or worker and environmental safety considerations.

- SSPC-SP1 (Solvent Cleaning): Removal of all visible oil, grease, dirt, soil and contaminants by cleaning with a solvent, vapor, alkali, emulsion or steam. Solvent cleaning does not remove rust or mill scale.
- SSPC-SP5 (White Metal Blast): Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning.
- SSPC-SP6 (Commercial Blast): Removal of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining.
- SSPC-SP7 (Brush-Off Blast Cleaning): Removal of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface.
- SSPC-SP10 (Near-White Blast Cleaning): Blast cleaning until at least 95% of each square inch is free of all visible rust, mill scale, paint and foreign matter.
- Wash Primer: Wash Primer is a fast drying, low VOC, water based primer designed to promote adhesion between the substrate and finish coats.
- Iron Phosphate and Chrome Phosphate: Phosphate coatings are used to promote the bonding of paint to metallic substrates. Iron phosphate is the most commonly used for paint on a ferrous (made of iron) substrate. Chrome phosphate performs the same function of promoting good paint adhesion, but is more commonly used on non-ferrous substrates such as aluminum.

Relative Resistance Chart

All metal surfaces exposed to the environment are affected by corrosion. The Relative Resistance Chart serves as a valuable reference tool in determining the proper coating for various job conditions and the protection level provided against a long list of chemical agents and other conditions.

Performance Coatings

Greenheck Name (Trade Names)	Std. Color	Maximum Service Temp	Dry Film Thickness	Material Type	Surface Preparation Guidelines	Qualities
Powder Coatings						
1. Permatector™ (Polyester Urethane)	Gray (040)	250° F 120° C	2-3 mils	Steel or Aluminum	Iron Phosphate	• Good chemical and corrosion resistance. • Good mechanical properties. • Very good exterior color/gloss retention.
2. Perma-Z	Gray (040)	250° F 120° C	4-6 mils	Steel	Iron Phosphate	• Good chemical and corrosion resistance. • Good mechanical properties. • Very good exterior color/gloss retention. • Zinc coating will “corrode” or self-heals to resume protection of the steel substrate if damaged.
3. Hi-Pro Polyester Super Durable	Dark Gray (041)	250° F 120° C	2-3 mils	Steel or Aluminum	Iron Phosphate	• Very good chemical and corrosion resistance. • Excellent mechanical properties. • Excellent exterior color/gloss retention.
4. Hi-Pro-Z Super Durable	Dark Gray (041)	250° F 120° C	4-6 mils	Steel	Iron Phosphate	• Good chemical and corrosion resistance. • Good mechanical properties. • Excellent exterior color/gloss retention. • Zinc coating will “corrode” or self-heals to resume protection of the steel substrate if damaged.
5. High Temperature Silver	Silver	500° F 260° C	2-3 mils	Steel	Iron Phosphate	• Good chemical resistance. • Good mechanical properties. • Withstands continuous temperatures up to 500° F (260° C).
6. Epoxy	Light Tan	250° F 120° C	2-3 mils	Steel or Aluminum	Iron Phosphate	• Excellent chemical resistance. • Excellent mechanical properties. • Fair exterior color retention. • Poor gloss retention. • Fades in sunlight.
7. Industrial Epoxy	Limestone	250° F 120° C	2.5-3 mils	Steel or Aluminum	Iron Phosphate	• Superior chemical and corrosion resistance. • Excellent mechanical properties. • Fair exterior color retention. • Poor gloss retention. • Fades in sunlight.

Performance Coatings

	Greenheck Name (Trade Names)	Std. Color	Maximum Service Temp	Dry Film Thickness	Material Type	Surface Preparation Guidelines	Qualities
Liquid Coatings							
8.	High Temperature *(Sherwin Williams Kem® Hi-Temp)*	Silver	850° F 450° C	0.9 mils	Steel	SSPC-SP10	• Exceptional heat resistant properties up to 850° F (450° C) for indoor and outdoor applications.
9.	Coal Tar Epoxy *(Sherwin Williams Hi-Mil Sher-Tar® Epoxy)*	Black	250° F 120° C	6-8 mils	Steel Aluminum	SSPC-SP10 SSPC-SP7	• Excellent moisture resistance. • Excellent corrosion resistance. • Excellent abrasion resistance.
10.	Anti-Condensate *(Rust Free)*	Black	275° F 135° C	5-10 mils	Steel Aluminum	SSPC-SP1 SSPC-SP1	• Highly abrasion resistant sealant. • Rust preventative sealant.
11.	Epoxy Phenolic *(Two component; Plasite 7122H)*	Med. Gray	200° F 95° C	6-8 mils	Steel Aluminum	SSPC-SP10 SSPC-SP6 *Pre-treat with chrome phosphate	• Wide range of chemical resistance. • Abrasion resistance.
12.	Polyurethane *(Sherwin Williams Polane® S Plus)*	Custom	250° F 120° C	1.25-1.5 mils	Steel Aluminum	Iron phosphate or wash primer Chrome phosphate or wash primer	• Excellent color and gloss retention. • Excellent overall exterior durability. • Good to excellent corrosion resistance. • Excellent abrasion resistance.
13.	Baked Phenolic Heresite P413	Dark Brown	400° F 200° C	5-7 mils	Steel Aluminum	SSPC-SP10 SSPC-SP10	• Good to excellent resistance to acids and inorganic salts. • Excellent resistance to solvents and water. • Flexibility.
	Plasite 3070	Medium Tan	400° F 200° C	5-7 mils	Steel Aluminum	SSPC-SP10 SSPC-SP10	• Superior resistance to acids and solvents.
14.	Modified Epoxy Phenolic *(Plasite 9570)*	Iron Oxide Yellow	300° F 150° C	12-15 mils	Steel Aluminum	SSPC-SP10 SSPC-SP6 *Pre-treat with chrome phosphate	• Excellent abrasion resistance while retaining temperature, chemical, and other physical properties. • Excellent resistance to all caustic solutions up to 200° F (95° C). • Chemical resistance to a wide range of acids, solvents and water solutions.
15.	Fluorocarbon *(DuPont™ Teflon S)*	Green	350° F 175° C	2-3 mils	Steel Aluminum	SSPC-SP10	• Satisfactory for mild resistance. • Excellent anti-stick surface.

Relative Resistance Chart

Resistance to Corrosive:

1. Permatector™
2. Perma-Z
3. Hi-Pro Polyester
4. Hi-Pro-Z (LabCoat™)
5. High Temperature Silver
6. Epoxy
7. Industrial Epoxy
8. High Temperature
9. Coal Tar Epoxy
10. Anti-Condensate
11. Epoxy Phenolic
12. Polyurethane
13. Baked Phenolic
14. Modified Epoxy Phenolic
15. Fluorocarbon

Resistance to Corrosive:

E = Excellent F = Fair NR = Not Recommended
G = Good P = Poor ND = No Data Available

Coatings are listed in order from best value to the most expensive.

Acids	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Acetic	G	G	E	E	G	G	E	NR	NR	NR	NR	F	G	F	G
Boric	G	G	E	E	G	G	E	F	NR	E	G	G	G	G	G
Carbolic (Phenol)	G	G	G	G	NR	F	G	ND	NR	ND	NR	NR	E	NR	ND
Chloric	G	G	G	G	ND	ND	G	NR	ND	NR	NR	NR	NR	ND	ND
Chloracetic	G	G	G	G	G	G	E	NR	NR	E	G	NR	G	ND	G
Chromic	G	G	G	G	NR	F	G	NR	NR	NR	NR	NR	G	F	N
Citric Acid	ND	ND	ND	ND	ND	ND	ND	NR	E	ND	F	E	F	F	ND
Ethyl Sulfuric	G	G	G	G	ND	ND	G	NR	ND	NR	NR	NR	E	ND	ND
Formic	G	G	E	E	NR	ND	E	NR	NR	NR	NR	NR	E	ND	G
Hydrochloric (Huriatic)	G	G	E	E	G	G	E	NR	NR	E	G	F	G	G	G
Hydrocyanic	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND
Hydrofluoric	P	P	F	F	NR	ND	ND	NR	ND	G	NR	NR	NR	ND	NR
Hypochlorous	G	G	G	G	E	ND	E	NR	ND	NR	NR	NR	G	F	NR
Lactic	G	G	E	E	E	ND	E	NR	ND	NR	G	G	E	ND	G
Napthenic	G	G	G	G	G	ND	G	ND	NR	ND	NR	ND	E	ND	ND
Nitric	G	G	G	G	G	F	G	NR	ND	G	NR	NR	NR	NR	NR
Nitrous	ND	ND	ND	ND	ND	ND	G	NR	ND	ND	ND	NR	ND	NR	NR
Oleic	ND	ND	ND	ND	G	G	E	ND	G	G	NR	G	E	F	ND
Oxalic	G	G	E	E	G	ND	E	NR	ND	G	G	ND	E	F	ND
Perchloric	ND	ND	ND	ND	ND	ND	E	NR	ND	NR	NR	ND	G	F	G
Phosphoric	G	G	E	E	G	G	E	NR	ND	E	G	G	E	G	NR
Picric	ND	ND	ND	ND	E	ND	E	ND	G	ND	NR	ND	E	G	G
Stearic	G	G	E	E	E	ND	E	G	ND	ND	E	G	E	ND	ND
Sulfuric	G	G	G	G	NR	G	E	NR	NR	G	G	F	G	G	NR
Sulfurous	ND	ND	ND	ND	E	E	E	NR	ND	ND	G	NR	E	F	NR
Tannic Acid	E	E	E	E	E	G	E	P	G	ND	ND	E	ND	ND	ND
Tartaric	G	G	E	E	E	ND	E	NR	ND	G	E	G	E	G	NR
Alkalis (Bases)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ammonium Hydroxide	G	G	E	E	G	G	E	NR	NR	NR	NR	G	G	NR	G
Calcium Hydroxide	G	G	E	E	E	G	E	NR	G	G	G	G	G	G	G
Calcium Oxide (Caustic Lime)	G	G	E	E	E	ND	E	NR	ND	NR	G	F	E	G	NR
Potassium Hydroxide (Caustic Potash, Coal Dust)	G	G	E	E	G	ND	E	NR	ND	NR	NR	G	NR	G	NR
Sodium Hydroxide (Caustic Soda)	G	G	E	E	G	G	E	NR	ND	NR	NR	P	NR	G	NR

Relative Resistance Chart, continued from page 8

Resistance to Corrosive:

1. Permatector™
2. Perma-Z
3. Hi-Pro Polyester
4. Hi-Pro-Z (LabCoat™)
5. High Temperature Silver
6. Epoxy
7. Industrial Epoxy
8. High Temperature
9. Coal Tar Epoxy
10. Anti-Condensate
11. Epoxy Phenolic
12. Polyurethane
13. Baked Phenolic
14. Modified Epoxy Phenolic
15. Fluorocarbon

Resistance to Corrosive:

E = Excellent F = Fair NR = Not Recommended
G = Good P = Poor ND = No Data Available

Coatings are listed in order from best value to the most expensive.

Oxidizing Agents	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bleaching Compounds	G	G	G	G	E	ND	G	NR	ND	NR	G	F	NR	G	F
Calcium Hypochlorite	G	G	G	G	E	ND	E	NR	ND	ND	NR	NR	G	G	G
Chlorine	F	F	E	E	ND	G	E	NR	NR	G	NR	NR	G	F	G
Hydrogen Peroxide	G	G	E	E	ND	ND	E	ND	ND	NR	NR	F	G	ND	G
Hypochlorites	G	G	G	G	G	G	E	NR	ND	ND	NR	F	G	NR	NR
Sulfur Dioxide	ND	ND	ND	ND	E	ND	E	NR	ND	ND	G	F	E	G	G
Salts	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Aluminum Chloride	G	G	E	E	E	ND	E	ND	NR	ND	G	G	NR	ND	ND
Aluminum Flouride	G	G	E	E	ND	ND	E	ND	ND	ND	G	G	NR	ND	ND
Aluminum Sulfate	G	G	E	E	E	ND	E	ND	G	ND	G	G	E	ND	ND
Ammonium Chloride	G	G	E	E	G	G	E	NR	G	E	E	F	E	G	G
Ammonium Nitrate	G	G	E	E	E	G	E	ND	ND	E	E	NR	E	G	G
Ammonium Sulfide	G	G	E	E	E	ND	E	ND	ND	E	G	NR	G	ND	G
Calcium Chloride	G	G	E	E	E	ND	E	NR	G	E	E	G	E	G	G
Calcium Cyanamide	G	G	E	E	E	ND	E	ND	ND	ND	E	G	ND	ND	ND
Calcium Sulfate	G	G	E	E	G	ND	E	ND	ND	ND	G	G	E	ND	E
Cupric Nitrate	G	G	E	E	E	ND	E	ND	ND	ND	E	G	E	ND	G
Cupric Sulfate	G	G	E	E	E	ND	E	NR	ND	ND	E	G	E	ND	G
Ferric Chloride	G	G	E	E	G	G	E	NR	NR	ND	E	G	E	NR	E
Ferric Sulfate	G	G	E	E	E	ND	E	ND	ND	ND	E	G	E	NR	E
Ferrous Sulfate	G	G	E	E	E	ND	E	ND	ND	ND	E	ND	E	NR	E
Lithium Chloride	G	G	ND	ND	E	E	E	ND	G	E	ND	ND	E	ND	G
Magnesium Chloride	G	G	E	E	E	ND	E	ND	G	ND	E	G	E	G	G
Magnesium Sulfate	G	G	E	E	E	ND	E	ND	ND	ND	E	ND	E	ND	G
Manganese Chloride	G	G	E	E	E	ND	E	ND	ND	ND	E	ND	E	ND	G
Manganese Sulfate	G	G	E	E	E	ND	E	ND	ND	ND	E	ND	E	ND	ND
Potassium Carbonate (Potash)	G	G	E	E	G	ND	E	NR	ND	ND	NR	G	NR	ND	ND
Potassium Chlorate	G	G	E	E	E	ND	E	ND	ND	ND	NR	G	G	ND	E
Potassium Chloride	G	G	E	E	E	ND	E	ND	ND	ND	E	G	G	ND	G
Potassium Nitrate	G	G	E	E	E	ND	E	ND	ND	ND	E	G	E	ND	G
Potassium Sulfate	G	G	E	E	E	ND	E	ND	ND	ND	E	G	E	ND	G
Potassium Sulfide	G	G	E	E	E	ND	E	ND	E	ND	G	G	E	ND	G
Salt Spray	G	G	E	E	E	E	E	F	G	E	G	G	E	G	E
Sodium Carbonate	G	G	E	E	ND	ND	E	ND	ND	ND	ND	ND	ND	G	ND
Sodium Chloride	G	G	E	E	E	E	E	F	G	E	E	G	E	G	G

Relative Resistance Chart, continued from page 9

Resistance to Corrosive:

1. Permatector™
2. Perma-Z
3. Hi-Pro Polyester
4. Hi-Pro-Z (LabCoat™)
5. High Temperature Silver
6. Epoxy
7. Industrial Epoxy
8. High Temperature
9. Coal Tar Epoxy
10. Anti-Condensate
11. Epoxy Phenolic
12. Polyurethane
13. Baked Phenolic
14. Modified Epoxy Phenolic
15. Fluorocarbon

Resistance to Corrosive:

E = Excellent F = Fair NR = Not Recommended
G = Good P = Poor ND = No Data Available

Coatings are listed in order from best value to the most expensive.

Salts, continued	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sodium Nitrate	G	G	E	E	E	ND	E	ND	ND	ND	E	G	E	G	G
Trisodium Phosphate	G	G	E	E	ND	ND	E	ND	ND	ND	ND	G	ND	ND	ND
Zinc Chloride	G	G	E	E	ND	ND	E	ND	ND	ND	E	G	E	G	E
Zinc Sulfate	G	G	E	E	ND	ND	E	ND	ND	ND	E	G	E	G	E
Solvents	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Acetaldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	NR	E	NR	N
Acetone	G	G	G	G	F	ND	G	G	ND	NR	NR	F	E	G	F
Alcohols	G	G	E	E	E	E	E	G	G	G	NR	G	E	NR	G
Aldehyde	F	F	G	G	NR	ND	G	ND	ND	ND	NR	NR	E	NR	ND
Benzene and Methyl Alcohol Mix	G	G	G	G	G	ND	E	G	ND	NR	NR	ND	E	NR	ND
Benzol	G	G	G	G	G	ND	E	P	E	ND	ND	G	ND	ND	ND
Butanol (Butyl Acetate)	G	G	E	E	NR	ND	E	G	ND	NR	NR	G	E	G	ND
Carbon Disulfide	ND	ND	ND	ND	NR	ND	ND	ND	ND	ND	NR	ND	E	G	ND
Carbon Tetrachloride	P	P	F	F	ND	ND	E	ND	ND	ND	ND	ND	ND	G	ND
Ethanol (Ethyl Alcohol)	G	G	G	G	G	ND	E	G	ND	ND	G	G	E	G	G
Ethyl Acetate	G	G	G	G	NR	ND	E	G	ND	NR	NR	G	E	G	G
Ethylene Glycol	G	G	E	E	ND	ND	E	G	ND	ND	ND	G	E	G	G
Formaldehyde	F	F	G	G	ND	ND	E	ND	NR	G	E	ND	E	NR	ND
Gasoline	G	G	G	G	G	G	E	G	G	NR	NR	G	E	G	G
Glycerol (Glycerin)	G	G	G	G	ND	ND	E	ND	ND	ND	G	G	E	ND	ND
Jet Fuel	F	F	G	G	ND	G	E	G	G	ND	G	F	E	G	ND
Kerosene	G	G	G	G	E	ND	E	G	NR	NR	G	F	E	G	ND
Ketones	G	G	G	G	NR	E	G	G	NR	NR	NR	F	E	F	G
Methanol (Methyl Alcohol)	G	G	G	G	ND	ND	E	G	ND	ND	G	G	E	G	G
Methyl Acetate	G	G	G	G	NR	ND	E	G	ND	ND	NR	G	E	G	G
Methyl Ethyl Ketone (MEK)	G	G	G	G	F	E	G	ND	ND	ND	NR	G	E	G	G
Methyl Isobutyl Kentone	G	G	G	G	F	G	G	P	E	ND	ND	G	ND	ND	ND
Naphthalene	G	G	G	G	ND	ND	E	ND	ND	ND	NR	G	E	G	ND
Sulfuric Chloride	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	NR	ND	G	NR	NR

Relative Resistance Chart, continued from page 10

Resistance to Corrosive:

1. Permatector™
2. Perma-Z
3. Hi-Pro Polyester
4. Hi-Pro-Z (LabCoat™)
5. High Temperature Silver
6. Epoxy
7. Industrial Epoxy
8. High Temperature
9. Coal Tar Epoxy
10. Anti-Condensate
11. Epoxy Phenolic
12. Polyurethane
13. Baked Phenolic
14. Modified Epoxy Phenolic
15. Fluorocarbon

Resistance to Corrosive:

E = Excellent F = Fair NR = Not Recommended
G = Good P = Poor ND = No Data Available

Coatings are listed in order from best value to the most expensive.

Solvents, continued	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Toluol (Toluene)	G	G	E	E	G	G	E	G	ND	NR	NR	G	E	G	G
Trichloroethylene	F	F	F	F	ND	ND	E	G	ND	ND	NR	NR	E	P	NR
Turpentine	G	G	E	E	NR	ND	E	G	ND	ND	NR	F	E	G	ND
Water, Fresh	E	E	E	E	E	E	E	F	E	E	E	E	E	E	G
Xylol (Xylene)	G	G	E	E	G	G	E	G	ND	NR	NR	G	E	G	G
Miscellaneous	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Abrasion	G	G	E	E	G	G	E	F	G	E	G	G	E	G	F
Ammonium Gas	E	E	E	E	G	G	G	ND	ND	E	G	G	E	G	E
Animal Oils	E	E	E	E	G	ND	E	ND	ND	ND	NR	E	E	G	ND
Carbon Dioxide	E	E	E	E	E	ND	E	E	ND	ND	E	E	E	G	E
Carbon Monoxide	E	E	E	E	E	ND	E	ND	NR	G	E	ND	E	G	E
Creosol	G	G	E	E	NR	ND	E	ND	ND	ND	NR	ND	E	ND	ND
Detergents	G	G	E	E	ND	ND	E	ND	ND	ND	ND	E	E	G	E
Ether	G	G	G	G	NR	ND	E	G	NR	ND	NR	G	E	G	ND
Fish Oil	E	E	E	E	ND	G	E	G	ND	ND	NR	G	E	G	ND
Hydrogen Sulfide	ND	ND	G	G	G	ND	G	ND	ND	ND	ND	P	ND	G	ND
Methane	E	E	E	E	ND	ND	E	G	ND	ND	ND	G	ND	ND	ND
Nitrogen Fertilizer	E	E	E	E	E	E	E	NR	ND	ND	G	F	E	NR	NR
Nitrogen Oxides	E	E	E	E	E	ND	E	ND	NR	ND	NR	ND	NR	NR	NR
Oils	E	E	E	E	E	G	E	ND	NR	G	NR	G	E	G	ND
Outdoor (Except Marine)	G	E	E	E	G	F	F	F	E	G	G	G	G	G	G
Outdoor (Marine)	G	E	G	E	F	F	F	F	E	F	G	F	G	G	G
Ozone	ND	ND	ND	ND	ND	ND	E	ND	ND	ND	ND	NR	ND	ND	ND
Phosgene (Carbonyl Chloride)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	E	ND	ND
Phosphorous Trichloride	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	NR	ND	E	ND	ND
Propane	E	E	E	E	ND	ND	E	G	ND	ND	ND	G	ND	G	G
Saturated Steam Vapor	ND	ND	ND	ND	ND	G	E	NR	E	NR	NR	G	E	G	E
Sunlight	G	G	E	E	E	NR	NR	G	G	G	F	G	G	G	E

P.O. Box 410 • Schofield, WI 54476-0410 • 715.359.6171 • greenheck.com