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Construction Engineering
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DoD Corrosion Prevention and Control Program

Application of Corrosion- and Fire-Resistant Coating Systems on Buildings 227 and 299 at Rock Island Arsenal

Final Report on Project FAR-13 for FY06

Susan A. Drozdz, Paul P. Greigger, Russell Fruge,
and Scott D. Benton

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Final report

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Abstract: Fire protective coatings have historically lacked sufficient durability to maintain the coating in good condition and protect the substrate from corrosion. New, innovative epoxy intumescent coatings are much more durable and inhibit corrosion of steel. This project demonstrated the performance of this type of coating system on two structures at Rock Island Arsenal where fire risk and corrosive conditions are significant, and included outdoor exposure testing and accelerated weathering tests at the ERDC-CERL paints and coatings laboratory. Additional research was conducted to further develop engineered siloxane-epoxy coating technology as fire protective and corrosion-resistant coating systems with improved durability. The coating system successfully demonstrated in this project has the potential to provide the benefits of this protection to many types of structures across the DoD.

Contents

List of Figures and Tables

Figures

Tables

Preface

This demonstration was performed for the Office of the Secretary of Defense (OSD) under Department of Defense (DoD) Corrosion Control and Prevention Project FAR-13; Military Interdepartmental Purchase Requests MIPR6FCERB1020, 20 Mar 06; MIPR6H6AG3CPC1, 15 May 06; and MIPR6HMBHDE097, 31 May 06. The proponent was the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. The technical monitors were Daniel J. Dunmire (OUSD(AT&L) Corrosion), Paul M. Volkman (IMPW-E), and David N. Purcell (DAIM-FDF).

The work was performed by the Materials and Structures Branch (CF-M) of the Facilities Division (CF), Construction Engineering Research Laboratory – Engineer Research and Development Center (ERDC-CERL). The Project Officer was Vincent Hock. Portions of this work were performed under contract by Mandaree Enterprise Corporation, PPG Industries, and the Almega Company, Inc. At the time this report was prepared, the Chief of the ERDC-CERL Materials and Structures Branch was Vicki L. Van Blaricum (CEERD-CF-M), the Chief of the Facilities Division was L. Michael Golish (CEERD-CF), and the Technical Director for Installations was Martin J. Savoie (CEERD-CV-ZT). The Deputy Director of ERDC-CERL was Dr. Kirankumar V. Topudurti, and the Director was Dr. Ilker Adiguzel.

The authors wish to acknowledge the primary personnel involved with the execution of this project, who were:

- PPG: Tim Figore, Tim Avampato, Terri Ziegler, and Norm Mowrer
- Rock Island Arsenal Directorate of Public Works: Hugh Halverson and Dana Johnson
- Almega (PPG Sub): George Aspiotes, and Dave Young

The Commander and Executive Director of ERDC was COL Richard B. Jenkins and the Director was Dr. James R. Houston.

Executive Summary

Fire protective coatings offer a form of passive fire protection. Many of the fire protective coating systems that have been developed over the years have not had sufficient durability to maintain the coating in good condition and protect the substrate from corrosion. The coatings can be brittle and inflexible, subject to failure over time, resulting in greater risk of damage due to corrosion or a fire. New, innovative epoxy intumescent coatings are much more durable and inhibit corrosion of steel. This project demonstrated the performance of this type of coating system on two structures at Rock Island Arsenal where fire risk and corrosive conditions are significant. A test rack for painted test panels was installed at the site, and panels placed there for long-term outdoor weathering tests. Accelerated weathering tests were conducted in the ERDC CERL laboratory.

Additional research was conducted to further develop fire protective and corrosion-resistant coating systems that exhibit improved durability, reduced environmental impact, and more rapid curing under ambient conditions. Engineered siloxane-epoxy coating technology was identified as having excellent potential to provide these features, but this resin system had not been formulated for use as corrosion resistant fire protective coatings.

The coating system demonstrated in this project has been shown to provide good corrosion protection to the steel in corrosive environments in accelerated laboratory tests and on the structures at Rock Island Arsenal. Additionally, the system is designed to protect the steel from reaching high temperatures in a fire for up to 3 hours. This system has the potential to provide the benefits of this protection to many types of structures across the DoD.

An aliphatic epoxy and siloxane resin-based prototype coating was developed which exhibits improvements in VOC, pot life, dry time, hardness, flexibility and elongation, chemical and corrosion resistance, and UV durability.

Unit Conversion Factors

Multiply	By	To Obtain
degrees Fahrenheit	(F-32)/1.8	degrees Celsius
Feet	0.3048	meters
gallons (U.S. liquid)	3.785412 E-03	cubic meters
Inches	0.0254	meters
Mils	0.0254	millimeters
square feet	0.09290304	square meters

1 Introduction

1.1 Problem statement

The primary reason steel structures are painted is to protect the steel from the effects of corrosion. The aesthetic effects of color, texture, and gloss are secondary. A typical coating system has a finite service life, after which it can be renewed by cleaning, spot priming and applying a new topcoat, or it can be completely removed and replaced with a new system.

A coating system can also provide thermal protection to a structure in the event of a fire. Some of the best coating systems currently available for fire protection are intumescent epoxies that decompose when exposed to high temperatures. Gasses are released which cause the material to swell to several multiples of its original thickness, forming an insulating char. This char prevents high heat from transferring to the steel, allowing time for the egress of building occupants or for firefighting before the structure itself is threatened. Fire protective coatings are applied in much greater thicknesses than traditional paint systems, and the degree of fire protection is usually in direct proportion to the coating thicknesses. A coating system for corrosion protection of steel has a thickness on the order of 127 microns (5 mils, 0.005 inch), fire protective coatings can range from 6350 microns (.25 inch) to a full 12700 microns (1/2 inch) or greater.

This type of coating is a form of passive fire protection. In order for the coating to perform its function at the time of a fire, it must be present in good condition at the time it is needed. The thick, heavy coating must maintain its adhesion to the steel surface and withstand the effects of temperature cycles, exposure to weather (for exterior systems), and impact and abrasion.

These performance requirements are in addition to the basic function of providing corrosion protection and aesthetic appeal. Many of the fire protective coating systems that have been developed over the years have not had sufficient durability to maintain the coating in good condition and protect the substrate from corrosion. The coatings can be brittle and inflexible, subject to failure over time, resulting in greater risk of damage due to corrosion or a fire.

Intumescent coatings are based on a variety of binder systems, including water based latexes or epoxies. Water-based latex coatings are generally used in what is often referred to as thin film intumescents (approximately 1.27 mm (0.05 inches or 50 mils) in thickness when applied). These thinner films are more aesthetically pleasing in appearance, yet they still provide up to 2 hours fire protection, with thicker films providing longer protection. Because of their composition these coatings tend not to be durable and provide little corrosion protection to steel.

New, innovative epoxy intumescent coatings are much more durable and inhibit corrosion of steel. They decompose on exposure to high temperatures, releasing gasses which expand the material, forming a layer of "char" that will help to keep steel from reaching softening temperatures for up to 4 hours. This leaves a longer widow of time for the egress of personnel from the building, and for fighting the fire before significant loss of strength of the steel occurs.

Additionally it is recognized that there is a need to further develop fire protective and corrosion-resistant coating systems that exhibit improved durability, reduced environmental impact, and more rapid curing under ambient conditions. These coatings will ideally also provide direct to metal adhesion and corrosion resistance. Engineered siloxane-epoxy coating technology was identified as having excellent potential to provide these features. Coatings employing this technology have demonstrated excellent durability and may be formulated without the addition of organic solvents. Additionally, coatings of this type cure rapidly under ambient conditions and can be applied with existing application equipment. However they have not been fully characterized with respect to structure property relationships or optimized for adhesion to multiple substrates. Further these coatings have not been formulated for use as corrosion resistant fire protective coatings.

1.2 Objective

The objectives of this effort were to:

- demonstrate apply a state-of-the-art epoxy-based fire resistant coating system with improved corrosion resistance on multiple Army structures where fire risk and corrosive conditions are significant;
- monitor the corrosion performance of the coating system on the structures over time, and monitor the performance of the coating system,

standard baseline systems, and alternative systems applied to metal coupons exposed on an outdoor rack and in accelerated testing in the laboratory; and
- further develop the coating performance by evaluating modified paint formulations in the laboratory.

1.3 Approach

A demonstration site was sought that had at least two different types of corrosive environments on structures where fire risk is a concern. Candidate structures for consideration included manufacturing facilities, heat or energy plants, or vehicle or aircraft maintenance facilities. The ideal structures would have exposed steel support columns and beams. The site also needed to have a suitable location for the placement of a corrosion test rack facing south, not shaded by other structures or foliage, and in the corrosive environment.

A separate laboratory study was performed to identify possible ways to further improve coating performance for military structure requirements.

Additional details about this study are provided in the following appendices:

- Appendix A: Project Management Plan for CPC Project AR-F-318
- Appendix B: Contractor Work and Safety Documents
- Appendix C: Laboratory and Coupon Test Data
- Appendix D: Suggested Implementation Guidance.

2 Technical Investigation

2.1 Project overview

A contract for the field application of the coating systems on Buildings 227 and 299 at Rock Island Arsenal was awarded to Mandaree Enterprise Corporation, and subcontractors PPG Industries, Inc. (coating materials and technical oversight), and Almega Company, Inc. (surface preparation and coating application). Site support for the work was provided by the staff at the Directorate of Public Works at Rock Island Arsenal. Additional laboratory work was performed by PPG to further develop fire-protective coatings systems with enhanced resistance to corrosion.

Two structures were selected for this work at Rock Island Arsenal. Building 227, a coal-fired heating plant, is known for having a corrosive environment due to the plant emissions. At Building 227 interior steel support columns in the two baghouses and exterior stair tower support columns were blast cleaned and protected with a 3-coat system including a primer, the intumescent fire protective coating, and a polyurethane topcoat. Adjacent structural members were cleaned and topcoated for aesthetic appeal and added protection. A fire and corrosion-resistant coating system was also applied to interior steel support columns in a section of Building 299, a manufacturing facility where the interior steel can be exposed to corrosive chemicals and chemical fumes. In both of the facilities a new corrosion-resistant fire protective coating system will to provide additional personnel and asset protection. The coating system was applied to selected surfaces on each building as shown in Table 1.

Table 1. Coating system application notes.

Surface	Notes
1. Bldg 227 Heating Plant West Baghouse	Apply epoxy intumescent coating to baghouse steel support columns and stair tower support columns on exterior of baghouse. Apply topcoat to the adjacent structural members. See drawings in Appendix B.
2. Bldg 227 Heating Plant East Baghouse	Apply epoxy intumescent coating to baghouse steel support columns and stair tower support columns on exterior of baghouse. Apply topcoat to the adjacent structural members. See drawings in Appendix B.
3. Bldg 299 – Interior Support Columns, Southwest Interior	Apply epoxy intumescent coating to interior steel support columns. Apply coating in increments of 1 high bay at a time, 2 high bays total. See drawings in Appendix B.

The surface preparation and coating systems were selected to provide long-term corrosion resistance and to provide up to 3 hours of protection to the steel in the event of a fire.

A test panel exposure rack was installed outside on the sunny south side of Building 227 and painted test panels were prepared and mounted to the exposure rack as the work on both buildings was being completed. These are being periodically rated for the performance of a series of coating systems, including the test coatings, and various alternate coating systems, including topcoat and primer systems without the intumescent intermediate coat. Research and development was conducted to further improve the corrosion inhibition, durability, cure response, and environmental impact of siloxane-epoxy coatings for military structures.

Additionally the researchers further developed the formulation of the fire protective and corrosion-resistant coating systems to provide coatings that exhibit improved durability, reduced environmental impact, and more rapid curing under ambient conditions. The ideal system is one that will also provide direct to metal adhesion and corrosion resistance, even when over a poorly prepared surface. Engineered siloxane-epoxy coating technology was identified as having excellent potential to provide these features. Coatings employing this technology have demonstrated excellent durability and may be formulated without the addition of organic solvents. Coatings of this type cure rapidly under ambient conditions and can be applied with existing application equipment. However they have not been fully characterized with respect to structure property relationships or optimized for adhesion to multiple substrates. Further these coatings have not been formulated for use as corrosion resistant fire protective coatings.

2.2 Surface preparation and installation

Surface preparation and coating system application was performed by the coating subcontractor, The Almega Company. Onsite work began June 4 and was concluded August 3, 2007. The same coating system was applied in on the interior and exterior surfaces of Building 227, and on the interior columns of Building 299.

The surface preparation was different for interior surfaces and exterior surfaces. The exterior surfaces on Building 227 were abrasive blasted to a near-white metal grade (SSPC SP6). Interior steel surfaces of building 227 were power washed per SSPC SP1, and the interior steel surfaces of Build-

ing 299 were solvent wiped in accordance with SSPC SP1. This coating system is based on three coats of the material shown in Table 2.

Table 2. Coating system components.

	Material Type	Manufacturer, Name, Number	Coating Thickness, microns (mils)
Primer	two-component direct-to-rust epoxy mastic	PPG, Pitt-Guard DTR	102 to 152 (4 to 6)
Intermediate Coat	2-component flexible intumescent epoxy	PPG, Pitt-Char XP	13460 (530)
Topcoat	high build, semi-gloss acrylic polyurethane	PPG, Pitthane 95-8800 Series	51 to 76 (2 to 3)

The intumescent epoxy coating is reinforced with a fiber mesh embedded at approximately half the total thickness. The purpose of the fiber mesh is to reinforce the layer of insulating char that forms in the event of a fire. The mesh prevents cracking to the steel substrate, which would reduce the insulating properties of the char. The procedure is as follows:

1. Apply approximately 6,350 microns (250 mils) of the material.
2. Apply the fiber mesh to the wet coating and roll in to eliminate wrinkles, gaps, and voids.
3. Apply a second coat of the intumescent epoxy to achieve the total thickness.

Figure 1 – Figure 6 show several views of Buildings 227 and 299 before and after the coating application work:

Figure 1. Building 227 exterior before coating application.

Figure 2. Building 227 exterior after coating application.

Figure 3. Building 227 exterior after coating application.

Figure 4. Building 227 interior after coating application.

Figure 5. Building 299 interior before coating application.

Figure 6. Building 299 interior after coating application.

2.3 Performance monitoring and data collection

The set of data from the accelerated laboratory testing and the coupon test rack outside Building 227 at Rock Island Arsenal is included in Appendix C.

2.4 Formulation enhancement studies

2.4.1 Identification of coating structure property relationships

The structure property relationships of engineered siloxane epoxy coatings were studied in several ways. Variations were performed on the epoxy resins, the siloxane resins, and the aminosilane curatives that resulted in improved flexibility and impact resistance, faster dry times, increased corrosion resistance, as well as changes in hardness, adhesion and durability, depending on the variations studied.

2.4.2 Aminosilanes

The aminosilane structure was altered through the type of silane functionality, the structure and nature of the amine unit, and the type of linkages

between these reactive sites. These changes led to significant impacts on the dry times and flexibility of the system.

Table 3. Tack-free times (ASTM D 1640*).

Commercial Aminosilane	Aminosilane A (difunctional)	Aminosilane B (low viscosity diluent)	70/30 Blend of A and B
2-3 hrs	8-10 minutes	30-40 minutes	10-15 minutes

*ASTM D 1640 - Standard Test Method for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature

Alteration of the aminosilane structure leads to significantly faster tack free times. The tack free time can be adjusted by changing the blend ratio of the aminosilanes A and B. Humidity also plays a role in the tack-free time of the polysiloxane coatings as seen in Figure 7. Humidity was varied at a constant 30% diluent level and the diluent was varied at a constant 50% RH.

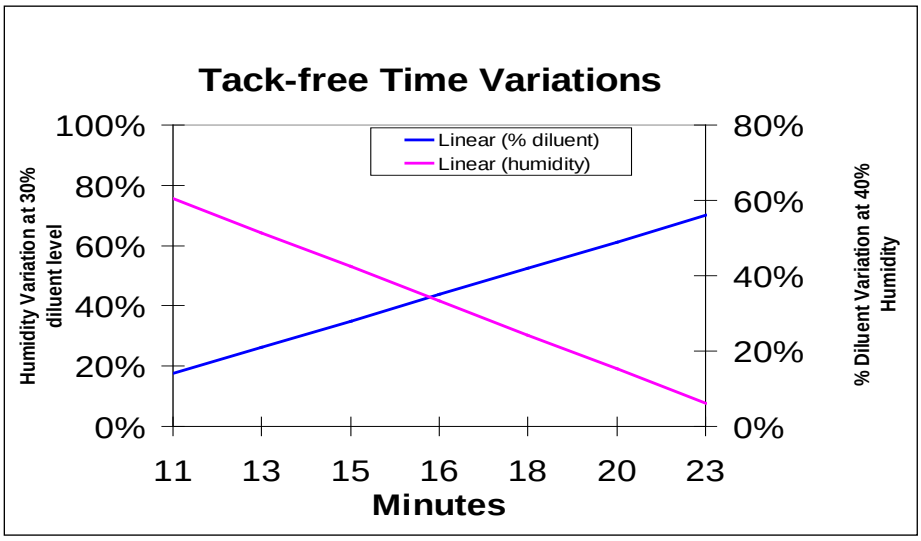

Figure 7. Tack-free times for modified formulations.

Commercially available epoxy siloxane coatings have low VOC and provide a good combination of UV durability and corrosion resistance. However, they are slow to cure, particularly in cold weather, and can not be force cured above 140 °F because of the volatility of certain constituents. Additionally, these coatings lack the flexibility required for certain applications.

The new aminosilane curatives can be used to improve the cure response and flexibility, especially with the use of a third aminosilane adduct (Ami-

nosilane C) that has higher amine content and lower alkoxysilane content. A comparison of the properties of these formulas is shown in Table 4.

Table 4. Property comparison of four formulations with differing aminosilane content.

Property/Composition	Commercial Polysiloxane	Experimental Formula I	Experimental Formula II	Experimental Formula III
	Epoxy	Epoxy	Epoxy	Epoxy
	Siloxane	Siloxane	Siloxane	Siloxane
	Commercial Aminosilane	----	----	Commercial Aminosilane
	----	Aminosilane A	Aminosilane A	Aminosilane A
	----	Aminosilane B	Aminosilane B	---
	----	----	Aminosilane C	---
	----	----	Titanate	---
Tack Free Times (ASTM D 1640)	3 hours	10-15 minutes	20-30 minutes	30-40 minutes
Adhesion (ASTM D 3359, Method B)	4B	3B	4B	4B
Hardness Konig (ASTM D 4366) / Pencil (ASTM D 3363)	74 / H	84 / 2H-4H	102 / H – 3H	90 /
% Elongation on Mandrel Bend (ASTM D 522)	<3%	11%	24%	4.5%
Salt fog resistance, SBS, 750 hours ASTM scribe rating (ASTM D 1654, Method A)	6	0	-	6

Referenced Test Methods:

ASTM D 1640 - Standard Test Method for Drying, Curing, or Film Formation of Organic coatings at Room Temperatures

ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Test

ASTM D 4366, Method A - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests, Method A - Konig Pendulum Hardness Test

ASTM D 3363 - Standard Test Method for Film Hardness by Pencil Test

ASTM D 522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

ASTM D 1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subject to Corrosive Environments

The use of titanate in the Experimental Formula II contributed to a faster tack free time, without titanate, the coating takes ~1.5 hr to become tack free. While this formula has improved physical properties as shown above,

the drawback to this system is the decreased UV durability of aminosilane C.

The type and amount of aminosilane was also found to have a major effect on corrosion resistance, particularly on sand blasted steel substrates. Epoxy siloxane coating systems cured with blends of fast curing Aminosilane A and Aminosilane B exhibited severe blistering at the scribe and ASTM ratings of 0 while similar epoxy siloxane resin systems cured with either the slower reacting commercial aminosilane or a blend of the slower reacting commercial aminosilane and Aminosilane A exhibited excellent corrosion resistance with ASTM scribe ratings of 6 after 1,500 hours salt fog exposure.

The aminosilane curative component of the current prototype provides an optimum balance of fast dry time and high hardness with improved flexibility, excellent corrosion resistance and exceptional UV durability.

2.4.3 Epoxy resins

The effect of epoxy resin structure, functionality and molecular weight on the performance properties of formulated epoxy siloxane coating systems was also investigated. Aliphatic, cycloaliphatic and aromatic epoxy resins were studied as well as epoxy resins based modification with core shell rubber and silica nanoparticle dispersions. Functionality and molecular weight of the epoxy resins were varied from 2 to 6 and about 300 to 1,500, respectively.

All of the formulations shown in Table 5 were based on a titanium dioxide pigmented resin blend of 53% siloxane resin and 47% of the indicated epoxy resin. Each pigmented resin system was cured with a blend of commercially available aminosilane and Aminosilane A and allowed to cure 2 weeks at ambient temperature before being placed in test.

Formulations based on the aromatic epoxy, core shell rubber dispersion epoxy and silica nanoparticle modified epoxy had poor gloss retention in QUV-B accelerated weathering tests. Low functionality, low molecular weight aliphatic epoxy resins tended to be water sensitive and had poor corrosion resistance in salt fog, cyclic Prohesion and Cleveland humidity testing. Low functionality, higher molecular weight epoxy resins had excellent flexibility but tended to have limited compatibility with the siloxane resin and low initial gloss. Medium functionality, medium molecular

weight aliphatic and cycloaliphatic epoxy resins generally provided the best combination of flexibility, UV durability and corrosion resistance.

Table 5. Epoxy resin formulation comparisons.

Epoxy Resin Structure	Comm. Epoxy Siloxane	Aromatic Epoxy	Aliphatic Epoxy A	Aliphatic Epoxy B	Cyclo Aliphatic Epoxy	Core Shell Rubber Dispersion Epoxy	Silica Nanoparticle Modified Epoxy	Aliphatic Epoxy C
MW/f	-	380/2	1062/6	1500/3	270/2	220/2	750/2	300/2
Conical Mandrel Elongation, % (ASTM D 522)	<3%	<3%	8.5%	22%	3.5%	3.5%	4.3%	4.5%
QUV-B, (ASTM G 154)								
60°gloss	100	100	100	100	100	100	100	100
% retention (ASTM D 523)								
initial	90	13	Detached From Substrate	90	90	30	65	102
2 week	70	Stopped Test -		80	70	10	60	100
4 week								
6 week	62			62	65	Stopped Test	55	95
8 week								
10 week	60			55	62		41	85
	55			50	60			82
Salt Fog, 750 hr (ASTM B 117)								
scribe rating (ASTM D 1654, Procedure A)	7	8	0	7	7	7	7	8

Referenced test methods:

ASTM D 522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

ASTM G 154 - Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

ASTM D 523 - Standard Test Method for Specular Gloss

ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM D 1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subject to Corrosive Environments

2.4.4 Siloxane resins

Because of their high solids content, low viscosity, excellent film forming properties and inherent resistance to degradation by ultraviolet light, alkoxy functional methylphenyl siloxanes are the silicone resins of choice for

formulating durable, ambient temperature curing epoxy siloxane coatings. Siloxane resins with 6 to 22% alkoxy content, methyl/phenyl ratios from 100/0 to 37/63 and molecular weights from 1000 to 1500 were evaluated by preparing a master batch of titanium dioxide pigmented aliphatic epoxy resin, post adding the siloxane resin and then curing the blend with a mixture of Aminosilane A and commercial aminosilane. As expected, all of the siloxane resins performed well in QUV-B accelerated weathering tests. In general, coatings based on siloxane resins with low 12% alkoxy content had good flexibility but were considered too soft for coating structures exposed to repeated handling, wear or abrasion. Coatings based on siloxane resins with high alkoxy content had excellent hardness and abrasion resistance but had low elongation and flexibility. The methyl/phenyl ratio in the siloxane resin was also optimized for compatibility and corrosion performance. The prototype coating is formulated, from siloxane resins which offered the best combination of gloss, flexibility, UV durability and corrosion resistance.

2.4.5 Corrosion inhibitors

A range of corrosion inhibitors were screened in the experimental formulas I and II shown above. A comparison of corrosion resistance on iron phosphate treated cold rolled steel is in the Table 6.

Table 6. Corrosion resistance comparisons using different types and concentrations of corrosion inhibitors.

Pigment	% Loading	Resin Formula	500 hr ASTM rating	700 hr ASTM rating
----	----	Commercial Epoxy Siloxane	5	4
----	----	I	4	4
Calcium inhibitor	10%	I	5	5
Magnesium inhibitor	10%	I	6	6
Calcium inhibitor	16%	I	7	6
Magnesium inhibitor	16%	I	6	6
----	----	II	6	5
Magnesium inhibitor	7%	II	8	7
Magnesium	10%	II	8	7

Pigment	% Loading	Resin Formula	500 hr ASTM rating	700 hr ASTM rating
inhibitor				
Calcium inhibitor	6%	II	5	4
Calcium inhibitor	11%	II	5	4

Magnesium oxide and calcium compounds were found to be the best corrosion inhibitors for these polysiloxane coating systems. Magnesium compounds give better performance at lower levels than the calcium compounds regardless of the resin composition.

The base resin system of experimental formula II has better corrosion resistance than the other epoxy polysiloxane coatings. When this is used in combination with magnesium oxide, superior performance is found with < 1 mm scribe creep after 500 hr. The UV durability of formula II with magnesium oxide as corrosion inhibitor does not make it useful as a direct to metal topcoat, however, this formula may find utility as a primer layer.

2.4.6 UV stabilizer package

Like many coating systems, epoxy siloxane coatings can benefit from inclusion of certain additives which protect the resin backbone from degradation by ultraviolet light. Accordingly, 15 light stabilizers were evaluated in various combinations in 54 different epoxy siloxane coating formulations by following gloss and color change using QUV-A and QUV-B accelerated weathering tests. Best results were obtained using a combination of ultraviolet light absorber and hindered amine light stabilizer.

2.4.7 Prototype formula

The prototype formula that was developed is based on a proprietary blend of aliphatic epoxy and siloxane resins, inhibitive pigments, ultra violet light stabilizers and aminosilane curatives. Compared to commercially available epoxy siloxane coatings, the new coating has high solids and low VOC, longer pot life with significantly faster dry times, higher hardness, improved flexibility and elongation, excellent resistance to a wide variety of chemicals including better resistance to organic acid and better corrosion resistance and UV durability. Application and performance properties are compared in Table 7 and Figure 8.

Table 7. Comparison of commercial and experimental epoxy siloxane coating materials.

Coating System	New Epoxy Siloxane	Commercial Epoxy Siloxane
Volume Solids, calculated	90%	90%
VOC, g/l, EPA Method 24	< 100g/l	<100g/l
Components	2	2
Mix ratio by volume	1.66 to 1.0	4 to 1
Dry film thickness per coat, mils	2 to 8	2 to 8
Pot life, hours	7	4
Dry times at 72F/40%RH (ASTM D 1640) dry to touch dry through	 30 to 40 minutes 60 to 75 minutes	 3 to 4 hours 7 to 8 hours
Konig hardness (ASTM D 4366, Method A)	90	74
Conical Mandrel Elongation (ASTM D 522) (after 3 days at 72°F + 11 days at 140°F)	4.5%	<3%
Salt Fog Exposure, 750 hours (ASTM B 117) Sandblasted Steel ASTM scribe rating (ASTM D 1654)	8	8
Cyclic Prohesion, 700 hour (ASTM D 5894) Bonderite 1000 smooth steel ASTM scribe rating (ASTM D 1654)	6	4
MEK Double Rubs (ASTM D 5402)	200+	200+
Chemical Spot Test, 24 hrs. (ASTM D 1308, Modified) NaOH, 50% HCL, conc. H_2SO_4, 98% Phenol, 85% H_3PO_4, 85% Acetone Ammonium Hydroxide, 28% Ethanol Acetic Acid, Glacial Cumene	 10 6 0 0 10 10 10 8 10 0	 10 10 0 0 10 10 10 0 10 0

Methods reference in table above:

EPA Method 24 - Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

ASTM D 1640 - Standard Test Method for Drying, Curing, or Film Formation of Organic coatings at Room Temperatures

ASTM D 4366, Method A - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests, Method A - Konig Pendulum Hardness Test

ASTM D 522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM D 1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subject to Corrosive Environments

ASTM D 5894 - Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)

ASTM D 5402 - Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs

ASTM D 1308, Modified - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes

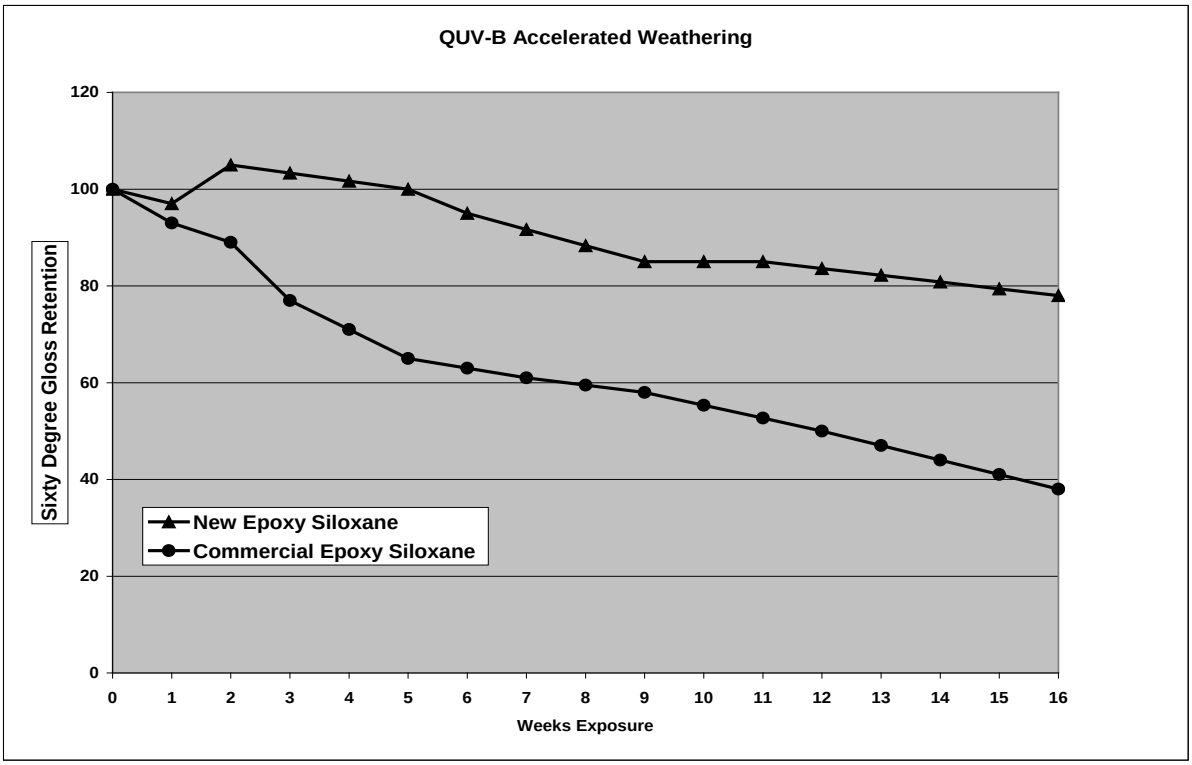

Figure 8. Accelerated weathering comparison of commercial coating and experimental formulation.

3 Discussion

3.1 Metrics

3.1.1 Materials and sample preparation

To assess the corrosion protection provided by the fire-protective coating, the coating system was compared with standard coating systems for exterior steel facilities as given in Unified Facilities Guide Specification (UFGS) 09 90 00, *Paints and Coatings*. The baseline standard coating systems for exterior ferrous metal are based on coatings specifications from the Master Painters Institute, Burnaby, BC, and are listed in the guide specification are as follows:

- System 1:
  - Primer: MPI #23, Surface Tolerant Metal Primer
  - Intermediate and Top Coats: MPI #9, Exterior Alkyd Enamel, Gloss, MPI Gloss Level 6 (i.e., a semi-gloss)
- System 2:
  - Primer: MPI #23, Surface Tolerant Metal Primer
  - Intermediate and Top Coats: MPI #94, Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5 (Note: this is a semi-gloss)

Coatings meeting the requirements of the MPI specifications were (1) selected from MPI's *Approved Products List*, (2) all made by a single manufacturer, and (3) applied in accordance with the manufacturer's printed instructions.

Several other coating systems were included in the exposure tests, including the primer and topcoat used on Buildings 227 and 299 (without the intumescent intermediate coat), and several alternative systems. These systems are described in Table 8.

Panels measuring 12 x 3 in. (a few prepared at ERDC CERL were 9 x 3 in.) were painted with the various systems and were scribed prior to exposure with a 2 in. long cut to bare metal parallel to the long edge and placed in the lower half of the panel.

Table 8. Coating systems included in exposure tests.

Coating System	1	2	3	4	5	8	9	10	11	12	14	15	16	17	18	19	20	21
Epoxy Mastic Primer	X	X	X	X	X	X	X	X	X	X	X	X	X					
Intumescent Epoxy Mid-Coat	X	X	X	X	X													
High Build Semi-gloss Polyurethane Topcoat	X					X												
Direct-to-metal Urethane Mastic		X					X							X				
Waterbase Gloss Exterior Acrylic			X					X										
Epoxy Siloxane				X					X						X			
Two-component Fluoropolymer					X					X								
Aliphatic Acrylic-Polyester Polyurethane											X							
High-Performance Acrylic												X						
Chlorinated Rubber Micaceous Iron Oxide Topcoat													X			X		
MPI Paint # 23 Surface Tolerant Metal Primer																	X	X
MPI Paint #9 Exterior Alkyd Enamel, Gloss																	X	
MPI Paint #94 Exterior Alkyd, Semi-Gloss																		X

Note: System 1 was the coating system installed on Buildings 227 and 299. Systems 20 and 21 are the baseline standard systems from UFGS 09 90 00.

3.1.2 Coupon test rack

A coupon test rack was mounted at a 45-degree angle facing south on the sunny south side of Building 227 (Figure 9). Duplicate sets of test panels were exposed in accordance with ASTM D 1014, *Standard Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates,* the performance of the coating systems was periodically rated in accordance with ASTM D 1654, *Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments, Method 1 (Air Blow-off).*

Figure 9. Coupon rack in place for outdoor exposure test.

This panel rating period was not yet complete at the time of publication of this report. The data for the six-month rating is provided below. Additional data will be provided in a supplement to this report.

3.1.3 Accelerated laboratory testing

Duplicate panels were exposed to a cycle of 7 days of salt fog and 7 days of a UV light / condensation cycle in accordance with ASTM D 5895, *Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)* for a total of 2,000 hours.

3.2 Results

3.2.1 Coating performance

The demonstration project to apply fire protective and corrosion resistant coatings at Rock Island Arsenal was successfully completed. Test panels of various fire and corrosion resistant systems were created and are undergoing exposure testing on an outdoor exposure rack in the corrosive environment near Building 227 at Rock Island Arsenal.

3.2.2 Formulation enhancement studies

An aliphatic epoxy and siloxane resin based prototype coating was developed that exhibits improvements in VOC, pot life, dry time, hardness, flexibility and elongation, chemical and corrosion resistance, and UV durability.

3.3 Lessons learned

This project provided the researchers with an excellent opportunity to demonstrate the application of its intumescent fire-protective coating system to the DoD facilities community; to evaluate the adhesion and corrosion resistance of several commercially available coatings systems in the corrosive environment of Building 227; and to work to develop new fire protective coating technology with improved corrosion resistance and other properties.

The process for application of the intumescent coating system is not much different than the approach taken to any industrial painting project, a process with which most facilities are familiar. Effective management of an industrial painting project must include attention to the following:

- Bid / Contract Scope language needs to be very specific. All parties need to agree in writing on the scope of the project.
- A coating system test panel prepared on a steel panel prior to beginning the work on the structure. This appearance test panel should be approved by all parties and be retained to serve as a reference for all work on the structures.
- The abrasive blast equipment and the heated plural component spray equipment are heavy and bulky, and the plans for movement of material and equipment must be coordinated among all parties.
- Where possible, the planned start date should take into consideration the time of year and normal temperatures ranges typically encountered. This can avoid exposing personnel to excessive heat within enclosed work area(s), and can prevent interruptions in coating application when the temperature falls outside the manufacturer's recommended range for coating application and curing.
- Placement of waste receptacles onsite and timely pick-up of waste such as spent abrasive media and paint and solvent wastes should be coordinated in advance with an approved local waste disposal company.

4 Economic Summary

4.1 Costs and assumptions

Demonstration project costs are shown below:

Funding Source	*OSD*	*Matching*
Labor	150	175
Materials	250	250
Navy / Air Force Support	20	20
Travel	20	20
Report	60	35
Total	500	500

Critical steel structures and components are painted on a 15 year cycle, at a cost of $2.2M. The maintenance of the coating systems and maintenance and repair of the painted structure and components is $150K.

The annual costs of mission impact due to corrosion of the structure is $50K. In this model two fire events are included in years 15 and 30, and savings of $8M and $6M are attributed to the performance of the intumescent paint in reducing fire damage.

The new paint system will be maintained at an annual cost of $40K, commencing after year 10.

4.2 Return-on-investment computation

1) Projected Useful Life Savings (ULS) is equal to the “Net Present Value (NPV) of Benefits and Savings” calculated from the Spreadsheet shown in Appendix 1 that is based on Appendix B of OMB Circular A94.

ULS= $8,755K (from OMB Spreadsheet.

2) Project Cost (PC) is shown as “Investment Required” in OMB Spreadsheet in Appendix 1; PC= $1,000K.

3) Potential ROI – Computation

$$\text{Potential ROI} = \frac{\text{ULS } \$\ 8{,}755\text{K}}{\text{PC } \$\ 1{,}000\text{K}} = 8.76$$

The calculated ROI for this project, which is based on current best practices, projected maintenance and rehab cost, has the potential to increase over the multiple year implementation due to reduction in down time, which will result in increased indirect savings.

Table 9. Return-on-investment calculation.

				Investment Required			**1,000,000**
				Return on Investment Ratio	**8.76**	**Percent**	**876%**
				Net Present Value of Costs and Benefits/Savings	**215,412**	**8,970,600**	**8,755,188**
A Future Year	**B Baseline Costs**	**C Baseline Benefits/ Savings**	**D New System Costs**	**E New System Benefits/ Savings**	**F Present Value of Costs**	**G Present Value of Savings**	**H Total Present Value**
1	2,350,000			50,000		2,243,040	2,243,040
2	150,000			50,000		174,680	174,680
3	150,000			50,000		163,260	163,260
4	150,000			50,000		152,580	152,580
5	150,000			50,000		142,600	142,600
6	150,000			50,000		133,260	133,260
7	150,000			50,000		124,540	124,540
8	150,000			50,000		116,400	116,400
9	150,000			50,000		108,780	108,780
10	150,000			50,000		101,660	101,660
11	150,000		40,000	50,000	19,004	95,020	76,016
12	150,000		40,000	50,000	17,760	88,800	71,040
13	150,000		40,000	50,000	16,600	83,000	66,400
14	150,000		40,000	50,000	15,512	77,560	62,048
15	150,000		40,000	8,050,000	14,496	2,971,680	2,957,184
16	2,350,000		40,000	50,000	13,548	812,880	799,332
17	150,000		40,000	50,000	12,664	63,320	50,656
18	150,000		40,000	50,000	11,836	59,180	47,344
19	150,000		40,000	50,000	11,060	55,300	44,240
20	150,000		40,000	50,000	10,336	51,680	41,344
21	150,000		40,000	50,000	9,660	48,300	38,640
22	150,000		40,000	50,000	9,028	45,140	36,112
23	150,000		40,000	50,000	8,436	42,180	33,744
24	150,000		40,000	50,000	7,884	39,420	31,536
25	150,000		40,000	50,000	7,368	36,840	29,472
26	150,000		40,000	50,000	6,888	34,440	27,552
27	150,000		40,000	50,000	6,436	32,180	25,744
28	150,000		40,000	50,000	6,016	30,080	24,064
29	150,000		40,000	50,000	5,624	28,120	22,496
30	150,000		40,000	6,050,000	5,266	814,680	809,424

5 Conclusions and Recommendations

5.1 Conclusions

The coating system demonstrated in this project has been shown to provide good corrosion protection to the steel in corrosive environments in accelerated laboratory tests and on the structures at Rock Island Arsenal. Additionally, the system is designed to protect the steel from reaching high temperatures in a fire for up to 3 hours. This system has the potential to provide the benefits of this protection to many types of structures across the DoD.

5.2 Recommendations

5.2.1 Applicability

Within the Department of Defense, a number of possibilities exist for the improvement of asset protection by the use of fire protective corrosion resistant coatings. A non-exhaustive list of these opportunities is shown in Table 10. It should be noted that the specifications on this table are of a general nature only. Where fire protection is required, it is necessary that requirements of the specific situation to be assessed to determine the appropriate type of coating system that will provide the most effective protection.

Table 10. Opportunities for technology implementation.

Structure Type	Substrate	Relevant Testing	Specification Recommended
Power Plant	Structural Steel	Cellulosic Fire, UL 263	3 hr rating 0.53" Flexible Epoxy Intumscent
Interior	Structural Steel	Cellulosic Fire, UL 263	1 hr rating interior Thin Film Thickness per steel size
Hangar	Structural Steel	Cellulosic Fire, UL 263	3 hr rating 0.53" Flexible Epoxy Intumscent
Fuel Storage Tanks	Steel vessel	D.O.T.	200 mil Pitt-Char XP
	Vessel supports	Hydrocarbon/ Jet Fire, UL 1709	2 hr, thickness per steel size
Cryogenic fuel Storage	Steel vessel	OTI-95-634 Chartrek 7 Jet Fire Certification	2 hr jet fire on vessels 2" foamglas plus 8mm Flexible Epoxy Intumescent

Structure Type	Substrate	Relevant Testing	Specification Recommended
Fuel Pipelines	Steel Pipe	Hydrocarbon/ Jet Fire, UL 1709	2 hr jet fire per steel size
Cryogenic Fuel pipe	Steel Pipe	Hydrocarbon/ Jet Fire, UL 1709	2" foamglas plus 11mm Flexible Epoxy Intumescent
Interior/Exterior	Structural Steel	Cellulosic Fire, UL 263	3 hr rating 0.53" Flexible Epoxy Intumscent

Relevant standards:

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

UL 263 - Standard for Fire Tests of Building Construction and Materials

UL 1709 - Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel

5.2.2 Implementation

DoD criteria documents cover cementitious or fiber-based fireproofing (UFGS-07 81 00 Spray-Applied Fireproofing April 2006) and detailed design criteria (UFC 3-600-01 26 Fire Protection Engineering for Facilities, September 2006), but these documents do not address the available intumescent coating systems. These documents need to be updated to allow application of the new, flexible epoxy intumescent coating systems. Ideally, an product specification will be adopted by SSPC - The Society for Protective Coatings, or the Master Painter's Institute so that the product specification can be referenced in the UFGS as a system.

A recommendation for implementation language is included in Appendix D.

Appendix A: Project Management Plan for CPC Project FAR-13

DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON DC 20310-0600

25 MAR 2005

DAIM-FD S: 15 Oct 2005

MEMORANDUM FOR DIRECTOR, INSTALLATION MANAGEMENT AGENCY, 2511 JEFFERSON DAVIS HIGHWAY, ARLINGTON VA 22202-3926

SUBJECT: FY 06 Army Corrosion Control Program

1. OSD has tentatively allocated a total of $15.0M in FY 06 matching funds for implementation of corrosion prevention and control projects for equipment and facilities. The enclosed list of Army projects, totaling $13.3M, will be presented for approval to OSD in April 05.

2. The Army programming target is not less than $10.0M of facility related projects in an effort to obtain a minimum of $5.0M of the OSD matching funds. To participate in OSD's funding augumentation, HQIMA will reserve $5.0M in FY06 OMA funds, to be released to ERDC-CERL upon confirmation by this office that OSD matching funds are available. Further instructions on the actual distribution of funds will follow at that time.

3. POC for this action is Mr. David N. Purcell, or (703) 601-0371, David.Purcell@hqda.army.mil.

4. Quality Facilities for Quality Soldiers!

FOR THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT:

MARK A. LORING
Colonel, GS
Director, Facilities and Housing

Encl
as

CF:
DACSIM

TRI SERVICE PROGRAM
EQUIPMENT/ FACILITIES

CORROSION PREVENTION AND CONTROL PROJECT PLAN

Coating System For Corrosion Prevention and Fire Resistance for Metal Structures (OMA)

15 June 2005

Submitted By:

Vincent F. Hock

U. S. Army Engineer Research & Development Center (ERDC)

Construction Engineering Research Laboratory (CERL)

Comm: 217-373-6753

(Project Number to be assigned by OSD when approved)

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

1. STATEMENT OF NEED

PROBLEM STATEMENT:

Fire protective coatings are used to protect structural elements in hangars, motor pools, fuel systems, and ships. They can be used to protect munitions and military vehicles/vessels from fire. Key infrastructure will be protected from collapse as a result of fire. Fire protective coatings include cementitious materials and organic based intumescent coatings.

Currently, organic coatings generally use resins such as solution vinyls, and latexes. Solution vinyls are slowly disappearing because of their high solvent content and the need for environmentally friendly coatings. Water-based latex coatings are generally used in what is often referred to as thin film intumescents (approximately 50 mils in thickness when applied) and provide up to 2 hours fire protection, but because of their composition tend not to be durable and provide little corrosion protection.

New, innovative epoxy intumescent coatings are much more durable and keep structural steel from reaching 1000 deg. F. in order to prevent softening of the steel and a significant loss of strength for up to 4 hours. Formulated with nano corrosion inhibitors, they provide excellent corrosion protection to the substrate.

Fire protection is a concern at the Rock Island Arsenal (RIA) maintenance facilities. The commonly used protective coatings on steel structures are susceptible to peeling and spalling, or other deterioration, due to the combined effect of exposure to sunlight, changing humidity, and hot and cold cycles experienced during weathering.

IMPACT STATEMENT: If this project is not funded, mission critical structures, such as manufacturing and storage facilities, boiler plant, vehicle maintenance facilities, and other at risk structures will remain at risk to fire damage, and will continue to corrode.

The technology proposed for implementation is not a routine maintenance technology. It is an emerging corrosion prevention and control and fire protection technology, which means that, although it is mature, it has not been widely implemented at Army installations.

The epoxy intumescent coating is a new technology that has been used in non-military applications, such as chemical plants, refineries, power plants, and other industrial applications. Use of this coating system at aircraft facilities will greatly enhance corrosion and fire protection of the structures.

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

The project has the potential for far-reaching impact across the DoD. Specifications and standards will be developed, along with a final report describing the project and its results. The corrosion and fire resistant coating technology will be available for implementation DoD wide in aircraft facilties, vehicle maintenance facilities, munitions storage facilities, and other industrial structures where a fire protective coating is needed.

2. PROPOSED SOLUTION

TECHNICAL DESCRIPTION: Coatings can serve as passive fire protection methods. Cementitious coatings and sprayed fiber systems are heavy, bulky, and inflexible. They do not adhere well to surfaces and are subject to spalling.

Intumescent coatings are based on traditional paint resins, such as solution vinyl, latex, and epoxy, and are applied as thin films like traditional paints. The resins allow the coatings to form tight bonds to structural surfaces. When exposed to fire, the intumescent coating reacts by expanding. It is transformed to a thick, ceramic-like, insulating char that provides thermal protection for the substrate.

Solution vinyls are slowly disappearing because of their high solvent content and the need for environmentally friendly coatings. Water-based latex coatings are generally used in what is referred to as thin film intumescents (approximately 50 mils in thickness when applied). These coatings provide up to 2 hours fire protection but because of their composition tend not to be durable outside and are typically used on interior structural steelwork of commercial buildings.

Epoxy coatings are very durable, can provide fire protection of 4 hours or more, but tend to be expensive and difficult to apply. The High Performance Coatings Group of PPG has been developing fire protective coatings for over 20 years. New advancements in fire protective coatings include the Pitt Char coating line.

Because the Pitt Char XP Fire Protective Coating is an epoxy, it resists solvents, acids, alkalis, salts and abrasion while retaining its fire protective properties. The coating bonds tightly and cures to form a dense, impervious barrier that blocks corrosives such as salt spray and moisture. It is a tough coating that withstands damage from impact. The coating is unique in that it is flexible, with elongation over 19%. It will adhere to structural steel and other metals, and fiberglass reinforced composites.

When applied under recommended conditions, it will stand up to conditions ranging from artic to tropical. The coating is virtually maintenance-free.

TECHNOLOGY MATURITY: This technology is mature. The intumescent epoxy

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

coating is commercially available.

RISK ANALYSIS: This is a **low risk** project, as the coating system proposed for use has been in select applications by industry, though not widely implemented for DoD applications.

EXPECTED DELIVERABLES AND RESULTS/OUTCOMES: Candidate structures at Rock Island Arsenal will be assessed for application of the intumescent epoxy system. The coating system will be applied to one hangar and one additional structure selected by the installation. The coating will be monitored for one year to validate the material performance. It is expected that the corrosion and fire protective coating system will provide excellent protection against atmospheric corrosion, and extend the surface life of the hangar by another 15 years, as well as reduce maintenance costs and provide the benefits of fire protection. Specifications for the coating system will be developed, including surface preparation, coating application, and maintenance painting. Training on the maintenance of the coatings will be provided to RIA personnel.

PROGRAM MANAGEMENT: The Project Manager will be Mr. Vince Hock. The Associate Project Manager is Ms. Susan Drozdz. Mr. Martin Savoie is the Chief of the ERDC/CERL Materials and Structure Branch. The stakeholder will be Mr. Jerry Sechser (Rock Island Arsenal DPW POC), Mr. Tom Shields (IMA NWRO), Mr. Paul Volkmann (HQ-IMA), Mr. David Purcell (HQ-ACSIM), as well as the Tri-Services WIPT representatives Ms. Nancy Coleal (AFCESA/CESM), and Mr. Tom Tehada (NFESC).

The customer representative is Mr. Robert Kalantari, Rock Island Arsenal. The technology will help RIA improve corrosion control and fire protection of their critical structures. **The Army plans to provide matching funds ($500K) for FY06 through HQ-IMA (See Memorandum from ACSIM attached as Appendix 2).** Coordination with the Army Corrosion Program Office will be through Mr. Hilton Mills (AMC).

This is a Tri-Service Project. Funds have been requested for Air Force, Army, and Navy representatives to participate in the evaluation of technology implementation.

3. COST/BENEFITS ANALYSIS

a. Funding ($K):

Funding Source	OSD	Matching
Labor	150	175
Materials	250	250
Navy / Air Force Support	20	20

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

Travel	20	20
Report	60	35
Total	500	500

Development of Project Budget

The $1M budget ($500K OSD, supplemented by $500K matching funds from IMA) is realistic and adequate for the project scope. This budget had been developed based on a detailed needs assessment for the structures.

b. Return-On-Investment Computation:

1) Projected Useful Life Savings (ULS) is equal to the "Net Present Value (NPV) of Benefits and Savings" calculated from the Spreadsheet shown in Appendix 1 that is based on Appendix B of OMB Circular A94.

ULS= $8,755K (from OMB Spreadsheet in Appendix 1. Assumptions for this calculation are also given in Appendix 1).

2) Project Cost (PC) is shown as "Investment Required" in OMB Spreadsheet in Appendix 1; PC= $1,000K.

3) Potential ROI – Computation (See Appendix 1).

$$\text{Potential ROI} = \frac{\text{ULS}}{\text{PC}} = \frac{\$\ 8{,}755\text{K}}{\$\ 1{,}000\text{K}} = 8.76$$

The calculated ROI for this project, which is based on current best practices, projected maintenance and rehab cost, has the potential to increase over the multiple year implementation due to reduction in down time, which will result in increased indirect savings.

c. Mission Criticality: The operational benefits of implementation of the corrosion index for mission critical systems are: 1) enhanced life safety and reliability, 2) life extension and reduced maintenance and repair for DoD facilities and equipment.

4. SCHEDULE

MILESTONE CHART

EVENT	MONTHS AFTER RECEIPT OF FUNDS
Award Contract	2
Select Structures to be Coated	4

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

Initiate Implementation of Corrosion And Fire Protective Coating System	6
Complete ROI Validation	18
Complete Documentation	18

a. Note: If project is approved, ***bi-monthly status reports will be submitted*** (i.e. starting the first week of the second month after contract award and every two months thereafter until final report is completed). This report will be submitted to the DoD CPC Policy & Oversight office. Report will include project number, progress summary (and/or any issues), performance goals and metrics and upcoming events.

b. Examples of performance goals and metrics: include achieving specific milestones, showing positive trend toward achieving the forecasted ROI, reaching specific performance quality levels, meeting test and evaluation parameters, and/or successfully demonstrating a new system prototype.

Development Project Schedule
This project to establish rates of corrosion and impact of corrosion damage in specific environments will be completed, including final report, within 18 months.

The goals of the project are: reducing the corrosion rate of the structural steel and increasing fire safety for the structures at Rock Island Arsenal, as well as validating the technology for other uses across the DoD. Detailed milestones are given in the schedule section. Implementation of the coating system will be accomplished by Contractors. ERDC-CERL will provide overall management, contract monitoring and provide bi-monthly reports. Existing contract mechanisms, such as IDIQ. ERDC-CERL will be able to award the contracts within 60 days of receipt of funds. Potential contractors have been identified.

5. IMPLEMENTATION

a. Transition approach: Where appropriate, Unified Facilities Guide Specifications (UFGS), Engineering Instructions (EI), Technical Instructions (TI), and Technical Manuals (TM), including updates, along with a final report describing the details of the project, will be developed and posted on the OSD Corrosion Exchange website.

It is the intent of the Project Management Plan (PMP) to implement the corrosion index at all DoD installations worldwide.

b. Final Report: A final report will be written 60 days after the project is completed. The report will reflect the project plan format as implemented and will include lessons learned.

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

Projected Benefits:
Based on the results of the initial implementation of this approach for the USAF aircraft fleets, this project will be used to optimize materials selection and corrosion management approaches at the local level for DoD installations.

Operational Readiness
An understanding of the local corrosion environment, corrosion rates for various materials, and the impact of corrosion damage will allow system developers and construction managers to select materials and plan corrosion prevention and control practices that will enhance the performance, reliability and safety of DoD equipment and facilities.

Management Support
This project enjoys the support of the Rock Island Arsenal DPW Office, specifically, Mr. Jerry Sechser, Director, Public Works. IMA-NWRO has also provided its support. HQ-ACSIM plans to provide matching funds ($500K) for FY06. See the attached Memorandum from ACSIM Director for Facilities and Housing in Appendix 2.

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

6. COORDINATION SHEET

ORGANIZATION	SIGNATURE	DATE
Asscciate Project Manager		14 Jun 05
Project Manager		14 June 05
ERDC /CERL Branch Chief		14 June 05
Rock Island Arsenal DPW		29 Sep 05
IMA Northwest Region		9/27/05
HQ ACSIM	/s/	15 June 05
HQ AMC		29 Sept 05
Tri Service Facilities WIPT Chair	/s/	15 June 05
HQ IMA		15 June 05

This is a Tri-Service Project. Funds have been requested for Air Force, Army and Navy representatives to participate in the evaluation of technology implementation.

JUN-15-05 WED 09:45 AM FAX NO. P. 04

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

6. COORDINATION SHEET

ORGANIZATION	SIGNATURE	DATE
Program Manager		
Project Manager		
ERDC /CERL Branch Chief		
Rock Island Arsenal DPW		
IMA Northwest Region		
HQ ACSIM	D Purcell	15 June 05
HQ AMC		
Tri Service Facilities WIPT Chair		

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TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

6. COORDINATION SHEET

ORGANIZATION	SIGNATURE	DATE
Program Manager		
Project Manager		
ERDC /CERL Branch Chief		
Rock Island Arsenal DPW		
IMA Northwest Region		
HQ ACSIM		
HQ AMC		
Tri Service Facilities WIPT Chair HQ IMA		6/15/05

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TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

6. COORDINATION SHEET

ORGANIZATION	SIGNATURE	DATE
Associate Project Manager		
Project Manager		
ERDC /CERL Branch Chief		
Rock Island Arsenal DPW		
IMA Northwest Region		
HQ ACSIM		
HQ AMC		
Tri Service Facilities WIPT Chair	Thomas Schade	6/15/05

This is a Tri-Service Project. Funds have been requested for Air Force, Army and Navy representatives to participate in the evaluation of technology implementation.

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

APPENDIX 1
POTENTIAL ROI CALCULATIONS BASED ON OMB CIRCULAR A94

1. Critical steel structures and components are painted on a 15 year cycle, at a cost of $2.2M. The maintenance of the coating systems and maintenance and repair of the painted structure and components is $150K per year.

2. The annual cost of mission impact due to corrosion of the structure is $50K. In this model two fire events are included in years 15 and 30, and savings of $8M and $6M are attributed to the performance of the intumescent paint in reducing fire damage.

3. The new paint system will be maintained at an annual cost of $40K per year, commencing after year 10.

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

Return on Investment Calculation

				Investment Required			1,000,000
				Return on Investment Ratio	8.76	Percent	876%
				Net Present Value of Costs and Benefits/Savings	215,412	8,970,600	8,755,188
A Future Year	B Baseline Costs	C Baseline Benefits/ Savings	D New System Costs	E New System Benefits/ Savings	F Present Value of Costs	G Present Value of Savings	H Total Present Value
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9	150,000			50,000		108,780	108,780
10	150,000			50,000		101,660	101,660
11	150,000		40,000	50,000	19,004	95,020	76,016
12	150,000		40,000	50,000	17,760	88,800	71,040
13	150,000		40,000	50,000	16,600	83,000	66,400
14	150,000		40,000	50,000	15,512	77,560	62,048
15	150,000		40,000	8,050,000	14,496	2,971,680	2,957,184
16	2,350,000		40,000	50,000	13,548	812,880	799,332
17	150,000		40,000	50,000	12,664	63,320	50,656
18	150,000		40,000	50,000	11,836	59,180	47,344
19	150,000		40,000	50,000	11,060	55,300	44,240
20	150,000		40,000	50,000	10,336	51,680	41,344
21	150,000		40,000	50,000	9,660	48,300	38,640
22	150,000		40,000	50,000	9,028	45,140	36,112
23	150,000		40,000	50,000	8,436	42,180	33,744
24	150,000		40,000	50,000	7,884	39,420	31,536
25	150,000		40,000	50,000	7,368	36,840	29,472
26	150,000		40,000	50,000	6,888	34,440	27,552
27	150,000		40,000	50,000	6,436	32,180	25,744
28	150,000		40,000	50,000	6,016	30,080	24,064
29	150,000		40,000	50,000	5,624	28,120	22,496
30	150,000		40,000	6,050,000	5,266	814,680	809,424

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

	Old System Cost			New System Cost	Benefits		
	Maintain	Paint	Total	Maintenance	Impact	Fire	Total
1	$150,000	$2,200,000	$2,350,000		$50,000		$50,000
2	$150,000		$150,000		$50,000		$50,000
3	$150,000		$150,000		$50,000		$50,000
4	$150,000		$150,000		$50,000		$50,000
5	$150,000		$150,000		$50,000		$50,000
6	$150,000		$150,000		$50,000		$50,000
7	$150,000		$150,000		$50,000		$50,000
8	$150,000		$150,000		$50,000		$50,000
9	$150,000		$150,000		$50,000		$50,000
10	$150,000		$150,000		$50,000		$50,000
11	$150,000		$150,000	$40,000	$50,000		$50,000
12	$150,000		$150,000	$40,000	$50,000		$50,000
13	$150,000		$150,000	$40,000	$50,000		$50,000
14	$150,000		$150,000	$40,000	$50,000		$50,000
15	$150,000		$150,000	$40,000	$50,000	$8,000,000	$8,050,000
16	$150,000	$2,200,000	$2,350,000	$40,000	$50,000		$50,000
17	$150,000		$150,000	$40,000	$50,000		$50,000
18	$150,000		$150,000	$40,000	$50,000		$50,000
19	$150,000		$150,000	$40,000	$50,000		$50,000
20	$150,000		$150,000	$40,000	$50,000		$50,000
21	$150,000		$150,000	$40,000	$50,000		$50,000
22	$150,000		$150,000	$40,000	$50,000		$50,000
23	$150,000		$150,000	$40,000	$50,000		$50,000
24	$150,000		$150,000	$40,000	$50,000		$50,000
25	$150,000		$150,000	$40,000	$50,000		$50,000
26	$150,000		$150,000	$40,000	$50,000		$50,000
27	$150,000		$150,000	$40,000	$50,000		$50,000
28	$150,000		$150,000	$40,000	$50,000		$50,000
29	$150,000		$150,000	$40,000	$50,000		$50,000
30	$150,000		$150,000	$40,000	$50,000	$6,000,000	$6,050,000

TRI SERVICE PROGRAM
DOD EQUIPMENT / FACILITIES
Coating System For Corrosion Prevention and Fire Resistance for Metal Structures

APPENDIX 2

Appendix B: Contractor's Work and Safety Plan

PPG Industries Inc.

Final Work Plan for

Rock Island Arsenal
Fire Protective Coatings Project

February 26, 2007

Contract # W9132T-PPG-001

Table of Contents

PPG's Role

PPG will provide inspection of the application at critical points as described below:

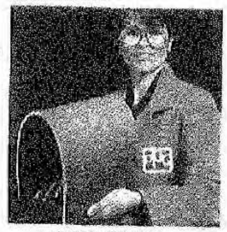
- Mobilization to the work area.
- After surface preparation, but prior to primer application
- After primer application, but prior to fireproofing application
- After fireproofing application, but prior to finish coat application
- After finish coat application, but prior to de-mobilization from the work area

Additionally, PPG will provide inspection on an as "needed basis" depending upon the results of the scheduled inspections.

PPG will provide all reports as set forth in the contract.

PPG will monitor the applied coatings approximately six months after the coating application is completed. Date shall be coordinated with the COTR.

TECHNOLOGY



Pitt-Char XP Coating is the result of the culmination of intensive research and development effort in which PPG has invested since 1986. *Pitt-Char XP* Coating is the only flexible intumescent epoxy (elongation over 12%) on the market today. The technology has several patents issued with more pending.

Pitt-Char XP Coating is unique due to its flexibility

INTUMESCENT PROCESS

Pitt-Char XP Coating is an intumescent coating. In harsh weather or chemical environments, the tough, durable epoxy coating provides a dense shield to the elements. However, when exposed to a fire, the coating softens, gases are released, and become trapped in the polymer matrix. The material swells or intumesces to several times its original thickness. The resultant foamed char provides an insulating barrier against the heat of the fire.

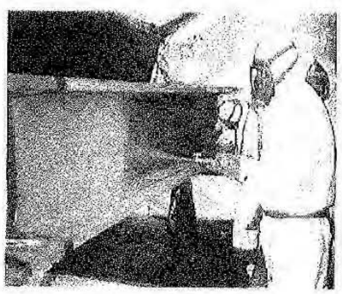
CORROSION

Because *Pitt-Char XP* Fire Protective Coating is an epoxy, it resists solvents, acids, alkalis, salts and abrasion while retaining its fire protective properties. The coating bonds tightly and cures to form a dense, impervious barrier that blocks corrosives like salt spray and constant moisture. With *Pitt-Char XP* Coating, you are assured of superior fire and corrosion protection in virtually any aggressive industrial environment in arctic or tropical climates.

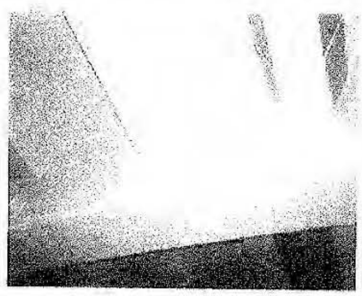
FLEXIBILITY

Pitt-Char XP Coating is based on a patented, flexible cross linked epoxy resin. The unique resin provides many positive attributes that enhance the coating's performance over other conventional epoxy intumescent coatings.

1. The flexibility allows the coating to relieve internal stresses generated during thermal cycling which prevents cracking and disbonding.
2. The coating can withstand the normal movement and/or vibrations found in steel support structures.
3. The high impact strength minimizes damage from physical contact occurring during construction or during normal operating conditions.
4. Pre-fabricated structures can be coated and transported to site without cracking or disbonding of the coating.
5. The resin system has excellent surface wetting characteristics to ensure good adhesion to the substrate.
6. The controlled cure rate allows ample time to install mesh and prevent inter coat adhesion problems.
7. The flexible coating imparts less stress upon the primer during curing thus minimizing the potential for primer adhesion failure.
8. *Pitt-Char XP* A & B Components can withstand storage at elevated temperatures (pre-heating prior to application) at 60°C for 4 to 5 days without hardening. Problems of hardening in the spray equipment holding tanks and the feed lines has been eliminated unlike rigid epoxy intumescent coatings.
9. The pot life after mixing is extended thus minimizing curing of the material in the feed hose, mixer, and spray gun.
10. *Pitt-Char XP* Coating is very user friendly. It allows application under a wide range of weather and temperature conditions without compromising the long term performance.



Application of *Pitt-Char XP* Coating prior to fabrication at an offsite location.



Deck section showing an coated pressure ... and the coating on the ... members.

COST EFFECTIVE VIEW – LOW MAINTENANCE FREE

Pitt Char XP Coating is generally more cost-effective when compared to conventional alternatives. Make your own life cycle cost comparisons. With *Pitt Char XP* Coating, application is fast and economical. Protection lasts longer because adhesion is stronger and corrosion resistance is higher. The tough surface of *Pitt-Char XP* Coating withstands impact that would seriously damage conventional coatings. The result: The protection that lasts longer and costs less.

- *Pitt Char XP* Coating is applied by a global network of trained certified applicators.
- PPG provides technical sales support to customers during the project design/specification phase.
- PPG provides global field technical support to our applicators.
- PPG has product warehousing facilities in the USA, UK, Norway, and Singapore.
- PPG is ISO-9001 certified by Lloyd's Register Quality Assurance.

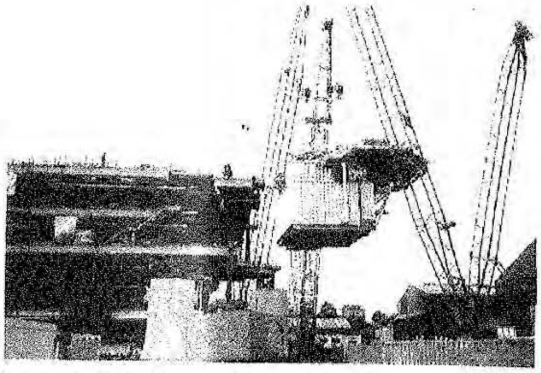
JOB HISTORY

Pitt-Char Coatings have been on the field since 1983 protecting substrates in a wide range of facilities including light industrial, refineries, chemical plants and offshore platforms. These facilities are world wide and cover the whole spectrum of climates and local environmental exposures. A detailed job history list is available upon request.

PRODUCT DATA

Pitt-Char XP Fire Protective Coating is a two component epoxy based intumescent coating. The unique, patented composition of *Pitt Char XP* Coating provides a flexible and tough epoxy barrier which transforms into a ceramic like, insulating char that provides thermal protection to the substrate even under hydrocarbon and jetfire conditions. *Pitt Char XP* Coating also protects the substrate from corrosion and retains its fire protection properties under aggressive chemical environments.

Color	Gray (after mixing). May be topcoated. A suitable topcoat recommendation is available from your *Pitt Char XP* Coating Technical Sales Representative.
Percent Solids by Weight	100%
In Service Temperature Restrictions	For applications on surfaces that exceed 150°F (65.6°C), consult your *Pitt Char XP* Coating Technical Sales Representative.
Application Method	*Pitt Char XP* coating must be applied only by trained applicators to ensure that proven application practices will be utilized. Air spray or specialized plural component airless spray equipment approved by PPG is recommended. Trowelling can be used for small areas or touch-up work.
Drying Time	Approximately 24 hours to achieve a Shore D hardness of 75.
Shelf Life	Minimum shelf life under proper storage condition is: 97-193 and 97-193M – 1 Year from date of manufacture. 97-195 and 97-195M – 2 Years from date of manufacture.
Pot Life	At 77°F (25°C) and 50% relative humidity: Approximately 30 minutes. (Pot life is not a factor when using specialized plural component airless spray equipment.)
Packaging and Availability	*Pitt-Char XP* Coating is packaged either as a 2-container kit for plural component spray equipment or as a 2 container kit for solvent reduced mastic spray. The plural spray kit is comprised of: 2 oversized containers of Component A (97-194) – 58.0 lbs. (26.18 kg) 1 – 5 gallon container of Component B (97-195) – 36.3 lbs. (16.2 kg) The mastic spray kit is comprised of: 1 oversized container of Component A (97-194M) – 44.5 lbs. (20.2 kg) 1 – 2 gallon container of Component B (97-195M) – 13.7 lbs. (6.2 kg)
Flash Point	Greater than 212°F (100°C) Pensky-Martens for each component.
Material Safety Data Sheet	Available from your *Pitt Char XP* Coating Technical Sales Representative.
Medical Response Information	Emergency Medical or Spill Control Information (281) 843-1308



Crew quarters and helideck being lifted onto main deck. *Pit Char XP* Coating posses adhesion, flexibility, and impact resistance to prevent material damage.

PHYSICAL AND MEC[illegible]AL

PROPERTY	TEST METHOD	RESULT TYPICAL
Tensile Strength Elongation	ASTM D 638 Type I ASTM D 638 Type I	707 psi (49.7 kg/cm²) 19.4%
Compressive Strength Modulus	ASTM D 695	2264 psi (159.2 kg/cm²) 4660 psi (327.6 kg/cm²)
Impact Strength	ASTM D 256 "A"	1.36 ft. lbs/in. (0.079 kg m/cm)
Bond Strength	ASTM D 1002 (modified 0.5 in./min.) Tensile Lap Shear	1151 psi (73.9 kg/cm²)
Hardness [illegible]	ASTM D 2240 Shore D	75 after 24 hrs. at 70°C
Density	practical density after spraying	68.7 lbs/ft³ (1100 kg/m³)
Thermal Conductivity	ASTM C 177 K Value	1.69 BTU in./°F ft² hr. (0.243 W/m°C)

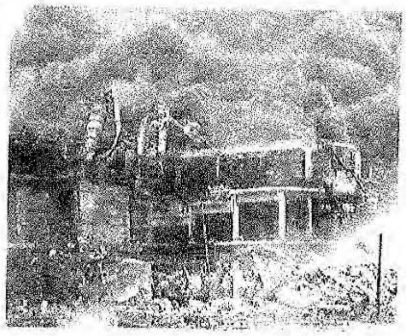
ENVIRONMENTAL PRO[illegible]TIES

Tests conducted by Underwriters' Laboratories Inc. (UL) to ensure retention of fire protection (UL 263 and UL 1709 test criteria). *Pit Char XP* Coating has passed the following tests:

- Salt Spray
- High Humidity
- Industrial Atmosphere (CO_2, SO_2) Air Mixture
- Solvent Spray
- Combination Dry, Wet, and Freeze Cycling
- Heat Aging (80°C for 175 days)
- Acid Spray

CRYOGENIC EXPOS[illegible]E

A steel panel coated with *Pit Char XP* Coating was exposed to liquid nitrogen until the surface temperature reached -311°F (-190.5°C) and the backside temperature reached -138.5°F (-94.7°C). The surface had very fine micro cracks, but upon warming back to room temperature the cracks sealed and were not visible. No disbonding occurred. The panel was fire tested and exhibited no loss of fire protection. The flexibility of *Pit Char XP* Coating allows the coating to relieve internal stresses generated from rapid thermal cycles thus preventing cracking and disbonding. The coating remains intact to provide corrosion and fire protection.



What are your assets worth?
Protect your investment
with *Pitt-Char XP* Coating.

PRODUCT FIRE TEST RE[illegible]TS

Pitt-Char Coatings have been fire tested at more than 12 fire testing facilities around the world. Our products have received approvals and certificates from Underwriters' Laboratories Inc (USA and Canada), Det Norske Veritas (Norway), Lloyd's Registry of Shipping (UK), GASAFE (France), and from several customers based on their own in house fire testing. Testing has covered a range of heat fluxes including jet fire impingement testing on various steel section geometries and sizes. A sampling of the test results are listed in the following tables. For additional test information, including actual explosion testing up to [illegible] bar overpressures, consult your local *Pitt-Char XP* Coating Technical Sales Representative.

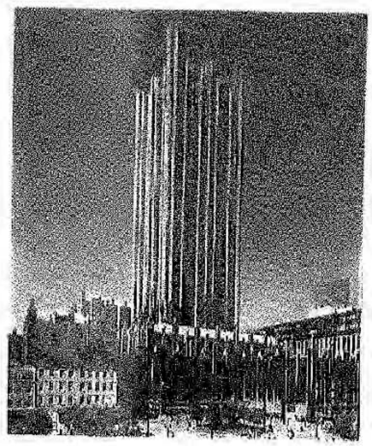
TEST DESIGN		TEST METHOD	FIRE RATING
Structural Steel -Range of Hp/A Values for I Sections and RH Sections		Norsok Method NF Fire 021	1 to 4 hours Hp/A from 28 to 300 Failure Temperatures 200°C to 400°C
Underdecks	H60 H120	IMO RES using exposure model described in ISO 834	11.0 mm (0.43") 15.0 mm (0.59")
Bulkheads	H60 H120 HO 100°C A-60	IMO RES using exposure model described in ISO 834 IMO RES A 0.517 (13)	10.0 mm (0.39") 14.0 mm (0.55") 7.0 mm (0.28") 8.0 mm (0.31")
Surface Flammability		ASTM E 84, UL 723 Tunnel Test as part of UL 263	Flame spread = 24.5 Smoke Development = 120
Column Test UL Design No. X 623		UL 263 "Fire Tests of Building Construction and Materials"	1 hr.: 0.19" (4.8 mm) 1½ hr.: 0.26" (6.6 mm) 2 hr.: 0.34" (8.6 mm) 2½ hr.: 0.42" (10.7 mm) 3 hr.: 0.53" (13.5 mm)
Column Test UL Design No. XR 612		UL 1709 "Fire Tests of Structural Steel Protected for Resistance to Rapid Temperature Rise Fires"	1 hr.: 0.28" (7.1 mm) 1½ hr.: 0.40" (10.2 mm) 2 hr.: 0.52" (13.2 mm) 2½ hr.: 0.63" (16.0 mm) 3 hr.: 0.75" (19.1 mm)
Jet Fire Test		OTI 95 634 "Jet Fire Resistance Test of Passive Fire Protection Materials"	Protection up to 2 hrs.
LPG/LNG Storage Tanks		CSTB [illegible] France - GASAFE	Protection up to 4 hrs.

PPG Industries, Inc., a leading manufacturer of glass, chemicals and coatings with 75 locations worldwide and a workforce of 3[illegible],000 people had sales of over $[illegible] billion dollars in 1997. PPG maintains a leadership position in the market through technology. PPG conducts Research and Development at 10 facilities worldwide. Coatings and Resins account for over $5 billion in sales.

For more information on how our products can provide fire protection for your particular application, please contact any location nearest to you:

PPG Industries, Inc.
151 Colfax Street
Springdale, PA 15144
Phone: (724) 274-3800
Fax: (724) 274-3355/3430
E-Mail: [illegible]@ppg.com

European Office
Ron Matheson
Ravsbera
Woodside Road
Ryton NE40 3BP
Phone: (44) 191 413 5539
Fax: (44) 191 413 5530



PPG Industries, Inc.
Worldwide Headquarters
Located in Pittsburgh, Pennsylvania

Russ Fruge
North American Sales Manager
Fire Protective Materials

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Telephone: (225) [illegible]
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E-Mail: rfruge@ppg.com
www.pittchar.com

Middle East Office
Saud Khlawi
PO Box 620657
Amman, Jordan 11162
Phone: (962) 6 [illegible]
Fax: (962) 6 [illegible]

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-83889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 (7:00 a.m. - 4:30 p.m. EST

Product ID: 97-149 (3814)
PRODUCT NAME: PITT-GUARD BTR COMP B
SYNONYMS: None
ISSUE DATE: 04/26/2006
EDITION NO.: 7
CHEMICAL FAMILY: Epoxy

EMERGENCY OVERVIEW:

Combustible. Keep away from heat, sparks, flames, and other sources of ignition. Do not smoke.CAUSES EYE IRRITATION. MAY CAUSE SLIGHT SKIN IRRITATION. MAY BE ABSORBED THROUGH THE SKIN. PROLONGED OR REPEATED CONTACT MAY CAUSE AN ALLERGIC SKIN REACTION.VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED. VAPOR IRRITATES EYES, NOSE AND THROAT. SANDING AND GRINDING DUSTS MAY BE HARMFUL IF INHALED.HARMFUL IF SWALLOWED.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous	
EPOXY RESIN 25068-38-6	40 - 70	x	
QUARTZ 14808-60-7	15 - 40	X	
NITROETHANE 79-24-3	1 - 5	X	
XYLENES 1330-20-7	0.1-1.0	X	
ETHYL BENZENE 100-41-4	0.1-1.0	X	
(As Silica, crystalline and Quartz) 14808-60-7	*	X	(See Sections 8 and 15 for information)

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.

SKIN CONTACT:
May cause slight skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

SKIN ABSORPTION:
May be absorbed through the skin. Prolonged or repeated contact may cause an allergic skin reaction.

INHALATION:
Vapor and/or spray mist may be harmful if inhaled. Vapor irritates eyes, nose, and throat. Sanding and grinding dusts may be harmful if inhaled.

INGESTION:
Harmful if swallowed.

SIGNS & SYMPTOMS OF OVEREXPOSURE:
Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage. Eye watering, headaches, nausea, dizziness and loss of coordination are indications that solvent levels are too high. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.

CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
Repeated exposure to vapors above recommended exposure limits (see Section 8) may cause irritation of the respiratory system and permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. This product contains crystalline silica which has been classified as a human carcinogen by IARC. Long-term exposures may also lead to a disabling lung condition known as silicosis. The risk depends on the duration and level of exposure to dust from sanding surfaces or mist from spray applications. Use of appropriate personal protective equipment and/or engineering controls should be employed whenever these types of operations are being performed. High exposures to xylenes in some animal studies have been reported to cause health effects on the developing embryo and fetus. These effects were often at levels toxic to the mother.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11. of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.

EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.

SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.

INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.

INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: 164 Degrees F (73 Degrees C)

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-149 (0014)
PRODUCT NAME: PITT-GUARD DUR COMP B

FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available.
LEL: 3.4
AUTOIGNITION TEMPERATURE:
Not Available
EXTINGUISHING MEDIA:
Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical, or universal aqueous film forming foam) designed to extinguish NFPA Class IIIA combustible liquid fires. Water spray may be ineffective. Water spray may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.
PROTECTION OF FIREFIGHTERS:
Fire-fighters should wear self-contained breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep this product away from heat, sparks, flame, and other sources of ignition (i.e., pilot lights, electric motors, static electricity). Invisible vapors can travel to a source of ignition and flash back. Do not smoke while using this product. Keep containers tightly closed when not in use. Closed containers may explode when overheated. Do not apply to hot surfaces. Toxic gases may form when this product comes in contact with extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbent should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
Vapors may collect in low areas. If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts. Containers should be grounded when pouring. Avoid free fall of liquids in excess of a few inches.
STORAGE:
Do not store above 120 degrees F (48 degrees C.). Store large quantities in buildings designed and protected for storage of NFPA Class IIIA combustible liquids.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear chemical-type splash goggles when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapors.

SKIN/GLOVES:
Wear protective clothing to prevent skin contact. Apron and gloves should be constructed of impermeable material. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. Clean contaminated clothing and shoes.
RESPIRATOR:
Overexposure to vapors may be prevented by ensuring proper ventilation controls, vapor exhaust or fresh air entry. A NIOSH- approved air purifying respirator with the appropriate chemical cartridges or a positive-pressure, air-supplied respirator may also reduce exposure. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
QUARTZ 14808-60-7	10 - 40	R- 0.05 MG/m³	Not established	R- 0.1 mg/m³	Not established
NITROETHANE 79-24-3	1 - 5	100 ppm	Not established	100 ppm	Not established
XYLENES 1330-20-7	0.1-1.0	100 ppm	150 ppm	100 ppm	150 ppm
ETHYL BENZENE 100-41-4	0.1-1.0	100 ppm	125 ppm	100 ppm	125 ppm

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG IPEL	PPG STEL
QUARTZ 14808-60-7	10 - 40	0.10 MG/m³	Not established	Not established	Not established
NITROETHANE 79-24-3	1 - 5	100 ppm	Not established	Not established	Not established
XYLENES 1330-20-7	0.1-1.0	100 ppm	150 ppm	Not established	Not established
ETHYL BENZENE 100-41-4	0.1-1.0	100 PPM	125 PPM	Not established	Not established

Key: ACGIH=American Conference of Governmental Industrial Hygienists, OSHA=Occupational Safety and Health Administration, TLV=Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit, Skin= Skin Absorption Designation. [C- Ceiling Limit, S- Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES (FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.398
PHYSICAL STATE:	Liquid
Percent Solids:	95.92
Percent Volatile by Volume:	5.080
pH:	Not available
ODOR THRESHOLD:	Not available
Vapour Pressure:	14.2 mmHg

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-149 (0614)
PRODUCT NAME: PITT-GUARD DTR COMP B

ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	11
BOILING POINT OR RANGE:	280 - 396Degrees F
Freezing Point or Range:	Not Applicable.
Melting Point or Range(°C):	Not Applicable.
Partition coefficient (n-octanol/water):	Not Applicable.
WEIGHT PER GALLON:	11.63 (U.S.) / 13.9 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:
- Carbon monoxide - Carbon dioxide - Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
EPOXY RESIN 25068-38-6	40 - 70	2.00 g/kg	2.00 g/kg	Not Available
NITROETHANE 79-24-3	1 - 5	1.10 g/kg	Not Available	Not Available
XYLENES 1330-20-7	0.1-1.0	4.30 g/kg	1.70 g/kg	21.80 g/l, 4 h
ETHYL BENZENE 100-41-4	0.1-1.0	3.50 g/kg	17.80 g/kg	Not Available

CHRONIC TOXICITY
Ingredient Target Organ/Chronic Effects:
- Neurotoxin - Mutagen - Kidney - Liver - Embryotoxin - Brain - Central nervous system - Carcinogen - Lung

Mutagenicity Toxicity:
This has not been tested for this product.
Reproductive Toxicity:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

Material/ CAS Number	Percent	Ingredient Specific Animal Data:
NITROETHANE 79-24-3	1 - 5	This product contains nitroethane. Studies with laboratory animals have shown that ingestion or inhalation of high levels of nitroethane causes kidney and liver damage and central nervous system effects.
ETHYL BENZENE 100-41-4	0.1-1.0	Ethylbenzene has been reported by NTP to cause cancer in laboratory animals following a chronic (2 year) inhalation exposure. Dose levels of 75, 250 and 750 ppm were used, with evidence of carcinogenicity found in the kidneys of rats and the lung and liver of mice at 750 ppm. The No Observed Effect Level (NOEL) was 75 ppm. The relevance of these findings to humans is uncertain, but appropriate safeguards should be employed to reduce or eliminate inhalation exposure to ethylbenzene.

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available

ENVIRONMENTAL FATE
Mobility: No information available.
Biodegradation: No information available.
Bioaccumulation: No information Available.

PHYSICAL/CHEMICAL
Hydrolysis: No information available.
Photolysis: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respirstory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name:	Paint
NOS Technical Name:	None
Hazard Class:	COMBUSTIBLE LIQUID
Subsidiary Class(es):	None
UN Number:	UN1263
Packing Group:	III

USA - RQ Hazardous Substances: Xylenes
USA-RQ Hazardous Substance Xylenes>15871.43 Pounds
Threshold Ship Weight:
Marine Pollutant Name: None
USA Shipments Only - Combustible Liquid Bulk Restriction: This material is regulated only in bulk (> 119 Gallons/450 L) sizes. Non-bulk (≤ 119 Gallons/450 L) shipments can be reclassified to "not regulated" for transportation.

USA Shipments Only - RQ Threshold Ship Weight: This is the total weight of this product that must be shipped to exceed the RQ quantity.

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-149 (0814)
PRODUCT NAME: PITT-GUARD QTR COMP B

U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA Inventory or is otherwise exempt from TSCA inventory reporting requirements.

FEDERAL REGULATIONS

US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS - TPQ (LBS)	SARA 313
EPOXY RESIN 25068-38-6	40 - 70	Not Listed	Not Listed	Not Listed
QUARTZ 14808-60-7	15 - 40	Not Listed	Not Listed	Not Listed
NITROETHANE 79-24-3	1 - 5	Not Listed	Not Listed	Not Listed
XYLENES 1330-20-7	0.1-1.0	100 lbs	Not Listed	Listed
ETHYL BENZENE 100-41-4	0.1-1.0	1000 lbs	Not Listed	Listed

SARA 311/312
Health (acute): Yes
Health (chronic): Yes
Fire (flammable): Yes
Pressure: No
Reactivity: No
WHMIS HAZARD CLASS: - Class B, Division 3 - Class D, Division 2, Subdivision A - Class D, Division 2, Subdivision B

STATE/PROVINCIAL REGULATIONS
CALIFORNIA PROP. 65: WARNING: This product contains a chemical known to the State of California to cause cancer.

Additional Information

Material/ CAS Number	Percent	IARC Group 1(Known Human Carc.)	IARC Group 2A (Probable Carc.)	IARC 2B (Suspected Carc.)	ACGIH Carc.	NTP Known Carc.	OSHA Carc.
QUARTZ 14808-60-7	15 - 40	Y	N	N	Y	N	Y
ETHYL BENZENE 100-41-4	0.1-1.0	N	N	Y	N	N	N

Key: IARC- International Agency on the Research of Cancer; ACGIH American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 2 2 0
HMIS Rating: 2*2 0

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe *=Chronic Effects

HMIS=Hazardous Materials Identification System, NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on this MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department

REASON FOR REVISION: Section 11 has been updated. Section 2 has been updated. Changes to this section may also result in changes in sections 8, 11 and/or 15. Section 9 has been updated. Date. Edition Updated MSDS format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
97-149 000001 (00394022.001)(03/24/00)
060105, 000, 0814

*** END OF MSDS ***

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-83889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 (8:00 a.m. - 4:30 p.m. EST

Product ID: 97-145 (0814)
PRODUCT NAME: PITT-GUARD DTR COMP A P
SYNONYMS: None
ISSUE DATE: 04/28/2006
EDITION NO.: 10
CHEMICAL FAMILY: Polyamide

EMERGENCY OVERVIEW:
Combustible. Keep away from heat, sparks, flames, and other sources of ignition. Do not smoke.CAUSES SEVERE EYE IRRITATION. MAY CAUSE MODERATE SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY CAUSE AN ALLERGIC SKIN REACTION.VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED. VAPOR IRRITATES EYES, NOSE, AND THROAT. SANDING AND GRINDING DUSTS MAY BE HARMFUL IF INHALED.HARMFUL IF SWALLOWED.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous	
QUARTZ 14808-60-7	15 - 40	X	
N.J. TRADE SECRET #80100337-5132	10 - 30	X	
TITANIUM DIOXIDE 13463-67-7	10 - 30	X	
METHYL ISOBUTYL KETONE 108-10-1	7 - 13	X	
UREA FORMALDEHYDE RESIN 68002-18-7	1 - 5	X	
SILICA 7631-86-9	1 - 5	X	
N-BUTYL ALCOHOL 71-36-3	0.5-1.5	X	
XYLENES 1330-20-7	0.1-1.0	X	
(All Silica, crystalline and Quartz) 14808-60-7	*	X	See Sections 8 and 15 for information

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes severe eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.

SKIN CONTACT:
May cause moderate skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

SKIN ABSORPTION:
Skin absorption not expected to occur. Prolonged or repeated contact may cause an allergic skin reaction.

INHALATION:
Vapor and/or spray mist may be harmful if inhaled. Vapor irritates eyes, nose, and throat. Sanding and grinding dusts may be harmful if inhaled.

INGESTION:
Harmful if swallowed.

SIGNS & SYMPTOMS OF OVEREXPOSURE:
Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage. Eye watering, headaches, nausea, dizziness and loss of coordination are indications that solvent levels are too high. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.

CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
Repeated exposure to vapors above recommended exposure limits (see Section 8) may cause irritation of the respiratory system and permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. This product contains crystalline silica which has been classified as a human carcinogen by IARC. Long-term exposures may also lead to a disabling lung condition known as silicosis. The risk depends on the duration and level of exposure to dust from sanding surfaces or mist from spray applications. Use of appropriate personal protective equipment and/or engineering controls should be employed whenever these types of operations are being performed. This product either contains formaldehyde or is capable of releasing formaldehyde above 0.5 ppm under certain conditions. If this product contains free formaldehyde, formaldehyde will be listed as an ingredient in Section 2 and 11 of this MSDS; if formaldehyde is not specifically listed, this product contains ingredients capable of releasing formaldehyde under certain conditions. Formaldehyde is a known cancer hazard, a skin sensitizer and a respiratory sensitizer. High exposures to xylenes in some animal studies have been reported to cause health effects on the developing embryo and fetus. These effects were often at levels toxic to the mother. The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.

EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.

SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-145 (0814)
PRODUCT NAME: PITT-GUARD DTR COMP A P

INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.
INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: 106 Degrees F (41 Degrees C)
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available
LEL: 1.4
AUTOIGNITION TEMPERATURE:
Not Available.
EXTINGUISHING MEDIA:
Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical, or universal aqueous film forming foam) designed to extinguish NFPA Class II combustible liquid fires. Water spray may be ineffective. Water spray may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.
PROTECTION OF FIREFIGHTERS:
Fire-fighters should wear self-contained breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep this product away from heat, sparks, flame, and other sources of ignition (i.e., pilot lights, electric motors, static electricity). Invisible vapors can travel to a source of ignition and flash back. Do not smoke while using this product. Keep containers tightly closed when not in use. Closed containers may explode when overheated. Do not apply to hot surfaces. Toxic gases may form when this product comes in contact with extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbent should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
Vapors may collect in low areas. If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts. Containers should be grounded when pouring. Avoid free fall of liquids in excess of a few inches.
STORAGE:
Do not store above 120 degrees F.(48 degrees C.) Store large quantities in buildings designed and protected for storage of NFPA Class II combustible liquids.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear chemical-type splash goggles when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapors.
SKIN/GLOVES:
Wear protective clothing to prevent skin contact. Apron and gloves should be constructed of: neoprene rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. Clean contaminated clothing and shoes.
RESPIRATOR:
Overexposure to vapors may be prevented by ensuring proper ventilation controls, vapor exhaust or fresh air entry. A NIOSH- approved air purifying respirator with the appropriate chemical cartridges or a positive-pressure, air-supplied respirator may also reduce exposure. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a reliable index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
QUARTZ 14808-60-7	15 - 40	R- 0.05 MG/m³	Not established	R- 0.1 mg/m³	Not established
TITANIUM DIOXIDE 13463-67-7	10 - 30	10 mg/m³	Not established	15 mg/m³	Not established
METHYL ISOBUTYL KETONE 108-10-1	7 - 13	50 ppm	75 ppm	96 ppm	75 ppm
SILICA 7631-86-9	1 - 5	10 mg/m³	Not established	6 mg/m³	Not established
N-BUTYL ALCOHOL 71-36-3	0.5 - 1.5	C- 50 ppm	Not established	C-50 ppm	Not established
XYLENES 1330-20-7	0.1 - 1.0	100 ppm	150 ppm	100 ppm	150 ppm

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG PEL	PPG STEL
QUARTZ 14808-60-7	15 - 40	0.10 MG/m³	Not established	Not established	Not established
TITANIUM DIOXIDE 13463-67-7	10 - 30	10 MG/m³	Not established	Not established	Not established
METHYL ISOBUTYL KETONE 108-10-1	7 - 13	50 ppm	75 PPM	Not established	Not established
SILICA 7631-86-9	1 - 5	R- 0.10 MG/m³	Not established	Not established	Not established
N-BUTYL ALCOHOL 71-36-3	0.5 - 1.5	C-50 ppm	Not established	Not established	Not established
XYLENES 1330-20-7	0.1 - 1.0	100 ppm	150 ppm	Not established	Not established

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-145 (0814)
PRODUCT NAME: PITT-GUARD DTR COMP A P

Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV=Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation [C- Ceiling Limit; S- Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.591
PHYSICAL STATE:	Liquid
Percent Solids:	87.51
Percent Volatile by Volume:	24.650
pH:	Not available.
ODOR THRESHOLD:	Not available.
Vapour Pressure:	14.0 mmHg
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	148
BOILING POINT OR RANGE:	214 - 401Degrees F
Freezing Point or Range:	Not Applicable.
Melting Point or Range(°C):	Not Applicable.
Partition coefficient (n-octanol/water):	Not Applicable.
WEIGHT PER GALLON:	13.26 (U.S.) / 15.9 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY
STABILITY:
This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known
HAZARDOUS DECOMPOSITION PRODUCTS:
- Carbon monoxide - Carbon dioxide - Oxides of nitrogen - Oxides of aluminum - Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION
ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
TITANIUM DIOXIDE 13463-67-7	10 - 30	10.00 g/kg	Not Available	Not Available
METHYL ISOBUTYL KETONE 108-10-1	7 - 13	2.08 g/kg	Not Available	32.77 g/l
N-BUTYL ALCOHOL 71-36-3	0.5-1.5	.79 g/kg	3.40 g/kg	24.26 g/l
XYLENES 1330-20-7	0.1-1.0	4.30 g/kg	1.70 g/kg	21.68 g/l

CHRONIC TOXICITY
Ingredient Target Organ/Chronic Effects:
- Embryotoxin - Brain - Central nervous system - Carcinogen - Lung

Mutagenicity Toxicity:
This has not been tested for this product.
Reproductive Toxicity:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

Material/ CAS Number	Percent	Ingredient Specific Animal Data
TITANIUM DIOXIDE 13463-67-7	10 - 30	This product contains titanium dioxide. Animals inhaling massive quantities of titanium dioxide dust in a long-term study developed lung tumors. Studies with humans involved in manufacture of this pigment did not show increased risk of cancer from exposure.
N-BUTYL ALCOHOL 71-36-3	0.5-1.5	This product contains an ingredient which has been shown to cause adverse reproductive effects in animals at doses which are also toxic to the mother.

SECTION 12 - ECOLOGICAL INFORMATION
POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available

ENVIRONMENTAL FATE
Mobility: No information available.
Biodegradation: No information available.
Bioaccumulation: No information Available.

PHYSICAL/CHEMICAL
Hydrolysis: No information available.
Photolysis: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS
Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name:	Paint
NOS Technical Name:	None
Hazard Class:	3
Subsidiary Class(es):	None
UN Number:	UN1263
Packing Group:	II

USA - RQ Hazardous Substances: Xylenes, Methyl Isobutyl Ketone
USA-RQ Hazardous Substance Xylenes>45150 Pounds, Methyl Isobutyl Ketone>40904.37 Pounds
Threshold Ship Weight: None
Marine Pollutant Name:
USA and Canada Shipments Only- Combustible Liquid Exception: Non-bulk (<= 119 Gallons/450 L) ground shipments can be reclassified to "not regulated" for transportation. Bulk shipments - USA Only (> 119 Gallons/450 L) can be reclassified to a Combustible Liquid.

USA Shipments Only - RQ Threshold Ship Weight: This is the total weight of this product that must be shipped to exceed the RQ quantity

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-145 (0814)
PRODUCT NAME: PITT-GUARD DTR COMP A P

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS
U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA inventory or is otherwise exempt from TSCA inventory reporting requirements.
FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS- TPQ (LBS)	SARA 313
QUARTZ 14808-60-7	15 - 40	Not Listed	Not Listed	Not Listed
N.J. TRADE SECRET 78108037-5132	10 - 30	Not Listed	Not Listed	Not Listed
TITANIUM DIOXIDE 13463-67-7	10 - 30	Not Listed	Not Listed	Not Listed
METHYL ISOBUTYL KETONE 108-10-1	7 - 13	5000 lbs	Not Listed	Listed
UREA FORMALDEHYDE RESIN 68002-19-7	1 - 5	Not Listed	Not Listed	Not Listed
SILICA 7631-86-9	1 - 5	Not Listed	Not Listed	Not Listed
N-BUTYL ALCOHOL 71-36-3	0.5-1.5	5000 lbs	Not Listed	Listed
XYLENES 1330-20-7	0.1-1.0	100 lbs	Not Listed	Listed

SARA 311/312
Health (acute): Yes
Health (chronic): Yes
Fire (flammable): Yes
Pressure: No
Reactivity No
WHMIS HAZARD CLASS: - Class B, Division 3 - Class D, Division 2, Subdivision A - Class D, Division 2, Subdivision B

STATE/PROVINCIAL REGULATIONS
CALIFORNIA PROP. 65: WARNING: This product contains a chemical known to the State of California to cause cancer.
Additional Information

Material/ CAS Number	Percent	IARC Group 1(Known Human Carc.)	IARC Group 2A (Probable Carc.)	IARC 2B (Suspected Carc.)	ACGIH Carc.	NTP Known Carc.	OSHA Carc.
QUARTZ 14808-60-7	15 - 40	Y	N	N	Y	N	Y

Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA - Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 2 2 0
HMIS Rating: 2*2 0

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects

HMIS=Hazardous Materials Identification System, NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Section 2 has been updated. Changes to this section may also result in changes in sections 8, 11 and/or 15. Section 9 has been updated. Date, Edition,
Updated MSDS
format

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
97-145 000009 (00396080.001)(03/30/06)
060330, 000, 0814

*** END OF MSDS ***

PITT-GUARD® 97-145 Series

HPC/Industrial Maintenance PITT-GUARD® Direct-To-Rust Epoxy Mastic Coatings

Generic Type

Polyamide-Epoxy Two Component

General Description

Pitt-Guard DTR products are intended for use where one coat high build barrier type protection is required for properly prepared metal substrates such as steel, aluminum or hot dipped galvanized steel and for use on properly prepared masonry. Their excellent wetting properties allow application and good performance over tightly adhering rust.

Tinting and Base Information

These products are designed to be tinted with colorants of the PerformaColor System. Use formulas from the PerformaColor® System Software. DO NOT TINT WITH 96 LINE CUSTOM COLORANTS.

97-144	Black
97-145	Porcelain White
97-147	Beige
97-148	Gray
97-149	Ready Mix Component B
97-1500	Neutral Base
97-1512	White Base
97-158	Tint Base Component B

Recommended Uses

Aluminum
Drywall
Ferrous Metal
Galvanized Steel
Wood
Concrete, Stucco, Plaster, Masonry
CMU
Marine Use Above the Water

Features / Benefits

Barrier coat corrosion protection
Excellent adhesion to minimally prepared surfaces
Tintable to hundreds of colors with the computerized PerformaColor system
No topcoat needed for corrosion protection
Ready Mixed Colors for immersion service

Limitations of Use

For Professional Use Only; Not Intended for Household Use. Apply only when material temperature is above 60°F (15°C) and air and surface temperatures are above 50°F (10°C) and surface temperature is at least 5°F (3°C) above the dew point. Avoid exterior painting late in the day when dew or condensation are likely to form or when rain is threatening. Not recommended for use in swimming pools or with alkyd finish top coats. Hot rolled steel should be prepared by abrasive blast cleaning whenever possible. The inherent nature of the chemistry of this product causes the film to yellow. This yellowing process continues as the film ages and may vary with application conditions. This yellowing process does not detract from coating performance. These products also lose gloss and chalk on exterior exposure, but film integrity is not affected. Drying times listed may vary depending on temperature, humidity, film and air movement.

Product Data

Gloss:	Semi-Gloss Typically 25 to 55 (60°Gloss Meter)
VOC*:	1.07 lbs/gal 128.00 g/L
Coverage:	195 to 340 sq ft/gal (48 to 31 sq. m/3.78L)
	Note: Does not include loss due to varying application method, surface porosity, or mixing
DFT:	4.0 minimum to 7.0 maximum
Weight/Gallon*:	12.4 lbs. (5.6 kg) +/- 0.4 lbs. (182 g)
Volume Solids*:	84.9% +/- 2%
Weight Solids*:	91.4% +/- 2%
Mix Ratio:	1 part Component A to 1 part Component B
Clean-up:	97-725,97-727,97-734 PPG Thinners

Results will vary by color, thinning and other additives
*Product data calculated on mixed 97-145

Drying Time:

To Touch:	8 hours
To Handle:	16 hours
To Recoat:	16 hours
Accelerated Recoat:	9 hours

Dry Time @77°F (25°C), 50% relative humidity

Pot Life:	4 hours
Induction Time:	30 minutes
Flash Point:	97-145 106°F (41.1°C) 97-149 164°F (73.3°C)

PITT-GUARD® 97-145 Series

HPC/Industrial Maintenance PITT-GUARD® Direct-To-Rust Epoxy Mastic Coatings

General Surface Preparation

The surface to be coated must be dry, clean, and free of oil, grease, release agents, curing compounds, and other foreign materials. The service life of the coating is directly related to the surface preparation. WARNING! If you scrape, sand, or remove old paint, you may release lead dust or fumes. LEAD IS TOXIC. EXPOSURE TO LEAD DUST OR FUMES CAN CAUSE SERIOUS ILLNESS, SUCH AS BRAIN DAMAGE, ESPECIALLY IN CHILDREN. PREGNANT WOMEN SHOULD ALSO AVOID EXPOSURE. Wear a properly fitted NIOSH-approved respirator and prevent skin contact to control lead exposure. Clean up carefully with a HEPA vacuum and a wet mop. Before you start, find out how to protect yourself and your family by contacting the USEPA National Lead Information Hotline at 1-800-424-LEAD or log on to www.epa.gov/lead. In Canada contact a regional Health Canada office. Follow these instructions to control exposure to other hazardous substances that may be released during surface preparation.

FERROUS METAL: Non-Immersion - SSPC-SP2, Immersion - SSPC-SP10

GALVANIZED STEEL: Remove grease and oils with a quality paint thinner or naphtha. If any oxidation (white rust) has formed, thoroughly sand and remove all forms of contamination. If the galvanized steel has been passivated or treated, the surface must be abraded to some degree and remove all forms of contamination.

ALUMINUM: SSPC-SP1, then SSPC-SP7

CONCRETE, STUCCO, PLASTER, MASONRY other than CMU: Allow all concrete, mortar, plaster, etc. to cure for thirty (30) days under normal drying conditions. Remove all dirt, dust, grime, loose mortar and all other forms of contamination. Concrete which has been treated with curing compounds or hardeners, needs to be thoroughly abraded. (Concrete needs to be Acid Etched)

CONCRETE MASONRY UNITS: Allow the mortar to cure for thirty (30) days under normal drying conditions. Remove all contamination.

WOOD: Sand in order to remove surface roughness and loose wood fibers. Remove any sap, then spot prime with the appropriate primer to seal any knots and sap stain before applying the regular primer. Countersink all nail holes. Spot prime nail heads and putty all cracks after the prime coat is dry. Remove grease and oils with a high quality paint thinner or naphtha.

Recommended Primers

Concrete Masonry Units	16-90, 97-685/97-686, 95-217
Galvanized Steel	Self Priming
Aluminum	Self Priming
Wood and Hardboard	Self Priming
Concrete,Stucco,Plaster,Masonry other than CM Unit	Self Priming
Drywall	Self Priming
Ferrous Metal	Self Priming

Directions for Use

Mix both components thoroughly before blending. (If 97-723 Accelerator is used, add it to "A" Component and mix well prior to the addition of "B" Component.) Add Component "B" to Component "A" and blend well using a mechanical mixer. Bases require a 30 minute digestion time. Use of material below 60°F (15.5°C) requires a 60 minute digestion time and is not recommended. Be sure to mix the correct A and B components. Explosion-proof equipment must be used when coating with these materials in confined areas. Keep containers closed and away from heat, sparks, and flames when not in use. Read all label and Material Safety Data Sheet (MSDS) information prior to use. MSDS are available through our website or by calling 1-800-441-9695.

Permissible temperatures during application:

Material:	60 to 90°F	15 to 32°C
Ambient:	50 to 100°F	10 to 38°C
Substrate:	50 to 130°F	10 to 54°C

Application Information

Recommended Spread Rates:

Wet Mils:	4.7	minimum to	8.2	maximum
Wet Microns:	119.0	minimum to	208.0	maximum
Dry Mils:	4.0	minimum to	7.0	maximum
Dry Microns:	102.0	minimum to	178.0	maximum

Application Equipment: Changes in application equipment, pressures and/or tip sizes may be required depending on ambient temperatures and application conditions. Spray equipment must be handled with due care and in accordance with manufacturer's recommendation. High-pressure injection of coatings into the skin by airless equipment may cause serious injury.

Conventional Spray: Fluid Nozzle: DeVilbiss MBC-510 or JGA gun, with 704 or 777 air cap with E tip and needle, or comparable equipment. Atomization Pressure: 55 - 70 Fluid Pressure: Can not specify, dependent on numerous factors.

Airless Spray: Pressure 1500 psi, tip 0.017" - 0.021"

Brush: Polyester/Nylon Brush

Roller: 3/8" nap solvent resistant cove

Thinning:

Add reducer prior to digestion and re-stir before use. When 97-725 causes fitting; 97-727 may be used when substrate temperature is below 100°F (37.7°C) resulting in a shorter pot life. For 2.08 lbs/gal VOC, thin up to 19% with 97-725. Conventional Spray: up to 32 oz./gallon with 97-725. Airless Spray: up to 25 oz./gallon with 97-725. Brush: up to 25 oz./gallon with 97- 734. Roller: up to 25 oz./gallon with 97-734

Packaging: 1-Gallon (3.78L) 5-Gallon (18.9L)

Not all products are available in all sizes. All containers are not full fillet

PPG Industries, Inc.
Architectural Coatings
One PPG Place
Pittsburgh, PA 15272
www.ppghpc.com

Technical Services
1-800-441-9695
1-888-607-5123 fax

Architect/Specifier
1 888 PPG IDEA

PPG Architectural Finishes
400 S. 13th Street
Louisville KY 40203

PPG Canada, Inc.
Architectural Coatings
4 Kenview Blvd
Brampton, ON L6T 5E4

PTI 10/2006

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-83889090 (China)

TECHNICAL INFORMATION: 1-800-441-9990 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 8:00 a.m. - 4:30 p.m. EST

Product ID: 97-194 (0814)
PRODUCT NAME: PITT-CHAR COMPONENT A
SYNONYMS: None
ISSUE DATE: 10/20/2005
EDITION NO.: 9
CHEMICAL FAMILY: EPOXY

EMERGENCY OVERVIEW:
CAUSES EYE IRRITATION. MAY CAUSE MODERATE SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY CAUSE AN ALLERGIC SKIN REACTION.VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED.HARMFUL OR FATAL IF SWALLOWED.STABLE - HAZARDOUS REACTIONS POSSIBLE AT EXTREMELY HIGH TEMPERATURES/PRESSURES. This product is not expected to present any unusual hazards under fire or spill conditions. Read entire MSDS before use.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "X" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material CAS Number	Percent	Hazardous	
EPOXY Proprietary	15 - 40	X	
ZINC BORATE 1332-07-6	10 - 30	X	
TRIS(2 CHLOROETHYL) PHOSPHATE 115-96-8	7 - 13	X	
(As Zinc Cmpnds) 1332-07-6	*	X	See Sections 8 and 15 for information
(Zinc in Zinc Cmpns) 1332-07-6	*	X	See Sections 8 and 15 for information

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.
SKIN CONTACT:
May cause moderate skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.
SKIN ABSORPTION:
Skin absorption not expected to occur. Prolonged or repeated contact may cause an allergic skin reaction.
INHALATION:
Vapor and/or spray mist may be harmful if inhaled.
INGESTION:
Harmful or fatal if swallowed.
SIGNS & SYMPTOMS OF OVEREXPOSURE:
Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.
CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
This product contains tris (2-chloroethyl) phosphate which may cause neurotoxicity through cholinesterase inhibition. This material may also be a cancer hazard based on animal data where the risk of cancer depends on the duration and level of exposure. Mutagenicity tests (in vitro) have produced inconsistent results.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.
EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.
SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.
INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.
INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given if person is fully conscious. Never give anything by mouth to an unconscious or convulsing person. Do Not induce vomiting. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: >200 Degrees F (> 93 Degrees C)
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available.
LEL: Not Available.
AUTOIGNITION TEMPERATURE:
Not Available.
EXTINGUISHING MEDIA:
Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical or universal aqueous film forming foam) designed to extinguish NFPA Class IIIB combustible liquid fires.
PROTECTION OF FIREFIGHTERS:
Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-194 (C814)
PRODUCT NAME: PITT-CHAR COMPONENT A

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Material not known to be explosive.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbant should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.
STORAGE:
Do not store above 120 degrees F.(48 degrees C.). Store large quantities in buildings designed and protected for storage of NFPA Class IIIB combustible liquids.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting).

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear safety glasses with side shields.
SKIN/GLOVES:
Wear protective clothing to prevent skin contact. Apron and gloves should be constructed of: rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. The decision whether to clean or discard contaminated clothing should be based on the chemicals contaminating them. Some chemicals can cause skin irritation, sensitization or other health effects if the cleaning process does not remove all traces of them. Consult a safety professional to determine whether clothing contaminated with this product can be safely cleaned and reused.
RESPIRATOR:
Where ventilation is inadequate, use a NIOSH- approved air purifying respirator with the appropriate chemical cartridges or positive- pressure, air-supplied respirator. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
ZINC BORATE 1332-07-6	10 - 30	10 mg/m³	Not established	15 mg/m³	Not established

Key: OSHA=Occupational Safety and Health Administration; PEL=Permissable Exposure Limit; Ceiling=PEL Ceiling Limit; STEL=PEL Short-Term Exposure Limit; Skin=OSHA Skin Designation.
Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV=Threshold Limit Value; TWA=Time Weighted Average. PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation. (C- Ceiling Limit; S- Potential Skin Abortion; R-Respirable Dust)
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.492
PHYSICAL STATE:	Liquid
Percent Solids:	100.00
Percent Volatile by Volume:	.010
pH:	Not available.
ODOR THRESHOLD:	Not available.
Vapour Pressure:	N.A. mmHg
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	0
BOILING POINT OR RANGE:	Not available.
Freezing Point or Range:	Not Applicable
Melting Point or Range(°C):	Not Applicable.
Partition coefficient (n-octanol/water):	Not Applicable.
WEIGHT PER GALLON:	12.43 (U.S.) / 14.9 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable but may undergo hazardous reactions at extremely high temperatures and pressures.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:
- None known

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
TRIS(2-CHLOROETHYL) PHOSPHATE 115-96-8	7 - 13	.39 g/kg	Not Available	Not Available

CHRONIC TOXICITY
Target Organs:

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-194 (0814)
PRODUCT NAME: PITT-CHAR COMPONENT A

- Reproductive - Teratogen

Mutagenicity Toxicity:
This has not been tested for this product.
Reproductive Toxicity:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

Material/ CAS Number	Percent	Ingredient Specific Animal Data:
ZINC BORATE 1332-07-6	10 - 30	This product contains borates. In animal studies, ingestion of borates over prolonged periods caused a decrease in sperm count and testicle size in males and adverse developmental effects in the fetus.

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available.

ENVIRONMENTAL FATE
Mobility: No information available.
Biodegradation: No information available.
Bioaccumulation: No Information Available.

PHYSICAL/CHEMICAL
Hydrolysis: No information available.
Photolysis: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbant material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Environmentally Hazardous Substance Liquid, NOS
NOS Technical Name: Zinc Borate
Hazard Class: 9
Subsidiary Class(es): None
UN Number: UN3082
Packing Group: III

USA - RQ Hazardous Substances: Zinc Borate
USA-RQ Hazardous Substance Threshold Ship Weight: Zinc Borate>3962 Pounds
Marine Pollutant Name: None

USA Shipments Only - RQ Threshold Ship Weight: This is the total weight of this product that must be shipped to exceed the RQ quantity.

USA Shipments Only - This material contains a U.S. DOT Hazardous Substance and is only regulated for shipments to or from the USA as Environmentally Hazardous Substance if the quantity of Hazardous Substance inside the container exceeds the Hazardous Substance Reportable Quantity (RQ).

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS
U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA inventory or is otherwise exempt from TSCA inventory reporting requirements.
FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA (US - RQ (LBS)	SARA (EHS - TPQ (LBS)	SARA 313
EPOXY Proprietary	15 - 40	Not Listed	Not Listed	Not Listed
ZINC BORATE 1332-07-6	10 - 30	1000 lbs	Not Listed	Not Listed
TRIS(2-CHLOROETHYL) PHOSPHATE 115-96-8	7 - 13	Not Listed	Not Listed	Not Listed
(As Zinc Cmpnds) 1332-07-6	*	Not Listed	Not Listed	Listed
(Zinc in Zinc Cmpns) 1332-07-6	*	Not Listed	Not Listed	Listed

SARA 311/312
Health (acute): Yes
Health (chronic): Yes
Fire (flammable): No
Pressure: No
Reactivity: No
WHMIS HAZARD CLASS: - Class D, Division 1, Subdivision B - Class D, Division 2, Subdivision A - Class D, Division 2, Subdivision B

STATE/PROVINCIAL REGULATIONS
CALIFORNIA PROP. 65: WARNING: This product contains a chemical known to the State of California to cause cancer.
Additional Information
Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 2 1 1
HMIS Rating: 2*1 1

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects.

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 97-194 (0814)
PRODUCT NAME: PITT-CHAR COMPONENT A

HMIS=Hazardous Materials Identification System, NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Section 11 has been updated. Date: Edition: Updated MSDS format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
97-194 000014 (00366601 001)(10/19/05)
061018, 000, 0814

*** END OF MSDS ***

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-3889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 7:00 a.m. - 4:30 p.m. EST

PRODUCT ID: 97-195 (0614)
PRODUCT NAME: PITT-CHAR COMP B
SYNONYMS: None
ISSUE DATE: 02/19/2004
EDITION NO.: 5
CHEMICAL FAMILY: POLYAMIDE

EMERGENCY OVERVIEW:
CAUSES IRREVERSIBLE EYE DAMAGE. MAY CAUSE SKIN BURNS. MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN. PROLONGED OR REPEATED CONTACT MAY CAUSE AN ALLERGIC SKIN REACTION. VAPOR AND/OR SPRAY MIST HARMFUL IF INHALED. VAPOR IRRITATES EYES, NOSE, AND THROAT. MAY CAUSE IRRITATION AND/OR ALLERGIC RESPIRATORY REACTION IN LUNGS. HARMFUL IF SWALLOWED.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous
POLYAMIDE RESIN 68410-23-1	40 - 70	X
ALUMINUM MAGNESIUM SILICATE 12174-11-7	3 - 7	X
2,4,6 TRIS (DIMETHYLAMINOMETHYL) PHENOL 90-72-2	3 - 7	X
TRIETHYLENE TETRAMINE 112-24-3	3 - 7	X
QUARTZ 14808-60-7	0.1-1.0	X

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
This product contains a material which causes irreversible eye damage. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.
SKIN CONTACT:
May cause skin burns. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.
SKIN ABSORPTION:
May be harmful if absorbed through the skin. Prolonged or repeated contact may cause an allergic skin reaction.
INHALATION:
Vapor and/or spray mist harmful if inhaled. Vapor irritates eyes, nose, and throat. May cause irritation and/or allergic respiratory reaction in lungs.
INGESTION:
Harmful if swallowed.
SIGNS & SYMPTOMS OF OVEREXPOSURE:
Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.
CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
This product contains crystalline silica which has been classified as a human carcinogen by IARC. Long-term exposures may also lead to a disabling lung condition known as silicosis. The risk depends on the duration and level of exposure to dust from sanding surfaces or mist from spray applications. Use of appropriate personal protective equipment and/or engineering controls should be employed whenever these types of operations are being performed. Prolonged inhalation of an ingredient(s) in this product may cause edema of the lungs and/or lung damage.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.
EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.
SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.
INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.

INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given if person is fully conscious. Never give anything by mouth to an unconscious or convulsing person. Do Not induce vomiting. Contact a poison control center, emergency room or physician right away as further treatment will be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available.
LEL: Not Available.
AUTOIGNITION TEMPERATURE:
Not Available.
EXTINGUISHING MEDIA:
Use extinguishers appropriate for surrounding fire.

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PRODUCT ID: 97-193 (0814)
PRODUCT NAME: PITT-CHAR COMP B

PROTECTION OF FIREFIGHTERS:
Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Material not known to be explosive. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbent should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.
STORAGE:
Do not store above 120 degrees F. (48 degrees C.).

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear chemical-type splash goggles and full face shield when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapors.
SKIN/GLOVES:
Wear protective clothing sufficient to cover exposed skin surfaces. For applications where skin contact is likely and impermeable clothing is necessary, select clothing constructed of: rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. The decision whether to clean or discard contaminated clothing should be based on the chemicals contaminating them. Some chemicals can cause skin irritation, sensitization or other health effects if the cleaning process does not remove all traces of them. Consult a safety professional to determine whether clothing contaminated with this product can be safely cleaned and reused.
RESPIRATOR:
Where vapors are present, an appropriate NIOSH-approved air purifying respirator with organic vapor cartridges or positive-pressure, air-supplied respirator is required. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS

If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
QUARTZ 14808-60-7	0.1-1.0	R- 0.05 MG/m³	Not established	R- 0.1 mg/m³	Not established

Key: OSHA=Occupational Safety and Health Administration; PEL=Permissable Exposure Limit; Ceiling=PEL Ceiling Limit; STEL=PEL Short-Term Exposure Limit; Skin=OSHA Skin Designation

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG PEL	PPG STEL
TRIETHYLENE-TETRAMINE 112-24-3	3 - 7	S- 0.5 PPM	Not established	1 ppm	Not established
QUARTZ 14808-60-7	0.1-1.0	R- 0.10 MG/m³	Not established	Not established	Not established

Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV=Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation. [C- Ceiling Limit; S- Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.135
PHYSICAL STATE:	Liquid
PERCENT SOLIDS:	100.00
PERCENT VOLATILE BY VOLUME:	010
pH:	Not available.
ODOR THRESHOLD:	Not available.
VAPOUR PRESSURE (mm Hg):	Not Applicable.
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
EVAPORATION RATE:	0
BOILING POINT OR RANGE:	Not available.
FREEZING POINT OR RANGE:	Not Applicable.
MELTING POINT OR RANGE:	Not Applicable.
OCTANOL/WATER PARTITION COEFFICIENT:	Not Applicable.
WEIGHT PER GALLON:	9.47 (U.S.) / 11.3 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:

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PRODUCT ID: 97-195 (0814)
PRODUCT NAME: PITT-CHAR COMP B

- Carbon monoxide - Carbon dioxide - Oxides of nitrogen - Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
2,4,6 TRIS (DIMETHYLAMINO METHYL) PHENOL 90-72-2	3 - 7	1.20 g/kg	1.28 g/kg	Not Available
TRIETHYLENE TETRAMINE 112-24-3	3 - 7	2.50 g/kg	81 g/kg	Not Available

CHRONIC TOXICITY
TARGET ORGANS:
- Respiratory sensitizer - Brain - Blood - Kidney - Liver - Teratogen - Carcinogen - Lung

MUTAGENICITY:
This has not been tested for this product.
REPRODUCTIVE:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

Material/ CAS Number	Percent	Ingredient Specific Animal Data:
TRIETHYLENE TETRAMINE 112-24-3	3 - 7	Repeated applications of triethylenetetramine to the skin of guinea pigs resulted in liver degeneration, damage to the kidneys and brain, and reproductive/teratogenic effects.

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS:
Ecotoxicity No data available.

ENVIRONMENTAL FATE
MOBILITY: None Known.
BIODEGRADATION: None Known.
Bioaccumulation No data available.

PHYSICAL/CHEMICAL

HYDROLYSIS: None Known.
PHOTOLYSIS: None Known.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Paint- Non-Regulated Goods

NOS Technical Name: None
Hazard Class: None
Subsidiary Class(es): None
UN Number: None
Packing Group: None

USA - RQ Hazardous Substances: None
USA-RQ Hazardous Substance None
Threshold Ship Weight:
Marine Pollutant Name: None

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS
U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA inventory or is otherwise exempt from TSCA inventory reporting requirements.
FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS: TPQ (LBS)	SARA 313
POLYAMIDE RESIN 68410-23-1	40 - 70	Not Listed	Not Listed	Not Listed
ALUMINUM MAGNESIUM SILICATE 12174-11-7	3 - 7	Not Listed	Not Listed	Not Listed
2,4,6 TRIS (DIMETHYLAMINO METHYL) PHENOL 90-72-2	3 - 7	Not Listed	Not Listed	Not Listed
TRIETHYLENE TETRAMINE 112-24-3	3 - 7	Not Listed	Not Listed	Not Listed
QUARTZ 14808-60-7	0.1-1.0	Not Listed	Not Listed	Not Listed

SARA 311/312
Health (acute): Yes
Health (chronic): Yes
Fire (flammable): No
Pressure: No
Reactivity: No
WHMIS HAZARD CLASS: - Class D, Division 2, Subdivision A - Class D, Division 2, Subdivision B - Class D, Division 1, Subdivision B

STATE/PROVINCIAL REGULATIONS
CALIFORNIA PROP. 65: WARNING: This product contains a chemical known to the State of California to cause cancer.
Additional Information

Material/ CAS Number	Percent	IARC Group 1(Known Human Carc.)	IARC Group 2A (Probable Carc.)	IARC 2B (Suspected Carc.)	ACGIH Carc.	NTP Known Carc.	OSHA Carc.
ALUMINUM MAGNESIUM SILICATE 12174-11-7	3 - 7	N	N	Y	N	N	N
QUARTZ 14808-60-7	0.1-1.0	Y	N	N	Y	N	Y

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Pittsburgh, PA 15272

PRODUCT ID: 97-195 (0814)
PRODUCT NAME: PITT-CHAR COMP B

Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 3 1 0
HMIS Rating: 3*1 0

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects.

HMIS=Hazardous Materials Identification System. NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Date; Edition; Updated MSDS format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
97-195 000011 [00252598.003](02/25/04)
020531, 000, 0814

*** END OF MSDS ***

6 1% 2700 1 0814 97-195 ,0814,002 97-195 01102/2004

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (412) 434-4515 (U.S.) (24 hours/day):
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-83889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 7:00 a.m. - 4:30 p.m. EST

Product ID: 85-8601 (0814)
PRODUCT NAME: S/G URETHANE WHITE BASE C
SYNONYMS: None
ISSUE DATE: 04/01/2006
EDITION NO.: 1
CHEMICAL FAMILY: Acrylic

EMERGENCY OVERVIEW:

Flammable. Keep away from heat, sparks, flames, and other sources of ignition. Do not smoke. Extinguish all flames and pilot lights. Turn off stoves, heaters, electrical motors, and other sources of ignition during use and until all vapors/odors are gone.CAUSES EYE IRRITATION. MAY CAUSE SLIGHT SKIN IRRITATION. VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED. VAPOR IRRITATES EYES, NOSE, AND THROAT.HARMFUL IF SWALLOWED.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous
TITANIUM DIOXIDE 13463-67-7	10 - 30	X
METHYL (N-AMYL) KETONE 110-43-0	10 - 30	X
TALC 14807-96-6	10 - 30	X
BARIUM SULFATE 7727-43-7	7 - 13	X
XYLENES 1330-20-7	0.1 1.0	X

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes eye irritation. Redness, itching, burning sensation and vision disturbances may indicate excessive eye contact.
SKIN CONTACT:
May cause slight skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.
SKIN ABSORPTION:
Skin absorption not expected to occur.
INHALATION:
Vapor and/or spray mist may be harmful if inhaled. Vapor irritates eyes, nose, and throat.
INGESTION:
Harmful if swallowed.

SIGNS & SYMPTOMS OF OVEREXPOSURE:
Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage. Eye watering, headaches, nausea, dizziness and loss of coordination are indications that solvent levels are too high. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.

CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
Repeated exposure to vapors above recommended exposure limits (see Section 8) may cause irritation of the respiratory system and permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. This product contains talc. In a lifetime inhalation study female rats exposed to an elevated respirable concentration (9 times the Permissible Exposure Limit) of cosmetic grade talc developed lung cancer. High exposures to xylenes in some animal studies have been reported to cause health effects on the developing embryo and fetus. These effects were often at levels toxic to the mother.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately. have Material Safety Data Sheet information available.
EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.
SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.
INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.
INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: 82 Degrees F (28 Degrees C)
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available
LEL: 1.1
AUTOIGNITION TEMPERATURE
Not Available.

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Pittsburgh, PA 15272

Product ID: 95-8801 (0114)
PRODUCT NAME: S/G URETHANE WHITE BASE C

EXTINGUISHING MEDIA:
Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical, or universal aqueous film forming foam) designed to extinguish NFPA Class IC flammable liquid fires. Water spray may be ineffective. Water spray may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

PROTECTION OF FIREFIGHTERS:
Fire-fighters should wear self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep this product away from heat, sparks, flame, and other sources of ignition (i.e., pilot lights, electric motors, static electricity). Invisible vapors can travel to a source of ignition and flash back. Do not smoke while using this product. Keep containers tightly closed when not in use. Closed containers may explode when overheated. Do not apply to hot surfaces. Toxic gases may form when this product comes in contact with extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbent should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
Vapors may collect in low areas. If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts. Containers should be grounded when pouring. Avoid free fall of liquids in excess of a few inches.

STORAGE:
Do not store above 120 degrees F.(48 degrees C.) Store large quantities in buildings designed and protected for storage of NFPA Class IC flammable liquids.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT

EYES:
Wear safety glasses with side shields.

SKIN/GLOVES:
Wear protective clothing. Gloves should be constructed of: butyl rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. Clean contaminated clothing and gloves.

RESPIRATOR:
Overexposure to vapors may be prevented by ensuring proper ventilation controls, vapor exhaust or fresh air entry. A NIOSH- approved air purifying respirator with the appropriate chemical cartridges or a positive-pressure, air-supplied respirator may also reduce exposure. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
TITANIUM DIOXIDE 13463-67-7	10 - 30	10 mg/m³	Not established	10 mg/m³	Not established
METHYL (N-AMYL) KETONE 110-43-0	10 - 30	50 ppm	Not established	100 ppm	Not established
TALC 14807-96-6	10 - 30	R- 2 mg/m³	Not established	R- 2 mg/m³	Not established
BARIUM SULFATE 7727-43-7	7 - 13	10 mg/m³	Not established	R- 5 mg/m³	Not established
XYLENES 1330-20-7	0.1-1.0	100 ppm	150 ppm	100 ppm	150 ppm

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG IPEL	PPG STEL
TITANIUM DIOXIDE 13463-67-7	10 - 30	10 mg/m³	Not established	Not established	Not established
METHYL (N-AMYL) KETONE 110-43-0	10 - 30	25 ppm	Not established	Not established	Not established
TALC 14807-96-6	10 - 30	R- 2 mg/m³	Not established	Not established	Not established
BARIUM SULFATE 7727-43-7	7 - 13	10 mg/m³	Not established	Not established	Not established
XYLENES 1330-20-7	0.1-1.0	100 ppm	150 ppm	Not established	Not established

Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV= Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit, Skin= Skin Absorption Designation; [C- Ceiling Limit; S- Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.555
PHYSICAL STATE:	Liquid
Percent Solids:	78.37
Percent Volatile by Volume:	41.240
pH:	Not available.
ODOR THRESHOLD:	Not available.
Vapour Pressure:	2.1 mm Hg

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 95-8801 (0814)
PRODUCT NAME: S/G URETHANE WHITE BASE C

ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	39
BOILING POINT OR RANGE:	280 - 399Degrees F
Freezing Point or Range:	Not Applicable.
Melting Point or Range(°C):	Not Applicable.
Partition coefficient (n-octanol/water):	Not Applicable.
WEIGHT PER GALLON:	12.96 (U.S.) / 15.5 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:
- Carbon monoxide - Carbon dioxide - Oxides of sulfur - Oxides of barium
- Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
TITANIUM DIOXIDE 13463-67-7	10 - 30	10.00 g/kg	Not Available	Not Available
METHYL (N-AMYL) KETONE 110-43-0	10 - 30	1.60 g/kg	10.21 g/kg	Not Available
XYLENES 1330-20-7	0.1-1.0	4.30 g/kg	1.70 g/kg	21.66 g/L 4 hr

CHRONIC TOXICITY
Ingredient Target Organ/Chronic Effects:
- Carcinogen - Embryotoxin - Brain - Central nervous system - Lung

Mutagenicity Toxicity:
This has not been tested for this product.
Reproductive Toxicity:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

Material/ CAS Number	Percent	Ingredient Specific Animal Data:
TITANIUM DIOXIDE 13463-67-7	10 - 30	This product contains titanium dioxide. Animals inhaling massive quantities of titanium dioxide dust in a long-term study developed lung tumors. Studies with humans involved in manufacture of this pigment indicate no increased risk of cancer from exposure.

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available

ENVIRONMENTAL FATE
Mobility: No information available
Biodegradation: No information available.
Bioaccumulation: No Information Available.

PHYSICAL/CHEMICAL
Hydrolysis: No information available.
Photolysis: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name:	Paint
NOS Technical Name:	None
Hazard Class:	3
Subsidiary Class(es):	None
UN Number:	UN1263
Packing Group:	III

USA - RQ Hazardous Substances: Xylenes
USA-RQ Hazardous Substance Threshold Ship Weight: Xylenes>26313.16 Pounds
Marine Pollutant Name: None
USA Shipments Only - RQ Threshold Ship Weight: This is the total weight of this product that must be shipped to exceed the RQ quantity

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS
U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA Inventory or is otherwise exempt from TSCA Inventory reporting requirements
FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS-TPQ (LBS)	SARA 313
TITANIUM DIOXIDE 13463-67-7	10 - 30	Not Listed	Not Listed	Not Listed
METHYL (N-AMYL) KETONE 110-43-0	10 - 30	Not Listed	Not Listed	Not Listed
TALC 14807-96-6	10 - 30	Not Listed	Not Listed	Not Listed
BARIUM SULFATE 7727-43-7	7 - 13	Not Listed	Not Listed	Not Listed
XYLENES 1330-20-7	0.1-1.0	100 lbs	Not Listed	Listed

SARA 311/312

Health (acute):	Yes
Health (chronic):	No
Fire (flammable):	Yes
Pressure:	No
Reactivity:	No

WHMIS HAZARD CLASS: - Class B, Division 2 - Class D, Division 2, Subdivision A

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 95-8801 (0814)
PRODUCT NAME: S/G URETHANE WHITE BASE C

STATE/PROVINCIAL REGULATIONS
Additional Information
Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen. OSHA- Occupational Safety and Health Administration

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 2 3 0
HMIS Rating: 2 3 0

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects.

HMIS=Hazardous Materials Identification System; NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Section 9 has been updated
Updated MSDS format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
95-8801 000005 (00396475.001)(04/03/06)
060331, 000, 0614

*** END OF MSDS ***

PPG PITTHANE® 95-8800 Series

HPC/Industrial Maintenance

PITTHANE® High Build Semi-Gloss Urethane Enamels

GENERAL DESCRIPTION

PITTHANE® High Build Semi-Gloss is a durable, high build, acrylic urethane that is recommended for use where a semi-gloss appearance and delayed onset of chalking are desired. Easy to apply, the PITTHANE High Build Semi-Gloss can be brushed, rolled or sprayed and offers excellent color and gloss retention. Available in both white and neutral bases, this product has infinite color capability through our PERFORMACOLOR® tint system. In addition, faster dry time (dry to handle in approximately 5.5 hours or 55 minutes with accelerator) a 2.8 VOC, and longer pot life are features that make it ideal for industrial and commercial use.

RECOMMENDED USES

Aluminum	Galvanized Steel
Concrete	Steel

FEATURES AND BENEFITS

Fully 2.8 VOC compliant
Virtually infinite color capability with PERFORMACOLOR® System
Good chemical resistance
Mar & abrasion resistant
Spray, brush or roller application
Semi-gloss finish
Excellent gloss & color retention
High Build characteristics

RECOMMENDED PRIMERS

Aluminum	95-245, 97-145, 97-946, 97-687
Concrete Masonry Units	95-217, 97-685
Concrete, Stucco, Plaster, Masonry other than CM Unit	95-217, 97-685
Drywall	95-245, 97-145, 97-946
Ferrous Metal	94-109, 94-258, 95-245, 97-145
Galvanized Steel	94-109, 95-245, 97-145, 97-946

PACKAGING

1-Gallon (3.78L)
5-Gallon (18.9L)
Pint (473 mL)

All products not available in all sizes. Not all containers are full-filled.

TINTING AND BASE INFORMATION

These products are designed to be tinted with colorants from the PERFORMACOLOR® System. Use formulas from the PITTHANE® Semi-Gloss section of the formula book or from the PERFORMACOLOR System Software. Do not tint with 96 line custom colorants.

PRODUCT CODE INFORMATION

95-859	Component B Curing Agent
95-8800	Neutral Base Component A
95-8801	White Base Component A

PRODUCT DATA

PRODUCT TYPE:	Acrylic Aliphatic Urethane
GLOSS:	Sprayed Semi-Gloss 40-60 (60° Gloss Meter)
VOC*:	2.43 lbs./gal. (291.6 g/L)
COVERAGE*:	206 to 516 sq. ft./gal. (18.1 to 47 sq. m/3.78L)

Note: Coverage does not include loss due to varying application method, surface porosity, or mixing.

WEIGHT/GALLON*:	12.4 lbs. (5.5 kg) +/- 0.3 lbs. (136 g)
VOLUME SOLIDS*:	64.3% +/- 2%
WEIGHT SOLIDS*:	80.5% +/- 2%
FILM THICKNESS	
Dry Mils*	2.0 to 5.0
Dry Microns:	50.8 to 127.0
Wet Mils*	3.1 to 7.8
Wet Microns:	78.1 to 198.1

*Product data calculated on 95-8801 mixed.

Results will vary by color, thinning and other additives.

MIX RATIO: 7 parts Comp. A to 1 part Comp. B

DRYING TIME: All @ 50% relative humidity

Drying times listed may vary depending on temperature, humidity, color and air movement.

Temperature:	77°F (25°C)	60°F (15.5°C)
To Touch:	2.5 hours	5.5 hours
To Handle:	5.5 hours	18 hours
To Recoat:	5.5 hours	18 hours

DRY TIME ACCELERATED WITH 6 fl. oz./gal. 97-722

Temperature:	60°F (15.5°C)	40°F(4.4°C)
To Touch:	45 min.	3 hours
To Handle:	2 hours	5 hours
To Recoat:	2 hours	5 hours

POT LIFE:	2.5 hours
CLEAN UP:	97-727, 97-730, 97-734 PPG Thinners
FLASH POINT:	95-8800 84°F (28.9°C) 95-8801 84°F (28.9°C) 95-859 331°F (166°C)

PITTHANE®

95-8800 Series

PITTHANE® High Build Semi-Gloss Urethane Enamels

HPC/Industrial Maintenance

GENERAL SURFACE PREPARATION

The surface to be coated must be dimensionally stable, dry, clean and free of oil, grease, release agents, curing compounds, and other foreign materials. Where appropriate bare areas should be primed with a suitable primer. See the list of recommended primers below. Job conditions may dictate the choice of an alternative primer. Consult the PPG HD Systems or your PPG Sales Representative if this is the case. The service life of the coating is directly related to the surface preparation. WARNING! If you scrape, sand, or remove old paint, you may release lead dust or fumes. LEAD IS TOXIC. EXPOSURE TO LEAD DUST OR FUMES CAN CAUSE SERIOUS ILLNESS, SUCH AS BRAIN DAMAGE, ESPECIALLY IN CHILDREN. PREGNANT WOMEN SHOULD ALSO AVOID EXPOSURE. Wear a properly fitted NIOSH-approved respirator and prevent skin contact to control lead exposure. Clean up carefully with a HEPA vacuum and a wet mop. Before you start, find out how to protect yourself and your family by contacting the USEPA National Lead Information Hotline at 1-800-424-LEAD or log on to www.epa.gov/lead. In Canada contact a regional Health Canada office. Follow these instructions to control exposure to other hazardous substances that may be released during surface preparation.

PREVIOUSLY PAINTED SURFACES: Old coatings should be tested for adhesion of the existing system and tiling by the proposed topcoat.

HPC Systems in Detail Brochure (H13805)COATINGS SYSTEMS 229-HD, 230-HD, 244-HD, 313 HD, 323-HD, 423-HD, 430-HD, 435-HD.

Note: Consult technical if cure at temperature below 40°F is needed.

LIMITATIONS OF USE

Apply only when air temperature is 40°F (4°C) or higher and when surface temperature is at least 5°F (3°C) above the dew point. The solvents contained in PITTHANE® Semi-Gloss Urethane Enamels can lift some alkyd, oil based and other coatings that are not resistant to strong solvents. A test patch application is recommended before PITTHANE Semi-Gloss Urethane Enamel is applied to a significant area of an unknown base coat or primer. Not recommended for immersion service. For Professional Use Only. Not Intended for Household Use.

SAFETY

Proper safety procedures should be followed at all times when handling this product. Explosion-proof equipment must be used when coating with these materials in confined areas. Keep containers closed and away from heat, sparks, and flames when not in use.USE WITH ADEQUATE VENTILATION. KEEP OUT OF REACH OF CHILDREN. Read all label and Material Safety Data Sheet for important health/safety information prior to use. MSDS are available through our website www.ppghpc.com or by calling 1-800-441-9895.

MIXING AND APPLICATION INFORMATION

Mix Component "A" thoroughly before blending. (If 97-722 Accelerator is used, add it to the "A" Component and mix well prior to the addition of the "B" Component. Add up to 6 oz. of 97-722 per mixed gallon). Add Component "B" to Component "A" and mix well. A mechanical mixer is recommended.

Application Equipment: Changes in application equipment and/or tip sizes may be required depending on ambient temperatures and application conditions.

Conventional Spray: Fluid Nozzle. DeVilbiss gun, with 704 or 777 air cap with E tip and needle, or comparable equipment.

Atomization Pressure: 55 - 70 Fluid Pressure. Can not specify, dependent on numerous factors.

Airless Spray: Pressure 1800 psi, tip 0.013" - 0.015" Spray equipment must be handled with due care and in accordance with manufacturer's recommendation. High-pressure injection of coatings into the skin by airless equipment may cause serious injury.

Brush: High Quality Natural Bristle Brush
Roller: 3/8" nap solvent resistant core

Thinning: If thinning is necessary, up to 7% of 97-730 (spray) or 97-734 (brush and roll) may be used. Acetone may be used for spray application.

Permissible temperatures during application:

Material:	60 to 90°F	16 to 32°C
Ambient:	40 to 100°F	4 to 38°C
Substrate:	40 to 140°F	4 to 60°C

PPG Industries, Inc.
Architectural Coatings
One PPG Place
Pittsburgh, PA 15272
www.ppghpc.com

Technical Services:
1-800-441-9895
1-888-807-5123 fax

Architectural Hotline:
1-800-PPG-1234

PPG Architectural Finishes
400 S. 10th Street
Louisville, KY 40203

PPG Canada, Inc.
Architectural Coatings
4-Kenview Blvd.
Brampton, ON L6T 5G4

G7 102006
Supersedes (11/2005)

MATERIAL SAFETY DATA SHEET

PPG High Performance Coatings

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): (412) 434-4515 (U.S.)
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-83889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)

PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 7:00 a.m. - 4:30 p.m. EST

Product ID: 95-859 (0814-F1)
PRODUCT NAME: PITTHANE 35 COMPONENT B
SYNONYMS: None
ISSUE DATE: 11/10/2008
EDITION NO.: 2
CHEMICAL FAMILY: POLYISOCYANATE

EMERGENCY OVERVIEW:
CAUSES SEVERE EYE IRRITATION. MAY CAUSE MODERATE SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY CAUSE AN ALLERGIC SKIN REACTION.VAPOR IRRITATES EYES, NOSE AND THROAT. MAY CAUSE IRRITATION AND/OR ALLERGIC RESPIRATORY REACTION IN LUNGS.MAY BE HARMFUL IF SWALLOWED.STABLE - HAZARDOUS REACTIONS POSSIBLE AT EXTREMELY HIGH TEMPERATURES/PRESSURES. This product is not expected to present any unusual hazards under fire or spill conditions. Read entire MSDS before use.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "X" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous	
HEXANE-1,6-DIISOCYANATE POLYMER 26182-81-2	60- 100	X	
HEXAMETHYLENE-DI-ISOCYANATE 822-06-0	0.1-1.0	X	
(As Diisocyanates) 822-06-0	*	X	See sections 3 and 15 for information

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes severe eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.
SKIN CONTACT:
May cause moderate skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.
SKIN ABSORPTION:
Skin absorption not expected to occur. Prolonged or repeated contact may cause an allergic skin reaction.
INHALATION:
Vapor irritates eyes, nose, and throat. May cause irritation and/or allergic respiratory reaction in lungs.
INGESTION:
May be harmful if swallowed.
SIGNS & SYMPTOMS OF OVEREXPOSURE:
Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Do not use if you have chronic (long-term) lung or breathing problems, or if you have ever had a reaction to isocyanates.
CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
Prolonged inhalation of an ingredient(s) in this product may cause lung sensitivity leading to pneumonitis. This product contains isocyanates. Inhalation may cause a burning sensation of the nose, throat and lungs. Allergic respiratory reactions to these materials are characterized by asthma-like symptoms such as chest tightness, wheezing, shortness of breath and coughing. These symptoms may follow repeated exposure or a single massive exposure and may be delayed.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.
EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.
SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.
INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.
INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: 331 Degrees F (166 Degrees C)
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available.
LEL: Not Available.
AUTOIGNITION TEMPERATURE:
Not Available.
EXTINGUISHING MEDIA:
Use extinguishers appropriate for surrounding fire.
PROTECTION OF FIREFIGHTERS:
Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 98-859 (6814-F1)
PRODUCT NAME: PITTHANE 35 COMPONENT B

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep this product away from heat, sparks, flame, and other sources of ignition (i.e., pilot lights, electric motors, static electricity). Invisible vapors can travel to a source of ignition and flash back. Do not smoke while using this product. Keep containers tightly closed when not in use. Closed containers may explode when overheated. Do not apply to hot surfaces. Toxic gases may form when this product comes in contact with extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbent should be placed in this container.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.
STORAGE:
Do not store above 120 degrees F. (48 degrees C.)

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear chemical-type splash goggles and full face shield when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapors.
SKIN/GLOVES:
Wear protective clothing sufficient to cover exposed skin surfaces. For applications where skin contact is likely and impermeable clothing is necessary, select clothing constructed of butyl rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. The decision whether to clean or discard contaminated clothing should be based on the chemicals contaminating them. Some chemicals can cause skin irritation, sensitization or other health effects if the cleaning process does not remove all traces of them. Consult a safety professional to determine whether clothing contaminated with this product can be safely cleaned and reused.
RESPIRATOR:
Where vapors or overspray are present, use a NIOSH approved, positive-pressure, air- supplied respirator for the entire time of spraying and until all vapors and mists are gone. Follow the respirator manufacturer's directions for respirator use. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Material/ CAS Number	Percent	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
HEXAMETHYLENE-DI-ISOCYANATE 822-06-0	0.1-1.0	0.005 ppm	Not established	Not established	Not established

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG PEL	PPG STEL
HEXANE-1,6-DI-ISOCYANATE POLYMER 28182-81-2	65- 100	Not established	Not established	0.5 mg/m³	mg/m³
HEXAMETHYLENE-DI-ISOCYANATE 822-06-0	0.1-1.0	C- 0.02 PPM	Not established	Not established	Not established

Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV=Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit (1989 Vacated values); IPEL=Internal Permissible Exposure Limit, Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation. [C- Ceiling Limit; S-Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.171
PHYSICAL STATE:	Liquid
Percent Solids:	100.00
Percent Volatile by Volume:	000
pH:	Not available
ODOR THRESHOLD:	Not available
Vapour Pressure:	Not Applicable.
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the solvents listed in Section 2
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	0
BOILING POINT OR RANGE:	Not available
Freezing Point or Range:	Not Applicable
Melting Point or Range(°C):	Not Applicable
Partition coefficient (n-octanol/water):	Not Applicable
WEIGHT PER GALLON:	9.78 (U.S.) / 11.7 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable but may undergo hazardous reactions at extremely high temperatures and pressures.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents. Avoid water and alcohols.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:
- Carbon monoxide - Carbon dioxide - Traces of isocyanate - Oxides of nitrogen - Hydrogen cyanide - Lower molecular weight polymer fractions

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 95-859 (0614-F1)
PRODUCT NAME: PITTHANE 35 COMPONENT B

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
HEXAMETHYLENE-DI-ISOCYANATE 822-06-0	0.1-1.0	71 g/kg	97 g/kg	15 g/l 4 hr

CHRONIC TOXICITY
Ingredient Target Organ/Chronic Effects:
- Lung - Respiratory sensitizer

Mutagenicity Toxicity:
This has not been tested for this product
Reproductive Toxicity:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available.

ENVIRONMENTAL FATE
Mobility: No information available.
Biodegradation: No information available.
Bioaccumulation: No Information Available.

PHYSICAL/CHEMICAL

Hydrolysis: No information available.
Photolysis: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Paints Non-Regulated Goods
NOS Technical Name: None
Hazard Class: None
Subsidiary Class(es): None
UN Number: None
Packing Group: None

USA - RQ Hazardous Substances: None
USA-RQ Hazardous Substance None
Threshold Ship Weight:
Marine Pollutant Name: None

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS

U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA Inventory or is otherwise exempt from TSCA Inventory reporting requirements.

FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS - TPQ (LBS)	SARA 313
HEXANE, 1,6-DI-ISOCYANATE, POLYMER 28182-81-2	60-100	Not Listed	Not Listed	Not Listed
HEXAMETHYLENE-DI-ISOCYANATE 822-06-0	0.1-1.0	100 LBS	Not Listed	Not Listed
(As Diisocyanates) 822-06-0	*	Not Listed	Not Listed	Listed

SARA 311/312:
Health (acute): Yes
Health (chronic): Yes
Fire (flammable): No
Pressure: No
Reactivity: No
WHMIS HAZARD CLASS: - Class D, Division 2, Subdivision A - Class D, Division 2, Subdivision B

STATE/PROVINCIAL REGULATIONS
Additional Information
Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program. *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen. OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 3 1 1
HMIS Rating: 3*1 1

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects.

HMIS=Hazardous Materials Identification System; NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Section 1 has been updated. Section 2 has been updated. Changes to this section may also result in changes in sections 8, 11 and/or 15. Section 14 has been updated. Date. Edition. Updated MSDS format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200). No supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
95-859 001001 [00077715.011](11/09/06)
970310, 001, 0614

*** END OF MSDS ***

Surface Preparation

1. Steel that is damaged or corroded must be repaired or replaced before the coating system is applied. Any necessary repair work will be performed by a third party and is not included within the scope of these surface preparation activities.

2. All surfaces to be coated shall be clean and dry prior to performance of any coating work.

3. Surfaces indicating oil and/or grease contamination, and all galvanized surfaces, shall be cleaned in accordance with SSPC SP 1 "Solvent Cleaning". The preferred method of solvent cleaning shall be detergent washing using a solution of Miracheм 500 followed by a thorough fresh water rinsing or by wiping surfaces with rags saturated with mineral spirits. This shall be accomplished prior to any other surface preparation that has been specified.

4. Existing chalking coatings that are to be over coated shall be high pressure washed with 3500 psi minimum pressure fresh water and allowed to dry prior to coating application.

5. All sharp edges, corners, and rough welds should be ground to a 1/8" radius. Weld spatter, burs and any other sharp surface irregularities shall be ground smooth prior to any abrasive blast cleaning and as part of any other surface preparation specified for surfaces to be coated.

6. Surface preparation shall be to the degree specified by the manufacturer's Product Data Sheet and shall fully conform to any referenced SSPC standards.

7. Prior to initiating abrasive blasting operations, the contractor shall erect suitable shields, tarpaulins, or other barriers to protect surfaces from damage by abrasives and paint overspray. The entire area shall be contained sufficiently to prevent objectionable debris and dust from escaping.

8. All metal surfaces to be coated, unless otherwise specified, shall be abrasive blasted in accordance with the approved work plan. The contractor shall use a suitable abrasive to produce an angular profile with a depth of 1.5 to 3.0 mils as measured in accordance with ASTM D4417 "Field Measurement of Surface Profile of Blast Cleaned Steel", Method C "Replica Tape". Within 8 hours after cleaning and prior to the deposition of any detectable moisture, contaminants, or corrosion, all blast cleaned surfaces shall be cleaned of dust and abrasive particles and given the first coat of paint. For exterior surfaces this cleaning may be accomplished by blowing the surface off with clean, oil, and moisture free air. For interior surfaces, sweeping and vacuuming is required.

9. Care should be taken to avoid contamination of the prepared surface by perspiration, fingerprinting, or by introduction of other contaminants from the workers or their equipment (example: dirty shoes or oily hoses).

10. After preparation as given above, the steel shall be inspected for sharp edges caused by improperly prepared welds or edge erosion and corrosion. Such areas shall be ground down to a round contour (1/4" radius approximately) using a Rigid Disc, 3M Clean and Strip Wheel or Grinding Wheel. This work activity may be done prior to final surface preparation or after.

11. Previously painted surfaces that will not be coated with Pitt-Char XP Coating, may be overcoated without removing the old coating and sandblasting the metal. The original paint and substrate must be in good condition, with good paint adhesion and no substrate corrosion. A test patch must be prepared where the old paint is overcoated with the epoxy primer and urethane topcoat. The system must be tested for adhesion after 7 and 30 days. If adhesion is acceptable, this overcoating may be proposed. Minimally, the old finish must be clean, dry, and abraded before overcoating.

Coatings Application

1. All corners, angles, bolt heads and threads and other difficult access areas shall receive one brush applied stripe coat of the material specified after the application of the primer coat. This shall be done in addition to the specified number of coats.

2. Areas inaccessible by spray equipment shall be coated by brush application.

3. When blasting and coating is to be done by section, coating of the blast-cleaned surface should extend no closer than 6 inches from the uncleaned surface.

4. When coating is applied adjacent to previously coated surface, the application should extend over the previous application by 6 inches.

5. Runs, drips, sags, excessive over spray, and other application related conditions that adversely affect performance of the coating shall be corrected before approval. Coating thickness for each coat shall meet the specified requirements for each product as measured in accordance with SSPC PA 2 "Measurement of Dry Film Thickness with Magnetic Gages". Any area of primer not meeting the minimum thickness requirement shall be recoated to meet specification requirements before any fireproofing or topcoat product is applied. Any coat found to be defective due to excessive thickness, dry spray, runs, pinholes, bubbles or other defects shall be removed and reapplied.

6. Ambient and surface conditions shall be within limits stated in the manufacturer's Product Data Sheet during application, and should be forecast or expected to remain so for at least 4 hours after application. Surface temperature shall be a minimum of 5 Deg.F. above the dew point for application. Coating materials shall be mixed, thinned, applied and cured in accordance with the manufacturer's latest printed instructions.

   Coating shall be applied under the following prevailing conditions:
   a) Surface free of moisture
   b) Air temperature and surface temperature between 45°F and 120°F unless otherwise stated in technical literature.
   c) Surface temperature at least 5°F above the temperature of the dew point.
   d) Work area free from inordinate amounts of dust that would contaminate prepared surfaces or damage freshly applied coatings.

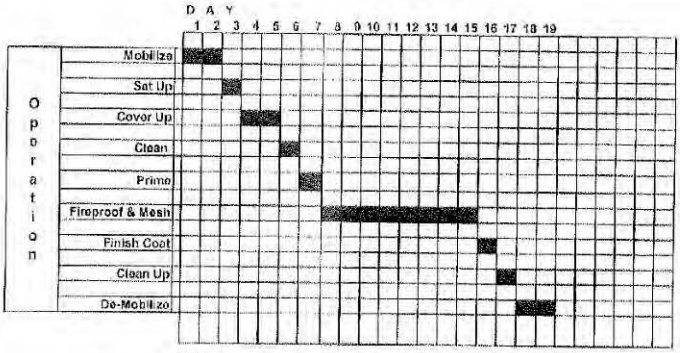
Material Preparation:

1. Only complete premeasured units as supplied by the manufacturer shall be mixed. Individual liquid components shall be mixed separately before combining and mixing together.
2. Mixed material shall be used before the manufacturer's pot life has expired or shall be discarded after the pot life has been exceeded.
3. Coating material shall be mixed until thoroughly dispersed. Mechanical mixing or boxing between two containers or both can accomplish this.

Re coat time, dry to handle time and cure time shall be observed carefully. Additional time, as required shall be allowed when coatings are applied below the reference temperature on the manufacture's Product Data Sheet (77 Deg.F.).

Project Schedules:

BAR CHART SCHEDULE
BUILDING 299



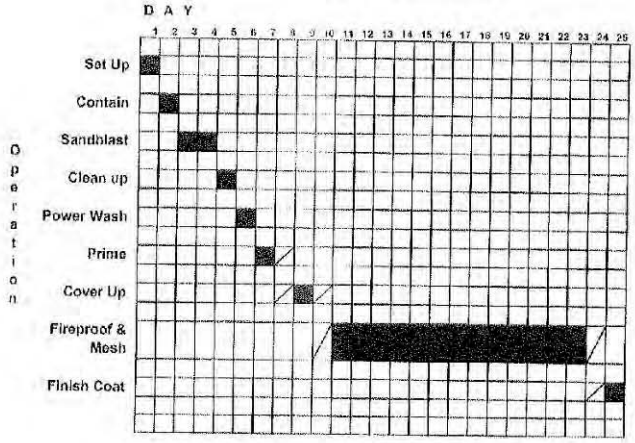
= ONE DAY

NOTE: Schedule based on working 6 days per week and up to 10 hours per day.

DEFINITIONS OF OPERATIONS

Mobilize : Transport personnel, equipment, supplies to work site.
Set Up : Move in and set-up equipment, storage, and office facilities.
Cover Up : Mask and cover areas adjacent to surfaces to be cleaned and coated. Set-up signs, etc
Clean : Solvent wipe all surfaces to be coated using mineral spirits.
Prime : Apply primer according to manufacturer's application guidelines using brush & roll technique.
Fireproof & Mesh : Apply PolyCrete XP per manufacturer's application guidelines.
Finish Coat : Apply two coats per manufacturer's recommendation using brush & roll technique.
Clean Up : Remove masking, signs, etc. Clean-up work area in preparation for de-mobilization
De-Mobilize : Remove personnel, equipment, supplies from work site.

BAR CHART SCHEDULE
AREA 227 BAGHOUSES



NOTE: Schedule based on working 6 days per week and up to 10 hours per day

DEFINITIONS OF OPERATIONS

Set Up	Set-up equipment, storage, and office facilities.
Contain	Hang tarps &/or screen material around area to be sandblasted.
Sandblast	Sandblast stairway columns on exterior of each building.
Clean up	Clean-up spent abrasive with shovels & brooms to a roll-off dumpster or drums.
Power Wash	Power-wash interior steel and exterior steel using 3,000 psi pressure washer.
Prime	Apply primer to all surfaces using brush & roll technique.
Cover Up	Mask all areas adjacent to surfaces to receive PittChar XP using visqueen and drop cloths.
Fireproof & Mesh	Apply PittChar XP per manufacturer's application guidelines.
Finish Coat	Apply finish coat per manufacturer's recommendation using brush & roll technique.

Almega Company Site Specific Safety Plan

For Fireproofing and painting work to be performed at the Rock Island Arsenal in the area 227 Bag Houses and Building 299, we have determined that the following safety measures will need to be addressed in order to provide our workers and those around them with a safe working environment

EM385 1-1

Section 1: Program Management

All employees working for the Almega Company are OSHA 10 certified and have completed the company safety program included in this report. For this project, our site foremen will conduct weekly safety meetings and keep the site contact informed on work operations with the mandated work safety forms. Prior to commencement of work, our foreman will identify and discuss with all employees, any hazards associated with work to be performed on arsenal property.

Section 4: Temporary Facilities

While on site, Almega will have a trailer to be used as an office, break room and storage for small equipment. The trailer will be set up and secured by the rental company representative as per their safety specifications.

Section 5: Personal Protective Equipment

All Almega Company employees are issued standard personal protective equipment, including safety harnesses and lanyard or another appropriate fall arrest system, safety glasses, hearing protection, hard hat, respirator with required filters and cartridges, rubber gloves and face shields. They will also be provided with any site specific equipment required.

Employees are expected to provide their own safety toed work boots, work clothing and gloves.

Prior to the start of work, all employees will receive proper training in the use of all necessary personal protective equipment and respirator fit tests. We will also have all applicable medical information available in regards to respirator fitness.

During sand blast operations, any worker operating a sand blast nozzle will be equipped with an OSHA approved, air fed sand blast helmet. Air flow and quality will be monitored at all times with an approved CO monitor.

While solvent cleaning surfaces where lead is present, workers will be required to wear protective Tyvek suits, rubber gloves and respirators equipped with HEPA filters.

Section 6: Hazardous Substances, Agents and Environment

Almega Company and PPG will provide MSDS sheets for all material to be brought on site. This information will be reviewed with employees and proper safety steps will be taken to ensure a safe work environment.

In Building 299, where solvent cleaning will take place to clean structural steel, the area will be well ventilated and workers will be issued rubber gloves, respirators with appropriate chemical cartridges and eye protection. Wash station will be maintained in the event a worker is exposed to solvent.

During sand blasting operations, Black Beauty sand will be used. Spent abrasives will be collected and disposed of accordingly.

Disposal of any waste solvents, spent abrasives, unused paint, used material buckets and waste water will be handled by PPG.

The coating on the steel in Building 299 has been identified as containing lead. Surface will be prepared for coating with a solvent cleaning/ wipe down. In order to protect our workers and those around them, operations will be air monitored for one day in order to establish that levels of lead release comply with

OSHA standards. The area will be cordoned off and signs will be posted to notify others of the presence of lead work. Please refer to our attached lead safety compliance program for further procedural information.

Section 7: Lighting
While performing inside work, all permanent light fixtures will be protected from exposure to coating material.
While working in Area 227, additional lighting may be required to provide a safe work environment.

Section 8: Accident Prevention Signs, Tags, Labels, etc.
During the course of work, all work sites and equipment will be properly barricaded and all appropriate signs shall be posted.

Section 9: Fire Prevention
Prior to beginning work, all fire hazards will be identified and fire extinguishers will be placed accordingly. Potential fire extinguisher locations include, but are not limited to, the company trailer, fire proofing trailer, in close proximity to the air compressor, heaters and materials.
Foreman and employees will also familiarize themselves with all site specific fire procedures and locations of fire alarms, hoses and extinguishers.
Work area will be kept clean as to prevent the build up of any potential fire hazards.
All electrical cords shall be equipped with GFI's.

Section 13: Hand and Power Tools
When needed for surface preparation in Building 299, all pneumatic power tools shall be inspected prior to each use. Any worker using a power tool will use proper personal protective equipment at all times.
Foreman shall review section 13.D on pneumatic power tools prior to their use.
For sand blasting set-ups, all hoses will be secured using tie wire and OSHA approved whip checks. Sand blast equipment will be supervised at all times during blasting operations.

Section 14: Material Handling, Storage and Disposal
All materials will be kept in appropriate locations. Paint and thinners will be kept in steel boxes when not being used and fire protective coatings will be kept in a storage trailer.
Should cleaning operations in Building 299 disturb any of the coatings containing lead, waste will be properly handled, contained and disposed of so as to minimize exposure. Please refer to our included company lead plan for more information.
Disposal of used materials will be handled by PPG.

Section 18: Motor Vehicles
Company vehicles will only be operated by employees with valid drivers licenses.
Any company vehicle or trailer brought on site will have all necessary Pennsylvania inspections and registrations.
All loads will be inspected by drivers before they are moved and drivers will comply with all arsenal traffic laws.

Section 20: Pressurized Equipment and Systems
All pressurized air and sand blast lines shall be inspected prior to each use in order to prevent any breaks.

Section 21: Safe Access and Fall Protection
Scaffolding will be utilized in both work areas. It will be constructed in accordance with the vendor's specifications and inspected prior to each use to ensure its compliance with applicable OSHA standards.

When workers are working from scaffolds or ladders, they will be required to use their safety harness and the appropriate fall arrest system. All fall arrest systems will be inspected at the beginning of each work day. Almega Company safety training includes a section dedicated to fall protection and no worker will be allowed to work about 6 feet before they receive this company training.
Fiberglass ladders will be used and all extension ladders will be tied off and anchored in accordance with OSHA standards.

Section 22: Work Platforms
See company plan for Section 21.

Almega Lead Safety Policy

4.0 LEAD

4.1 PURPOSE

4.1.1 The purpose of this program is to establish and implement corporate practices and procedures to:

a) protect the health of Almega Company, Inc.'s employees exposed to lead on the job.

b) comply with the OSHA Construction Industry Lead Standard, 29 CFR 1926.62

4.2 APPLICABILITY AND SCOPE

4.2.1 This program applies to all Almega Company, Inc.'s projects involving the disturbance of lead paint

4.2.2 This Lead Protection Plan establishes methods for complying with the OSHA Construction Industry Lead Standard, 29 CFR 1926.62. Project-specific requirements are identified using Attachment 1.

4.2.3 Implementation of this program is under the direct control of the Competent Person assigned to the project.

4.2.4 This program also applies to all subcontractors working under the direct control of Almega Company, Inc. involved with lead-based paint removal projects and activities. Subcontractors must provide all manpower, supplies, equipment, training, and medical examination and testing necessary to comply with this program.

4.3 DEFINITIONS

4.3.1 Action Level - Employee exposure, without regard to the use of respirators, to an airborne concentration of lead in micrograms per cubic meter of air ($\mu g/m^3$) calculated as an eight hour time-weighted average (TWA). The Action Level for lead is 30 $\mu g/m^3$.

4.3.2 Competent Person - One who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

4.3.3 Lead - the word "lead" when used in this program, means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. Lead is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form lead compounds.

4.3.4 Lead-based Paint - Definitions vary depending upon industry or use. Per 16 CFR 1303, "Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint", a paint cannot be manufactured for consumer use if it contains 0.06% (600 ppm) or greater lead by weight. Abatement in public housing is triggered at 0.5% (5000 ppm) or 1.0 mg/cm². For the purpose of this program, its requirements shall be implemented when lead in any amount, is detected in the paint.

4.3.5 µg/dl - micrograms per deciliter of whole blood. Common units for reporting concentrations of lead in blood samples. Also reported as µg/100g (micrograms per 100 grams) of whole blood.

4.3.6 µg/m³ - micrograms per cubic meter of air. Common units for reporting airborne concentrations of lead.

4.3.7 MSHA - Mine Safety and Health Administration. Federal agency which tests and certifies respirators.

4.3.8 NIOSH - National Institute for Occupational Safety and Health. Federal agency which conducts research on safety and health issues.

4.3.9 OSHA - Occupational Safety and Health Administration. Safety and health standards are contained in Title 29 of the Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 29 CFR 1926).

4.3.10 PEL - Permissible Exposure Limit. Employee exposure, without regard to the use of respirators, to an airborne concentration of lead in micrograms per cubic meter of air (µg/m³) calculated as an eight hour time weighted average (TWA). The PEL for lead is 50 µg/m³.

4.3.11 TWA - 8 hour Time Weighted Average concentrations of airborne contaminants. This is the employee's average airborne exposure in any eight hour work day. A formula is used to calculate the PEL if an employee is exposed to lead for more than 8 hours in any work day. The employees allowable exposure to lead, as a time weighted average (TWA) for that day, is reduced according to the following formula.

$$\text{Allowable Employee Exposure in } \mu g/m^3 = \frac{400}{\text{Number of Hours Worked in the Day}}$$

4.4 ACTION LEVEL

4.4.1 The Action Level refers to employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter (µg/m³), calculated as an 8-hour time weighted average (TWA).

4.4.2 Whenever workers' airborne lead exposures exceed or are expected to exceed the Action Level, the following portions of this program are implemented for the work project:

a) Competent Person

b) Employee Information and Training

c) Employee Medical Surveillance and Medical Removal Protection

d) Initial and Periodic Exposure Assessment

e) Record keeping

f) Regulated Areas

4.4.3 The Action Level may be exceeded where lead-containing coatings or paint are present and the following activities are performed: abrasive blasting, cleanup of spent abrasives, containment movement and removal, spray painting with lead paint, manual scraping, manual sanding, power tool cleaning with and without dust collection systems, water jetting, chemical stripping, and heat gun applications. Some non-painting related activities that may result in exposures above the Action Level include: manual demolition of structures, welding, cutting, torch burning, or rivet busting; installation, removal or demolition of lead containing materials; lead burning; and lead contamination/emergency cleanup operations.

4.4.4 Almega Company, Inc. provides hand washing facilities in near proximity to the worksite on all jobs where employees are potentially exposed to lead at any level.

4.5 PERMISSIBLE EXPOSURE LIMIT

4.5.1 The Permissible Exposure Limit (PEL) for airborne lead exposure is 50 $\mu g/m^3$ as an 8-hour TWA concentration. This is the maximum 8 hour average concentration of lead that an employee may be exposed to during each work day. For work days longer than 8 hours in a given day, the PEL is reduced using the following formula:

Permissible Exposure Limit = (PEL x 8) ÷ (hours worked in a day)

4.5.2 Whenever workers' airborne lead exposures exceed or are expected to exceed the PEL, without regard to the use of respirators, in addition to the requirements of Section 4.4.2, the following portions of this program are implemented for the work project:

a) Compliance Program

b) Engineering/Work Practice Controls

c) Respiratory Protection

d) Protective Clothing and Equipment

e) Hygiene Facilities and Practices

f) Warning Signs

g) Housekeeping Procedures

4.5.3 The following methods are used, as feasible and effective, for maintaining airborne lead exposures below the PEL.

a) Engineering controls to minimize dust generation during the coating removal process.

b) Work practices, such as wearing protective clothing, using hygiene facilities, and effective housekeeping procedures.

c) Respiratory protection is worn in work areas where the PEL may be exceeded.

d) No eating, drinking, smoking, or chewing of tobacco products is permitted in work areas or anywhere that lead exposures may exceed the PEL.

4.5.4 During the period that respirators are worn, the protection factor of the specific respirator may be used to determine employees exposures to airborne lead and to achieve compliance with the PEL. The protection factors listed in the respirator selection table of Section 7.0 of Attachment 2 may be used. For example:

Measured airborne lead concentrations in the workers breathing zone:	300 µg/m³, 8-hour TWA
Half-mask, air-purifying, negative pressure respirator with HEPA filters worn all day:	protection factor of 10
Employees daily lead exposure: (measured exposure divided by the protection factor)	30 µg/m³

4.6 COMPETENT PERSON

4.6.1 The competent person is involved in both the planning and performance of projects where employee airborne lead exposures may exceed the Action Level.

4.6.2 The competent person is a designated Almega Company, Inc. employee or authorized third party with training and experience in conducting jobs involving lead exposure. The competent person has the capability of identifying hazards and the authority to take immediate corrective action.

4.6.3 The competent person will be at the work site at all times while lead exposure activities are in progress. He or she may have other job duties, but will inspect the work on a frequent and regular schedule for hazards or deficiencies and complete site inspection forms (see Form 1) and/or ensure that oversight work performed by others has been appropriately performed.

4.7 EXPOSURE ASSESSMENT

4.7.1 Almega Company, Inc. (or its agents) determines worker exposures to lead through historical data or by instrument monitoring in order to establish the specific worker protection measures necessary for the project.

4.7.2 When previously collected sampling data of the same operations under similar conditions has conclusively determined that current job condition exposure levels will be less than the Action Level, initial exposure monitoring is not performed.

4.7.3 When previously collected sampling data of the same operations under similar conditions has conclusively established the exposure levels that will occur on the project, initial monitoring is not performed. Protection and work practices are implemented consistent with the pre-established exposure levels.

4.7.4 When conclusive historical monitoring data is not available, personal air samples are collected on a per-job basis to determine airborne lead exposures for employees performing tasks which may involve lead exposure. Representative full shift (at least 7 hours) air samples are collected for each job activity in worker classification. Sampling information is recorded on Form 2.

4.7.5 A chain-of-custody form is completed to accompany samples to the laboratory.

4.7.6 Almega Company, Inc. implements employee protective measures for the following activities until results of the employee exposure assessment are received. These protective measures include but are not limited to, protective clothing, respirators, training, change areas, medical surveillance, and

implementation of good personal hygiene practices (e.g., washing of hands, forearms and faces). The protective measures are modified, as necessary, according to the results of the monitoring. The work activities involved, and presumed exposures levels are:

Activity	Presumed Exposure Level
a) Manual demolition of structures (e.g., dry wall) Manual scraping Manual sanding Heat gun applications Power tool cleaning with dust collection systems Spray painting with lead paint	50 to 500 µg/m³
b) Using lead containing mortar Lead burning Rivet busting Power tool cleaning without dust collection systems Clean-up activities where dry expendable abrasives are used Abrasive blasting enclosure movement and removal	500 to 2,500 µg/m³
c) Abrasive blasting Welding Torch cutting or burning	In excess of 2,500 µg/m³

4.7.7 Where initial monitoring indicates that exposures are below the Action Level, and where work activities and conditions will remain the same as at the time of initial sampling, additional monitoring is not repeated for that work activity. In addition, the initial protective measures implemented can be discontinued with the exception of the hand wash facility.

4.7.8 For projects where initial monitoring indicates that lead exposures are at or above the Action Level but below the PEL, additional representative exposure monitoring is conducted at least once every six (6) months for that work activity.

4.7.9 Where initial monitoring indicates that lead exposures are at or above the PEL, additional representative exposure monitoring is conducted at least once every three (3) months.

4.7.10 All air samples are collected and analyzed according to NIOSH Method 7082, or an equivalent method. All samples are analyzed by laboratories successfully participating (at least in the previous twelve months) in the ELPAT Program or accredited by the American Industrial Hygiene Association (AIHA) for metals analysis.

4.7.11 All exposed employees are notified in writing of the monitoring results within 5 days after receiving the results (See Form 3). In addition, Almega Company, Inc. will notify all other workers whose exposures are represented by the data. When the results indicate that employees are exposed to lead above the PEL, Almega Company, Inc. includes in the written notification, a description of the corrective measures to be taken to ensure the employee is adequately protected.

4.8 ENGINEERING AND WORK PRACTICE CONTROLS

4.8.1 Almega Company, Inc. utilizes engineering and work practice controls to reduce employee exposures to the lowest feasible level.

4.8.2 When high levels of lead dusts are generated (e.g., abrasive blast cleaning inside of a containment), ventilation systems are used. Alternate methods of control are considered and may involve the use of wet removal methods to minimize dusting, vacuum shrouded tools, or others. Decisions are based upon contract requirements, quality of surface preparation and productivity required, effectiveness of the control of lead emissions, and other project-specific considerations.

4.8.3 When mechanical ventilation systems are used to control lead exposures, Almega Company, Inc. evaluates the performance of the system to maintain its effectiveness in accordance with the following information:

a. Visual Inspections

1. Visual inspections may include periodic assessments of the following items:

- Inspecting the inside of ductwork for clogging or plugging by material
- Inspecting ductwork for deterioration
- Inspecting flexible ductwork for excessive bends or elbows
- Checking exhaust fan conditions including the fan belt
- Checking exhaust system filters

- Inspecting make-up air louvers, baffles, or flap seals
- Verifying that containment tarps are in good condition
- Verifying that joints are sealed tightly where containment tarps are connected (to each other and to the structure being painted)
- Inspecting the containment for signs of leakage or evidence of lapse in negative pressure (e.g., walls not concave)

b. Air Velocity Measurements

i. Measurements of air velocity are made with velometers inside the ductwork or containment for comparison with accepted or design criteria. Velometers are used in accordance with the manufacturer's instructions.

ii. Since air velocity through a containment is not uniform, several measurements are made in equal sub-sections of the cross sectional area. These air velocity measurements are averaged and multiplied by the cross-sectional area at the point of measurement to determine the total volume of air exhausted in cubic feet of air per minute (cfm). A similar procedure is followed inside ductwork, however a center-line velocity measurement result is multiplied by .90 to approximate the average air velocity through the duct. This data is then compared to design criteria to assess the exhaust system effectiveness.

iii. In the event that measured air velocities or calculated total exhaust air volumes are detected significantly below the design criteria (e.g., 80% or less of design or specified performance), work activities are immediately stopped until corrective measures are implemented.

c. Static Pressure Measurements

i. Periodic measurements of static pressure using a magnehelic gauge are made to assess negative pressure inside the containment. Static pressure measurements are also used to identify malfunctioning equipment, clogged ducts, dirty or broken filters, and damaged exhaust system components. These measurements are made through small holes drilled into the side wall of ductwork.

ii. In the event that the static pressure measurements across the containment are below the specified criteria (typically from

0.01 to 0.03 inches of water), work activities are immediately stopped until corrective measures are implemented.

d Reporting/Record Keeping

i The results of the visual inspections are reported on Form 4. Results of instrument verifications are reported on Form 5. Records are maintained for the length of the project plus 3 years.

4.8.8 When welding, torch cutting or burning, Almega Company, Inc. considers the removal of paint in advance to reduce exposures. When this approach is utilized, the lead containing coating is stripped a distance of approximately 4 inches on both sides of the area of heat application.

4.9 RESPIRATORY PROTECTION

4.9.1 Respirators are worn by all Almega Company, Inc. employees who may be exposed to airborne lead at or above the Permissible Exposure Limit.

4.9.2 The respiratory protection program for lead exposure activities shall be implemented in accordance with Part B – Section 2.0. Respiratory protection program criteria specific to 29 CFR 1926.62 for respirator users are also contained in Attachment 2.

4.9.3 Contaminated respirator cartridges are disposed of as hazardous or non-hazardous, as appropriate.

4.10 PROTECTIVE CLOTHING AND EQUIPMENT

4.10.1 Protective clothing and equipment are worn by all employees whose airborne lead exposures may exceed the PEL. Protective clothing and equipment are provided at no cost to the employee.

4.10.2 Protective clothing includes washable or disposable work clothing and/or full body coveralls. Other protective equipment includes eye protection, faceshields, hats, gloves, shoes or disposable shoe covers, and hearing protection, as appropriate.

4.10.3 Clean work clothes are provided daily to employees whose airborne exposure levels (without regard to use of a respirator) are over 200 $\mu g/m^3$ of lead as an 8-hour TWA. Employees whose exposure levels are less than 200 $\mu g/m^3$ are provided clean work clothing at least weekly.

4.10.4 Disposable protective clothing is used for no more than one work day. It is disposed of as hazardous or non-hazardous waste as appropriate.

4.10.5 Reusable clothing is collected at the end of each work day in closed bags or containers. Reusable clothing which is contaminated with lead is cleaned according to applicable federal, state, or local regulations pertaining to lead-contaminated laundry and water discharge. If the clothing is not washed on site, it is sent to an authorized laundry. All containers of lead-contaminated laundry are labeled as follows:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE OR FEDERAL REGULATIONS.

4.10.6 Lead-contaminated clothing, shoes, shoelaces, hard hats, gloves, or equipment do not go home with any employee unless decontaminated at the end of the project. Removal of any contaminated items from the site by any employee is strictly prohibited. HEPA vacuums or wet methods may be used to clean workers personal items before leaving the site.

4.11 HOUSEKEEPING

4.11.1 Employees are not permitted to remove lead-containing dust from protective clothing or equipment by blowing, shaking, or by any other means which disperses lead into the air.

4.11.2 HEPA equipped vacuum cleaners are used for cleaning heavy dust contamination from protective clothing and equipment. HEPA vacuum cleaners and/or wet methods are used to maintain good housekeeping practices in the change areas and designated eating areas.

4.11.3 The use of compressed air for clean up around the work area is strictly prohibited.

4.11.4 Almega Company, Inc., prohibits the use of compressed air for cleaning in the work area, unless it is used in conjunction with a ventilation system.

4.12 PERSONAL HYGIENE FACILITIES AND PRACTICES

4.12.1 All employees whose airborne lead exposures exceed the PEL wear coveralls into work areas to prevent any contamination of personal clothing, or are provided with separate work clothing which allows the employee to work without wearing street clothing beneath.

4.12.3 Clean change areas are provided for all projects where employee airborne lead exposures may exceed the Permissible Exposure Limit. The clean change areas are equipped with storage facilities for street clothing and a separate area

for the removal and storage of lead-contaminated clothing and equipment. The change areas are designed and used so that contamination of street clothing does not occur. Airborne lead exposures in the change area are maintained below the Action Level.

4.12.4 When employee lead exposures exceed the Permissible Exposure Limit, shower facilities are provided where feasible. Shower facilities comply with the OSHA Standard, 29 CFR 1926.51, Sanitation. When showers are provided, all employees whose airborne lead exposures exceed the PEL shower at the end of each work shift. Shower facilities are provided with hot and cold running water.

4.12.5 Hand wash facilities are made available on all jobs involving potential exposure to lead. Handwash facilities are placed in near proximity to the work site and are equipped with running water, cleansing agents and towels. In addition to washing, all employees remove or clean their protective clothing by vacuuming before eating, drinking or smoking.

4.12.6 All employees exposed to any amount of lead on the job thoroughly wash their hands, face and forearms before eating, drinking, or smoking and at the end of each work shift.

4.12.7 Eating, drinking, smoking, or chewing tobacco are prohibited in work areas and in any area where lead exposure may exceed the PEL.

4.13 MEDICAL SURVEILLANCE

4.13.1 All employees who may be exposed to lead above the Action Level on any single day of the year are provided with initial biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin (ZPP).

4.13.2 All exposed employees are notified in writing of the biological monitoring results within 5 days after receiving the results (Form 6). When the results indicate that employees are exposed to lead above 40 micrograms per deciliter (µg/dl) Almega Company, Inc. includes in the written notification, a description of the medical removal program procedures.

4.13.3 Employees are provided a complete medical exam annually if:

a) a blood sampling test at any time during the preceding 12 months indicates a blood level at or above 40 µg/dl.

b) the employee notifies the supervisor/competent person that he/she has signs/symptoms of lead intoxication.

c) the employee desires medical advice concerning the effect of past or current lead exposure on the ability to procreate a healthy child.

d) the employee is pregnant

e) the employee demonstrates difficulty in breathing during a respirator fitting test or during use.

4.13.4 The specific contents, requirements, and frequencies of medical examinations, blood lead tests, and medical removal protection benefits are provided in Attachment 3 of the Medical Surveillance/Examination Program.

4.13.5 All employees are removed from lead exposure above the Action Level due to:

a) elevated blood lead levels (at or above 50 µg/dl confirmed by a follow up test within 2 weeks of the first), or

b) at the recommendation of a physician.

4.13.6 Removed employees may be reassigned to other job duties that do not involve exposure to lead above the Action Level. They are returned to lead exposure work above the Action Level only when their blood lead drops below 40 µg/dl, measured by two tests taken at least two weeks apart, or when the physician indicates that it is no longer necessary to limit exposure (when the removal was not caused by elevated blood lead levels). Almega Company, Inc. provides employees up to eighteen (18) months of medical removal protection benefits on each occasion that an employee is removed from exposure to lead. The benefits are provided for up to 18 months or as long as the job the employee was removed from continues and it is determined that they cannot be reassigned to other job duties that do not involve exposure to lead.

4.14 EMPLOYEE INFORMATION AND TRAINING

4.14.1 All employees who work on projects where airborne lead exposures are known to be or expected to be at or above the Action Level on any single day are provided information and training on the hazards of lead and measures for controlling these hazards and protecting their health.

4.14.2 Employees receive initial comprehensive lead training before performing work that may involve airborne lead exposure. This training is repeated annually as a refresher course.

4.14.3 The content of lead training includes:

a) An overview of the OSHA Construction Industry Lead Standard and the adverse health effects of lead, with particular emphasis on reproductive hazards.

b) Specific exposure-producing operations.

c) Respiratory Protection Program and the purpose, selection, fitting, use and limitations of respirators.

d) Medical Surveillance Program and Medical Removal Protection Program.

e) Methods of compliance including engineering controls and work practices.

f) Written compliance programs.

g) Instructions on the use of chelating agents.

h) Employee's right of access to records.

i) Training in site-specific issues including but not limited to:

i. Review of operations expected to have exposures greater than the Action Level.

ii. Review of operations expected to have exposures greater than the Permissible Exposure Limit.

iii. Review of the Engineering controls to be utilized on the project.

iv. Review of the work practices and decontamination procedures to be utilized on the project.

v. Review of the personal protective equipment (PPE) associated with specific job assignments.

4.14.4 Training records (see Form 7) of all employees are maintained and kept on file in accordance with the requirements outlined in the section entitled Record Keeping.

4.15 WARNING SIGNS

4.15.1 Warning signs are posted around work area activities where lead exposures may exceed the Action Level (Note: this exceeds the OSHA mandate for signs at the Permissible Exposure Limit). The work areas are demarcated by ropes, tape, walls, containments, or other visible means, and are designated as regulated area or zones.

4.15.2 The signs are posted in locations that are easily visible from a distance, enabling employees or bystanders to take necessary protective measures.

before entering the work area. Signs read as follows: "WARNING, LEAD WORK AREA, POISON, NO SMOKING OR EATING."

4.15.3 The Competent Person controls access of persons into work areas.

4.15.4 Persons entering work areas where warning signs are posted must comply with the requirements of this or a comparable program, and wear appropriate protective clothing and respirators.

4.16 RECORD KEEPING

4.16.1 All records relating to training, medical examinations, blood lead monitoring, exposure monitoring, and project specific requirements are maintained by Almega Company, Inc. for the employees' length of employment plus 30 years.

4.17 OBSERVATION OF MONITORING

4.17.1 Almega Company, Inc. provides affected employees or their designated representatives (assuming adequate training, medical surveillance and PPE are documented) an opportunity to evaluate the monitoring of the lead exposures. The employee or designated representative is entailed to: an explanation of the monitoring procedures, observe all steps related to the monitoring, and record the results obtained or receive copies of the results when returned by the laboratory.

4.18 PROJECT-SPECIFIC REQUIREMENTS

4.18.1 The specific worker protection requirements for each lead removal project are determined by Almega Company, Inc. in accordance with this program and project specifications. Job-specific requirements are outlined in the Site-Specific Lead Compliance Program (Attachment 1). This attachment is posted at the job site and maintained with the work records of the project.

4.19 OTHER RELEVANT INFORMATION

4.19.1 This compliance program is available for examination by all employees or authorized persons/agency.

4.19.2 Each site-specific lead compliance program is reviewed and updated at least every 6 months.

Almega Employee Test Examples

_____ Copy with Corrections Given to Employee

Formula

The Almega Company, Inc.

INDUSTRIAL & COMMERCIAL PAINTING CONTRACTORS

1337 McLaughlin Run Road
Pittsburgh, PA 15241

(412) 221-3446 • Fax: (412) 221-1856
E-Mail: almega@alliancedsprog.com
Website: www.almega.com

Name _____ Date: _____

HAZARD COMMUNICATION TRAINING TEST

Please view the information presented in the videotape. Answer the questions on the test by following along with the videotape. Additional time will be provided at the end of the tape to review any questions you have left blank. Remember the answers to the questions are presented during the tape.

1. The two main types of hazards associated with chemicals include

   _____ and _____.

2. Material Safety Data Sheets don't really provide good information? **True** **False**

3. MSDS provide _____ information.

4. Chemicals must contain labels with basic information about the materials?

   True **False**

5. What type of material ignites below 100 degrees? **Flammable or Combustible**

6. MSDS are not required at a job site? **True** **False**

7. It is not important how you dispose of chemicals or used material? **True** **False**

8. What are the four chemical hazards? _____

9. What is the most common way you are exposed to a chemical?

   (A) Skin absorption (B) Inhalation **(C) Injection**

10. What does PEL stand for? _____

Name _____ Form #33
(5 Tests)

Date _____

LEAD SAFETY TRAINING TEST

Please view the information presented in the videotape. Answer the questions on the test by following along on the videotape. Additional time will be provided at the end of the tape to review any questions you have left blank. Remember the answers to the questions are presented during the tape.

1. Who can be exposed to lead? _____
2. Children are affected more adversely than adults? **True** **False**
3. Symptoms of overexposure include: _____
4. Lead builds up in what parts of the body? (4) _____
5. How is your exposure determined? _____ and _____
6. What is the PEL for LEAD? **45 ug/m3** **30 ug/m3** **50 ug/m3**
7. The Action Level for lead exposure is _____ ug/m3
8. Engineering controls are the first step in controlling lead exposure? **True** **False**
9. Personal Protective Clothing and Equipment are used when levels aren't lowered below the PEL by engineering controls? **True** **False**
10. A _____ filter is used in a respirator for lead protection.
11. The filter on a respirator is changed when _____ in breathing resistance is noticed by the user.
12. Lead contaminated Personal Protective Clothing is removed when leaving the work area? **True** **False**
13. Contaminated PPE is disposed of by normal means? **True** **False**
14. Eating, smoking, and chewing is _____ in lead area.
15. Blood testing is done prior to starting the job? **True** **False**
16. Medical Monitoring is done when exposed to lead for at least 30 days below the PEL? **True** **False**
17. The action level for lead in the blood is _____ ug/dl.
18. _____ ug/dl means medical removal from lead exposure projects.
19. The employee should review his or her blood test results? **True** **False**
20. Employee has the most control of exposure levels? **True** **False**

FORMS #33

Page 2

Name _____

Date _____

Form #35
(5 Tests)

FALL PROTECTION TRAINING TEST

Please view the information presented on the videotape. Answer the questions on the test by following along with the videotape. Additional time will be provided at the end of the tape to review any questions you have left blank. Remember the answers to the questions are presented during the tape.

1. Fall protection equipment should be inspected _____

_____

2. When working above ground you must use a fall arrest system? **True** **False**
3. Your fall protection equipment must include a _____ foot shock-absorbing lanyard
4. You can substitute/alter equipment? **True** **False**
5. You can loop your lanyard around the anchor point? **True** **False**
6. _____ snap hook must be used.
7. The snap hook can be attached directly to a vertical lifeline? **True** **False**
8. The location of the anchor point should be directly above you at its highest point?

True **False**

9. Fall protection must always be worn correctly to function properly? **True** **False**
10. The correct fall distance is critical for fall protection equipment to work properly?

True **False**

Name _____ Form #35
Date _____ (5 Tests)

PERSONAL PROTECTIVE EQUIPMENT TEST

Please view the information presented in the videotape. Answer the questions on the test by following along with the videotape. Additional time will be provided at the end of the tape to review any questions you have left blank. Remember the answers to the questions are presented during the tape.

1. If you don't know what PPE to use _____
2. Personal Protective Equipment includes (**name three**) _____
3. One respirator cartridge will protect you from all hazards? **True** **False**
4. Ladders are placed using the 4-to-1 rule from the wall? **True** **False**
5. Always face the ladder while climbing or descending the ladder? **True** **False**
6. Ladders must extend _____ feet above the landing
7. Housekeeping is very important to on the job safety? **True** **False**
8. Lift with your _____ not your _____
9. Always _____ electrical equipment.
10. Ground fault circuit interrupters must be used when using electrical equipment?

    True **False**

11. Emergency numbers should be clearly posted at the job site? **True** **False**
12. Report all _____ and _____ no matter how small or minor you may think they are
13. Who is the person most responsible for your safety? _____

Name_____ Form #15

Date_____ 15 Tests

RESPIRATOR TRAINING TEST

Please view the information presented in the videotape. Answer the questions on the test by following along with the videotape. Additional time will be provided at the end of the tape to review any questions you have left blank. Remember the answers to the questions are presented during the tape.

1. A field test is required for proper usage? **True** **False**
2. Positive and negative field tests are adequate if leaks do not occur? **True** **False**
3. Qualitative fit test consists of _____ and negative, pressure test and _____
4. Correct type of cartridge/filters must be used for proper protection? **True** **False**
5. Filters/Cartridges should be replaced when? _____ _____ or _____
6. Your respirator should fit comfortably? **True** **False**
7. A full beard is acceptable when using a respirator? **True** **False**
8. A regular _____ and _____ of the respirator should be conducted?
9. Solvents should not be used to clean respirators? **True** **False**
10. Who is the most responsible for the condition and use of your respirator? _____ _____

FORMS.CIS Page 5

Almega Employee References

For work to be completed at the Rock Island Arsenal, we will utilize a four man crew.

Foreman: Dave Young- will be on site company representative. 22 years experience in the application of PPG Pitt-Char

Workers: Mark Lowers- 22 years experience with PPG Pitt Char

We do not currently know who the final two workers will be as they will most likely come from the local union hall.

Estimated Waste Quantities

Black Beauty Sand- 2 Tons

Waste Thinner- 15 gal.

Paint- 20 gal.

Waste Water- 250 gal.

Maintenance and Repair:

Should paint repair become necessary, utilize the following procedure for 97-145 and 95-8800 series primers and topcoats.

Solvent clean, per SSPC SP-1, the substrate to remove any contamination that may be present.

Abrade substrate to remove gloss and to obtain a surface profile for adhesion of the repair coating. This can be accomplished by following the standards of SSPC SP 2/3 Hand and/or Power Tool Cleaning. Feather sand any edges to allow for a smooth surface to repaint. Care should be taken not to abrade the surface too aggressively as surface defects may be visible when coated. Spot prime any bare metal with 97-145 series coating.

Prior to coating, Solvent wipe substrate to remove dust and residual contamination. Use 95-8800 to over coat the epoxy primer or the existing urethane topcoat.

If a repair is desired in an area where the product is subjected to immersion, remove all material by appropriate means. It is not recommended to touch up damaged coatings that are subjected to immersion.

Subject: Repair Procedure for Pitt-Char XP Coating

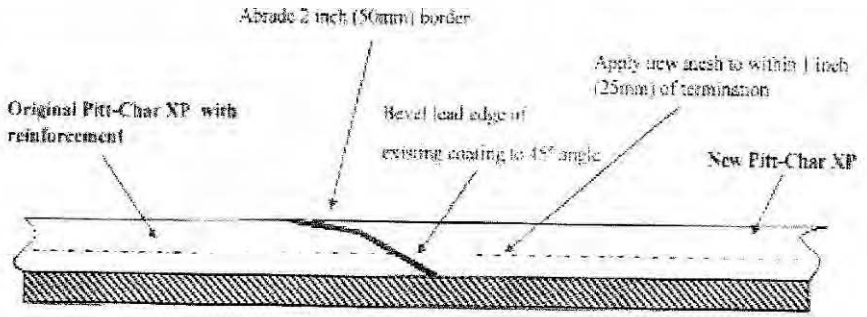
1. Outline damage area and cut through existing Pitt-Char XP coating and mesh reinforcement with a disc grinder. Remove damaged coating with hammer and chisel or pneumatic chisel. A sharp 1-2" wide chisel is used to split the coating at the primer level. Care shall be taken not to gouge or damage the steel substrate. Remove any loose or damaged coating and reinforcement material. The repair border of existing Pitt-Char XP coating shall be checked to ensure good adhesion to the substrate. The lead edge of the repair shall be tapered to a 45° angle.
2. Abrade entire repair area and a 2 inch boundary using either a brush blast, disc grinding or wire cup brush. For small areas use a hand wire brush or coarse grit sand paper. Remove any top coat to achieve a whitened, non glossy surface of the existing Pitt-Char XP coating in the repair area. All bare metal exposed shall be spot primed according to project specifications. Follow primer manufacture recommendations for application and recoat time.
3. Application of Pitt-Char XP shall achieve the original coating thickness and reinforcement as specified for the project. This may be accomplished by spray or hand trowel application as suitable. Repair areas smaller than 6 x 6 inches do not require mesh replacement.
4. New Pitt-Char XP coating shall be feathered onto abraded boundary area to achieve a uniform appearance in accordance with original Pitt-Char XP coating application. It shall not be applied to non abraded areas.

Pitt-Char XP Trowel Procedure

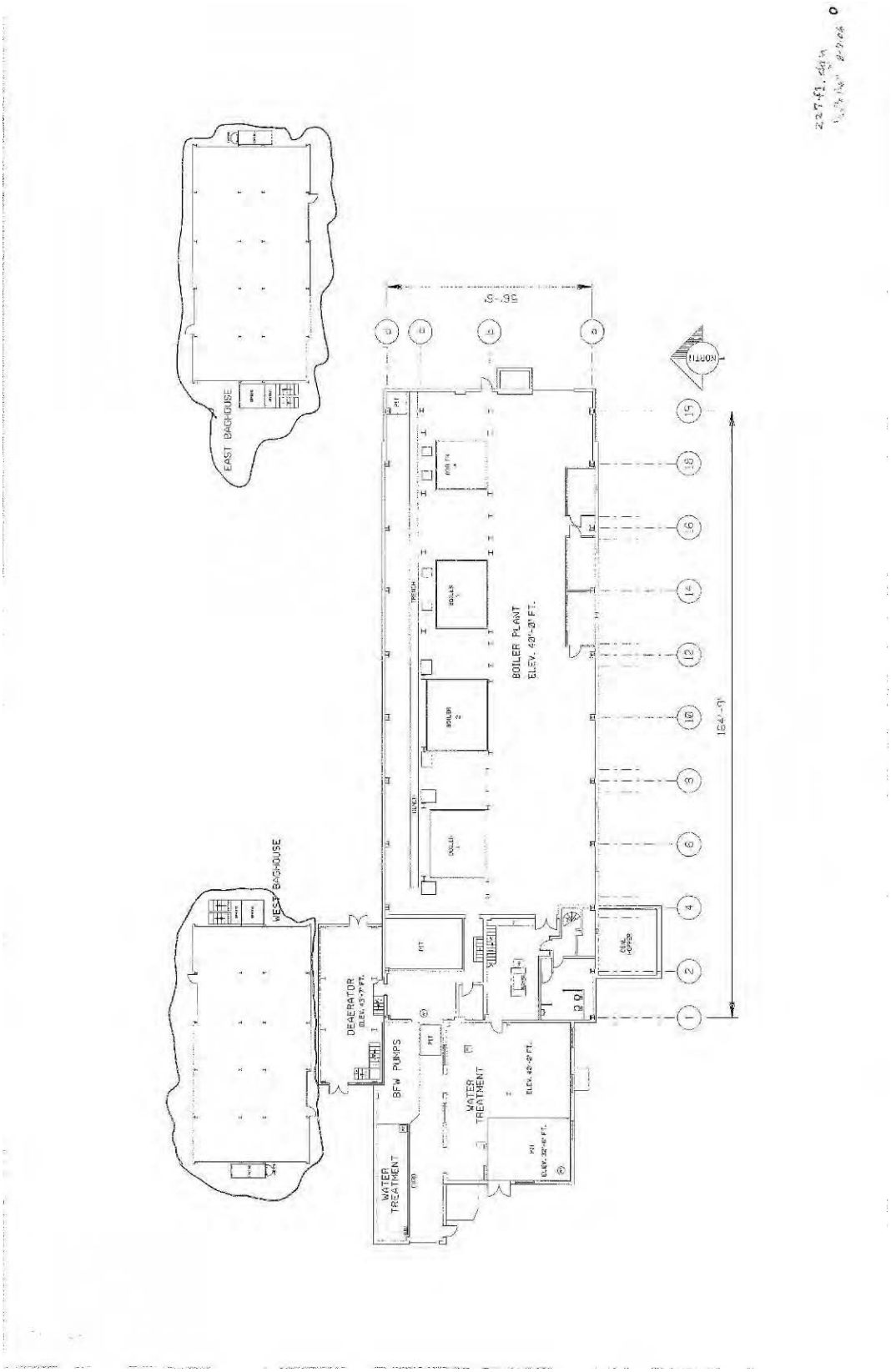
1. Material shall be warmed to 70–100°F. The mix ratio by weight is 3.25 parts component A (97-194) to 1.00 part component B (97-195).
2. Add 2-3% solvent (PM Acetate, Dichloromethane, or methylenechloride) to component A and mix until uniform.
3. Apply component B to component A and mix with a paddle or high lift mix blade until coating is a uniform gray color, 3-5 minutes is normal. **Do not over mix as this will induce heat and shorten pot life.**
4. Apply coating with rectangular and pointed trowels using standard plastering techniques. Coating shall be applied in 100-200mil/coat applications until desired film thickness is achieved. After coating has started to stiffen it may be rolled smooth using a short nap roller dipped in the same mixing solvent. Remove excess solvent from roller as added solvent may cause coating to slump. Allow sufficient time for cure between coats, depending on ambient temperature, 4 –6 hours as a minimum.
5. Large areas shall be applied using spray technique as described in application manual.

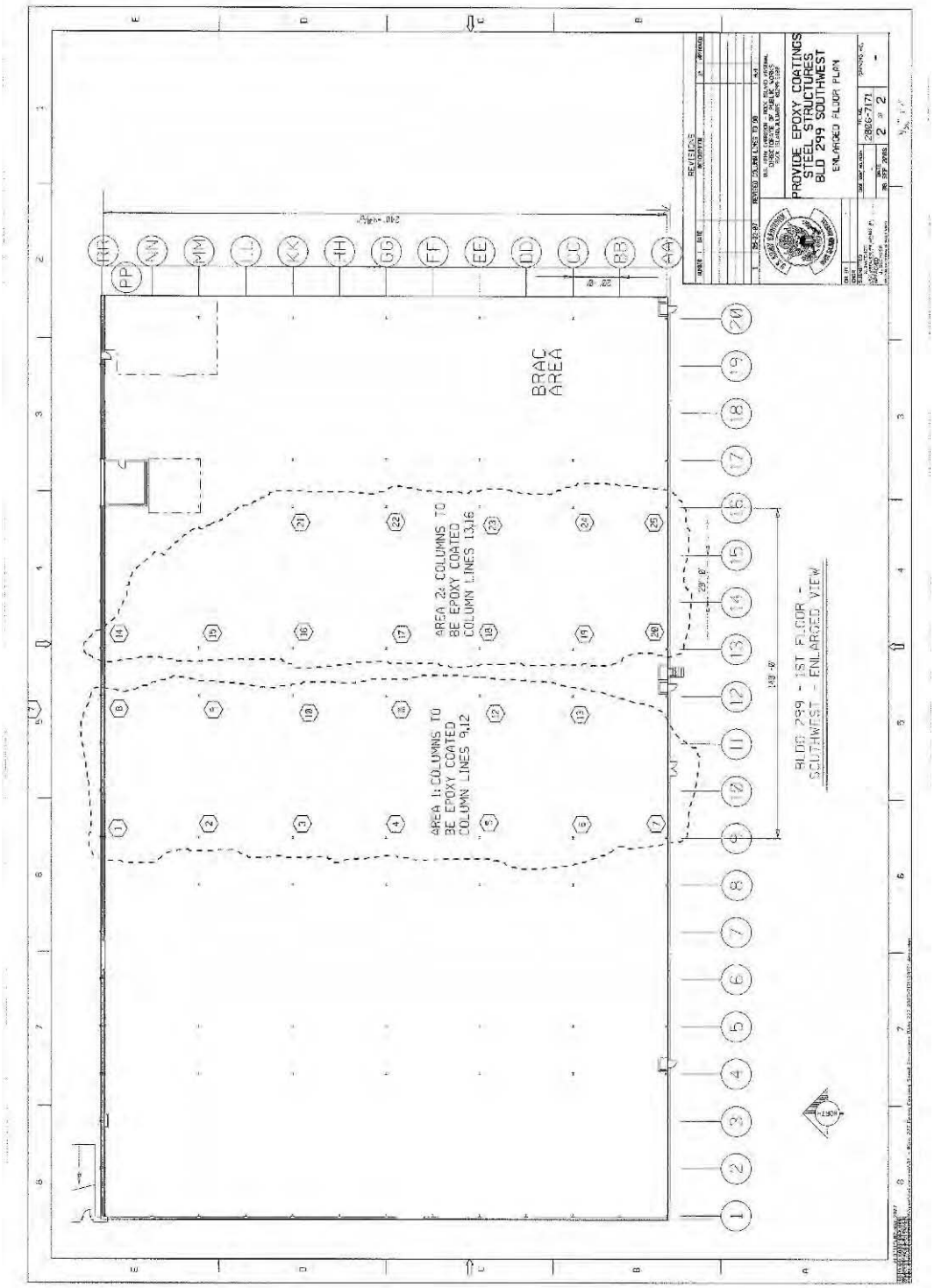
TF 1/07

PITT-CHAR XP REPAIR PROCEDURE



- Repairs shall be conducted by certified applicators.
- Remove all damaged and loose fire protection.
- Remove and replace all damaged primer with approved system.
- Replace Pitt-Char XP to specified thickness by approved methods.
- Replace existing reinforcing mesh to original specification. Mesh reinforcement is not required on repairs less than 6 x 6 inches (150 x 150mm).
- Surface finish of Pitt-Char XP shall be as agreed by Project Team and PPG Industries.
- Replace topcoat system per specification where required.

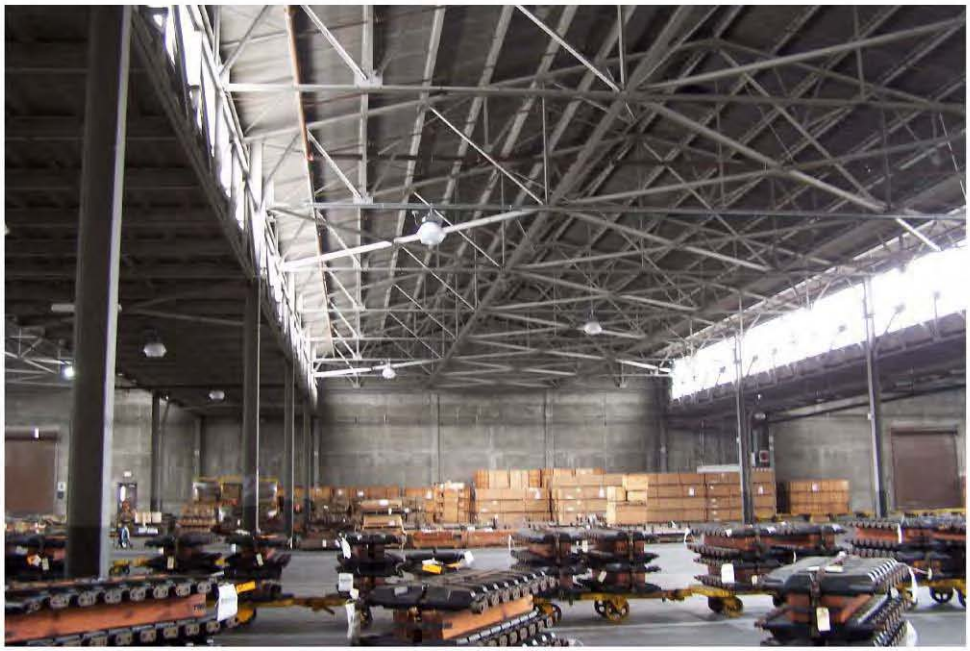

EAST BAGHOUSE
WEST BAGHOUSE
BOILER PLANT
ELEV. 421'-0" FT.
DEAERATOR
BFW PUMPS
WATER TREATMENT
WATER TREATMENT
NORTH
164'-9"


PROVIDE EPOXY COATINGS
STEEL STRUCTURES
BLD 299 SOUTHWEST
ENLARGED FLOOR PLAN
BRAC
AREA
AREA 2: COLUMNS TO
BE EPOXY COATED
COLUMN LINES 13,16
AREA 1: COLUMNS TO
BE EPOXY COATED
COLUMN LINES 9,12
BLDG 299 - 1ST FLOOR -
SOUTHWEST - ENLARGED VIEW

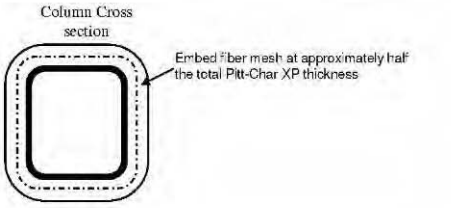
Rock Island Building 227

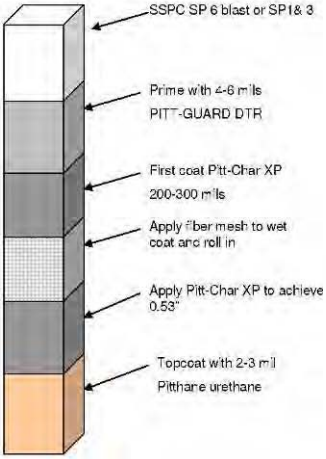
Typical stair tower (1 of 2) for Pitt-Char XP application on structural steel from ground to 16 ft. elevation of third landing

Rock Island Building 229
Typical high bay for Pitt-Char XP column application from floor to 18 ft. elev.



Pitt-Char XP application for Rock Island Arsenal Hollow sections (Detail 1)

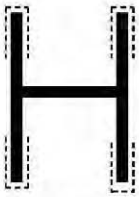




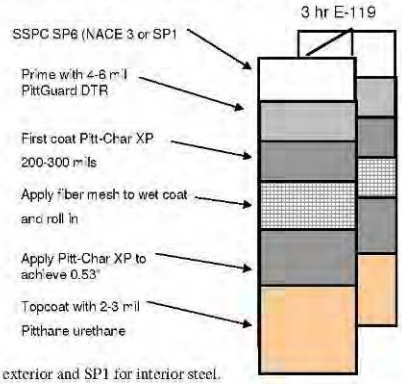
- Surface preparation is SSPC SP6 (NACE 3) for exterior steel and SP1 for interior steel consisting of solvent wipe for bldg 299 and power wash for bldg 227. Rusted areas shall cleaned per SP3 as required.
- Apply 4-6 mil DFT PITT-GUARD DTR primer
- Apply approximately half the specified thickness of Pitt-Char XP coating.
- Install fiber mesh onto "wet" coating. Overlap all seams 2 inch minimum and stagger
- Rollout mesh to eliminate all wrinkles, gaps and air voids.
- Apply second coat to achieve specified film thickness (0.53")
- Surface must be finished off per approved reference sample done at project startup.

TF 4/07

Pitt-Char XP application for Rock Island Arsenal W sections (Detail 2)



Mesh Cross Section



- Surface preparation is SSPC SP6 (NACE 3) for exterior and SP1 for interior steel. Bldg 299 shall have solvent wipe, bldg 227 shall be power washed, both shall have power tool SP3 where required.
- Apply Pitt-Guard DTR primer 4-6 mil DFT
- Apply approximately half the specified thickness of Pitt-Char XP coating.
- Install mesh into "wet" first coat and wrap mesh around flanges edge.
- Mesh shall extend halfway to web from flange edge. Lap all mesh seams: 2 ". Roll mesh for 100% contact.
- Apply second coat (s) to achieve specified thickness (0.53". Topcoat with Pitthane urethane

TF 3/07

Rock Island Arsenal

Construction Procedure
January 2007

Section I

General Description

1.1 THICKNESS

1.2 MESH

1.3 APPLICATION

Revised 1/07
Rock Island Arsenal

PPG PITT-CHAR FIRE PROTECTIVE MATERIALS

1.1 Thickness

The project will use UL thickness of Pitt-Char XP for 3 hour, E119 rating protection 0.530"

1.2 Reinforcement

The reinforcement system shall be fiberglass mesh 238-2/66. Mesh shall be applied to the flange edges. Precut mesh sections shall be applied after approximately half the specified coating thickness has been applied. The mesh shall be installed onto uncured Pitt-Char XP coating and completely rolled to provide 100% contact with the coating. The mesh shall not have any wrinkles, gaps or airvoids. It shall be lapped 2-inch minimum at all seams.

1.3 Application

"I" Columns Vertical columns and diagonal braces shall be coated on all four sides. Please refer to Section VI for details. Typical application is 2-3 coats using plural airless equipment. Pitt-Char XP terminations shall be tapered to a 45° angle and rolled to a feathered edge with tight adhesion to substrate. Stop fiberglass mesh approximately 2 inches from terminations to allow for tapered edge. No mesh shall be exposed after specified thickness has been applied.

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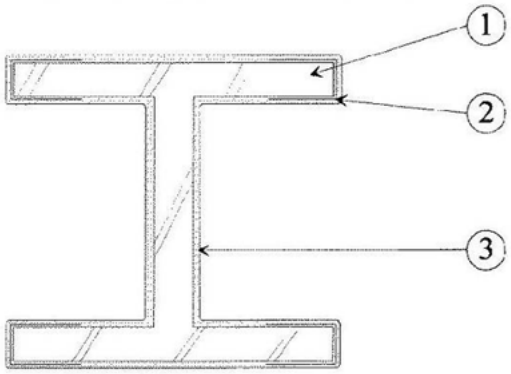
Rock Island Arsenal

PPG PITT-CHAR FIRE PROTECTIVE MATERIALS

Fire Resistance Ratings - ANSI/UL 263

Design No. X623
December 03, 1999

Ratings — 1, 1-1/2, 2, and 2-1/2 Hr, 3 Hr (See Item 3)



1. **Steel Column** — Min size W10x49. The column surfaces shall be free of dirt, loose scale and oil. Steel surfaces to be primed with polyamide-epoxy and zinc rich primers to an approximate dry film thickness of 0.003 in.

2. **Glass Fiber Mesh** — 6 in. wide, weighing 4.5 oz per sq yd, embedded at approximately mid-depth of mastic coating. Glass fiber mesh must be applied for the 1-1/2, 2, 2-1/2 and 3 hr ratings.

3. **Mastic Coating*** — Coating spray applied directly from containers to the appropriate thicknesses shown in the table below.

Rating Hr	Material Thickness In.
1	0.19
1.5	0.26
2	0.34
2.5	0.42
3	0.53

PPG INDUSTRIES INC — Type Pitt-Char XP. Investigated for Exterior Use.

*Bearing the UL Classification Mark

Revised 1/07
Rock Island Arsenal

Section II

Application Disciplines

QA/QC

FOREMAN

PUMP MECHANIC

SPRAYER

MESH INSTALLER

ROLL/TROWEL

Revised 1/07
Rock Island Arsenal

Pitt-Char XP Disciplines

This outline describes the minimal requirements to be certified in the various disciplines as a *Pitt-Char XP* coating applicator. Candidates will be certified according to the following categories:

I. QA/QC
II. Supervisor
III. Pump Mechanic
IV. *Pitt-Char XP* Coating Sprayer
V. Mesh Installer
VI. Roll/Trowel

All supervisors, QA/QC, pump mechanics and sprayers at job startup must be formally trained by PPG. After formal training, supervisors are permitted to train new personnel. Non-certified personnel may perform trowel/rolling, and mesh installation.

A *Pitt-Char XP* fire proofing project will require at least one certified individual from each of the 6 categories. Some categories may be done by one person.

I. QA/QC MANAGER

Scope: The QA/QC Inspector is responsible for the verification that all quality control aspects of the application are being met. This person will have the responsibility of completing all daily application logs and has final approval on all QC documents required from the contractor by the client. The QA/QC Inspector will order repairs and/or stop production if deviations from the quality plan are observed.

Requirements: This position requires the person to be fully knowledgeable and experienced in all other job categories including supervisor, pump mechanic, mesh installer, and roller/trowel.

It is recommended that the QA/QC manager have a minimum of 1 year experience as a *Pitt-Char XP* coating supervisor.

II. SUPERVISOR

Scope: The supervisor or foreman is responsible for the application of *Pitt-Char XP* coating. He will direct the activities of each crew, organize the operation for efficiency and ensure that all work is carried out according to both PPG's and the client's specifications.

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Rock Island Arsenal

Requirements: This position requires the person to be certified in the following disciplines: roller/trowel, mesh installer, sprayer and pump mechanic.

It is recommended that the supervisor have a minimum of 2 years field experience in the application of fire protective coatings.

The qualified supervisor will have demonstrated the ability to train personnel as roller/trowel, mesh installers, sprayers, and pump mechanics. He shall be certified by PPG Industries in this capacity.

III. PUMP MECHANIC

Scope: The pump mechanic is responsible for the operation, maintenance and repair of the *Pitt-Char XP* spray equipment.

Requirements: The certified pump mechanic will demonstrate the knowledge required to operate, maintain, and repair the spray equipment. The pump mechanic must have a basic understanding of electrical and pneumatic systems. He must be knowledgeable of the correct spray parameters. He must fully understand start up and stop procedures. He will be knowledgeable of *Pitt-Char XP* material handling and loading into the equipment. The pump mechanic will prepare a daily log of all areas coated and material batches used such as the daily log attached.

The qualified person must demonstrate knowledge of troubleshooting procedures. The certified pump mechanic will be trained by a supervisor or a PPG technical service representative.

IV. PITT-CHAR XP SPRAYER

Scope: The certified *Pitt-Char XP* Sprayer will have demonstrated the ability to apply the fireproofing by the correct spray methods and with the proper thickness and surface appearance.

Requirements: A certified sprayer will have demonstrated his ability to apply *Pitt-Char XP* coating. He will be able to spray apply *Pitt-Char XP* with no sags but with an acceptable surface appearance and uniform thickness. The spray will fully understand how parameters such as heat, pressure, and spray tip size effect film build, appearance andoverspray. He will understand the requirements for surface preparation and priming. The certified sprayer will be trained by a trained supervisor or a PPG technical service representative.

Revised 1/07
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V. MESH INSTALLER

Scope: The certified mesh installer will demonstrate the ability to cut and install fiber or steel meshing.

Requirements: The certified mesh installer will be trained by a certified supervisor or a PPG technical service representative.

VI. TROWEL/ROLLER

Scope: The certified trowel/roller will demonstrate the ability to trowel or roll the spray applied material to achieve a uniform thickness and final surface appearance. The trowel/roller will also carry out wet film thickness measurements.

Requirements: The certified trowel/roller will be trained by a certified supervisor or a PPG technical service representative.

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Rock Island Arsenal

SECTION III

SURFACE PREPARATION

3.1 SURFACE PREPARATION

3.2 PRIMER ADHESION

A. ASTM D-3359 "X" Cut

B. ASTM PULL-OFF STRENGTH D4541-93

3.3 PRIMER

3.4 PRIMER REPAIR

Revised 1/07
Rock Island Arsenal

3.1 SURFACE PREPARATION

Building 227 East & West Baghouse
Exterior Stair Towers
Steel surfaces shall be degreased to remove any grease, oil or soluble contamination prior to blasting and/or power tool cleaning per SSPC SP1.This may be accomplished by power detergent wash followed by fresh water rinse or solvent wipe with mineral spirits. The entire area to be fireproofed shall be blasted to SSPC SP6 with 1.5-3.0 mil anchor pattern with angular grit. and primed with recommended primer. The surface shall be clean, dry and free of contamination prior to application of Pitt-Char XP coating.

Interior support columns
Steel surfaces shall be degreased to remove any grease, oil or soluble contamination prior to priming per SSPC SP1. This may be accomplished by power detergent wash followed by fresh water rinse or solvent wipe with mineral spirits. All corroded areas shall be power tool cleaned per SSPC SP11 prior to primer application. The surface shall be clean, dry and free of contamination prior to application of Pitt-Char XP coating.

Building 299 Interior support columns of 2 high bays
Steel surfaces shall be degreased to remove any grease, oil or soluble contamination by solvent wipe per SSPC SP1. This shall be accomplished by solvent wipe with mineral spirits and primed with recommended primer system. Existing coating contains lead. Appropriate procedures shall be followed for all removal of the existing coating. The surface shall be clean, dry and free of contamination prior to application of Pitt-Char XP coating.

3.2 PRIMER

Entire area to be fireproofed shall be primed with PPG Pitt-Guard DTR Epoxy Mastic Coating 97-145 series. The dry film thickness shall be 4-6 mils. Follow the recommended application procedure as outlined on TD F11.

3.3 Primer Adhesion

To verify the primer adhesion, an adhesion test must be carried out. After the primer has cured and before the application of the *Pitt-Char XP* coating, the primer should be tested for proper adhesion. Two test methods are acceptable for checking primer adhesion. Random areas shall be checked on all exterior and interior areas. Minimum of 4 checks per building are recommended.

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PPG PITT-CHAR FIRE PROTECTIVE MATERIALS

3.3A ASTM D-3359 X Cut

A scalpel blade or knife is used to cut the primer. An "X" is cut into the primer with 2 cuts. Each cut is 1.5 inches long. The cut should penetrate and reach the substrate. A 3-inch length of a semi-transparent tape with good adhesive strength (such as Permacel 99) is placed over the center of the "X" and pressed firmly on the cut. The tape is removed in 1-2 minutes in a manner such that it is pulled back on itself (as close to 180° from the point of contact). The primer should show adhesion of 4A or better. An adhesion result of 4A means that only slight peeling or removal of paint occurred from the cut lines. If test fails run the ASTM pull-off strength test below to qualify primer adhesion.

3.3B ASTM PULL-OFF STRENGTH D4541-93

The general pull-off is performed by securing a loading fixture (dolly) normal (perpendicular) to the surface of the coating with an adhesive. After the adhesive has cured, a testing apparatus is attached to the loading fixture and aligned to apply tension normal (perpendicular) to the test surface. The force applied to the loading fixture is then gradually increased and monitored until either a plug of coating material is detached, or a specific value is reached. When a plug of material is detached, the exposed surface represents the plane of limiting strength within the system. The nature of the failure is qualified in accordance with the percent of adhesive and cohesive failures, and the actual interfaces and layers involved. The pull-off strength is computed based on the maximum indicated load, the instrument calibration data and the original surface area stressed. Epoxy primer shall have a minimum of 500psi pull strength.

3.4 PRIMER REPAIR

Any contamination such as dirt, dust, grease or oils shall be removed prior to primer application. Repair primer per PPG Industries recommended procedure.

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Rock Island Arsenal

Section IV

Application

4.1 Description

4.2 Airless Equipment

4.3 Airless Application
a. Initial Setup
b. Air/power

4.4 Surface Inspection

4.5 Adjacent Surface Protection

4.6 Release Agents

4.7 Site Storage

4.8 Shelf Life

4.9 Shipping

4.10 Material handling (airless)

4.11 Thickness

4.12 Appearance

4.13 Surface Finish

4.14 Temperature

4.15 Removal

4.16 Repair

4.17 Recoat

4.18 Trowel

Revised 1/07
Rock Island Arsenal

4.19 Cleanup

Photos

4A. Approved Surface Finish

4B. Unacceptable Surface Finish

4C. Application Tools

Revised 1/07
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4.1 SPRAYING *PITT-CHAR XP* COATINGS DESCRIPTION

Pitt-Char XP Coating is a high viscosity mastic material that can be applied without sagging, under most conditions, up to 250 mils in one continuous application. When shear and heat are applied, the viscosity brakes and the liquid flows easily. As soon as the shear is removed or the material cooled, the material returns to its high viscosity state. The equipment used for mixing and application of *Pitt-Char XP* Coating makes use of these properties to a great extent.

4.2 AIRLESS SPRAY EQUIPMENT

As part of the continuing effort to provide higher production rates and smoother applications of *Pitt-Char XP* Coating, equipment has been designed to permit airless application. The equipment makes use of heat and high pressure to apply *Pitt-Char XP* Coating through conventional airless spray tips. Application is at 100% volume solids, no thinner is used to reduce viscosity. These are plural component units with product mixing occurring in a mixing block located approximately 12-15 feet from the spray gun.

Spray- Quip Inc.
1754 Des Jardines
Houston, Texas, 77023
Tel: 713 923 2771
Fax: 713923 7822
Attn. Herb Chilman

4.3 AIRLESS APPLICATION OF 100% SOLIDS *PITT-CHAR XP* FIRE PROTECTIVE COATING

4.3A Initial Set-Up

To assure successful and profitable application of *Pitt-Char XP* Coating, the application contractor must be prepared to: (1) provide a crew large enough and arrange equipment rigging and work, if possible, to allow the spray man to spray continuously with a minimum of flushing; (2) have on-site at all times during spray operation, a supervisor/technician who thoroughly understands the basics of the application, material, and equipment; (3) the supervisor is to assure that the *Pitt-Char XP* coating is properly stored, heated and applied by the crew; (4) the supervisor will supervise the application crew regarding daily use, cleanup, and maintenance of the spray unit. THIS PERSON IS THE KEY TO THE SUCCESSFUL AND PROFITABLE APPLICATION OF *PITT-CHAR XP* COATING.
The applicator should have on-site before start-up the necessary safety gear for the personnel - masks, gloves, suits, etc. Also needed are cleanup tools including an assortment of brushes, rubber gloves, wrenches (that fit) and preferably a work bench with a vise. Containers, a selection of pails, buckets, and or pans to soak and clean the spray gun, tips, static mixer, valves,

Etc. Tupperware type containers with sealable lids have been used successfully. Set up cleaning bench in a well lighted and ventilated area. Finishing, mesh installation or repair tools, including rollers, roller covers, masonry trowels, and brushes. A hot box insulated and thermostatically controlled to a temperature of 120 to 140°F, large enough to hold one days anticipated spray production. A portable scale with a range of 100 lb to run weight ratio tests.

4.3B Air/Power Requirements (Per pump manufacturer)

Air	125psi
Electrical	230V single phase, 60 amps

4.4 SURFACE INSPECTION

Surfaces primed in accordance with Section III "Surface Preparation", shall be inspected immediately prior to the application of *Pitt-Char XP* Coating. The surface must be clean, dry and free of contaminants. Inspect carefully for grease contamination and remove by approved methods. Do not apply *Pitt-Char XP* Coating under conditions where condensation, frost, or icing is present or forming on the surface. Do not apply *Pitt-Char XP* Coating to surfaces where the surface temperature is below 50°F (10°C). Do not apply *Pitt-Char XP* coating if the surface temperature is less than 5°F (3°C) above the dew point.

4.5 PROTECTION OF ADJACENT SURFACES (MASKING, DEMASKING)

Pitt-Char XP Coating has excellent adhesion to a variety of surfaces. Overspray, drips, etc., will be difficult to remove if allowed to dry. Mask gauges, light fixtures and other mechanical or electric equipment in the area near the application. Use duct tape and plastic sheeting to prevent wind blown overspray onto other areas. Masking should be removed as soon as danger of over spraying the surfaces ceases. In a partially cured state, *Pitt-Char XP* Coating is rubbery. When fully cured, it is very tough, typically 50-60 on a Shore D scale. These conditions make removal of masking very difficult.

Conventional masking tape is unsatisfactory for use at the boundary of *Pitt-Char XP* Coating application. *Pitt-Char XP* Coating has the ability to wet through this tape and gain some adhesion to the protected area. Duct tape works well at such a boundary. Masking tape may be used at more remote areas not expected to receive a full, wet application of *Pitt-Char XP* Coating.

4.6 USE OF RELEASE AGENTS

Do not use grease, oil, silicones, etc., to prevent adhesion of *Pitt-Char XP* Coating to non fireproofed adjacent areas. Other areas are easily contaminated and will prevent a bond of the *Pitt-Char XP* Coating. The use of release agents is absolutely prohibited.

4.7 SITE STORAGE OF MATERIALS

Pitt-Char XP shall not be stored in direct sunlight. Temperature of the packaged material must be maintained in a sheltered or air conditioned area below 90°F (32°C).

Prior to application (24 hours), *Pitt-Char XP* should be warmed to 120°F minimum for spray pumps. *Pitt-Char XP* coating must be used after 4 days storage between 120-140°F.

4.8 SHELF LIFE

Minimum shelf life under proper storage conditions is:

97-194 and 97-194M	1 year from date of manufacture
97-195 and 97-195M	2 years from date of manufacture

4.9 SHIPPING

Pitt-Char XP Coating is packaged in 100% solids containers. They contain no solvent, resulting in no restrictions for air or land transportation. The flash point for both *Pitt-Char XP* components is greater than 200°F. Material must be stored below deck out of direct sunlight and below 90°F.

4.10 MATERIAL HANDLING (AIRLESS APPLICATION)

Components A and B should be supplied to plural airless units between 120 to 140°F.
Pitt-Char XP Coating is a two-component material whose volumetric ratio is 2.33:1. The "A" (white) part is packaged in a tall pail. The "B" (black) part is packaged in a standard 5 gallon pail. The pails are filled at the factory so that mixing two pails "A" with 1 pail of "B" produces the proper volume ratio. The spray ratio of the pump can be verified by a weight check if component A and B pails are not emptying at a 2 : 1 rate. This can be accomplished by disconnecting the hoses before the mixing block. The hose openings should be reduced to ¼" to simulate back pressure of the mixer and spray tip. One hot pail of each component should be pumped through prior to the weight check. The pump is turned on at low pressure (1500 – 2000 psi) and the individual components are collected in separate clean pre-weighed pails. The weights of each component should be 3.25 "A" to 1.00 part "B". Tolerance of 10% off-ratio in either direction is acceptable. Acceptable A to B range is 2.93–3.58: 1. The material used for the weight check may be reused if kept clean.

For proper metering and spray fan to be achieved, "A" and "B" must be preheated to reduce the viscosity before use in a plural airless unit. Begin pre-heating the number of pails of "A" and "B" needed for the next shift approximately 24 hours ahead of time. Put pails in the hot box with space between the pails for proper air circulation. The heat must be thermostatically controlled and evenly distributed. DO NOT HOLD PAILS AT TEMPERATURES OVER 140°F OVER 4 DAYS. Component A's viscosity reduces, but is not pour readily. Component B will pour when preheated. If material has been properly preheated and will not achieve a proper fan pattern, consult your PPG Technical Representative. The representative may suggest mechanical agitation or substituting a different batch. If the components are too viscous, miss-metering and loss of fan pattern will occur.

READ START-UP AND OPERATION INSTRUCTIONS IN EQUIPMENT MANUAL PROVIDED BY SPRAY PUMP MANUFACTURER.

When applying Pitt-*Char XP* Coating 97-194/97-195, two pails of component A (97-194) will be emptied for one pail of Component B (97-195).

4.11 FIRE PROTECTION THICKNESS

The applicator must endeavor to meet the material thickness shown on the passive fire protection drawings issued by the project. Applied thickness shall average specified thickness with no one measurement lower than 90% of specified thickness of 530 mils.

Thin areas will need to be recoated to achieve specified thickness. Thickness checks will be conducted using either an Elcometer, non destructive probe or 1/8" dilled hole and calibrated probe. Structural steel sections will be checked every 4-6 linear feet minimum. Areas under the tolerance will be quantified by additional thickness checks every foot. QA/QC is responsible for thickness checks and documentation, which shall be available to the company.

4.12 APPEARANCE OF PITT-CHAR XP COATING

Pitt-Char XP Coating must be applied in a manner such that no air voids, pinholes, lap seams, loose fibers, or "birdnesting" are present in the cured film. These situations may occur during application from a variety of reasons such as: cold material, worn spray tips, dirty mixer or valves, and poor access to substrate. The proper technique to eliminate these problem areas is to immediately trowel the surface using either pointed or rectangular masonry trowels. This technique will provide good wetting through reinforcing mesh, and also eliminate any imperfections mentioned above. Close nap rollers with a minimum amount of PM Acetate solvent are then used to remove trowel marks and achieve desired finished appearance. A poor spray fan pattern or application angle will result in additional trowel and touch-up work. See Figure A and B for examples of approved and unacceptable surface finish.

4.13 FINAL SURFACE FINISH

The spray applied finish of *Pitt-Char XP* Coating has a matted or "orange peel" appearance. The desired cured coating texture will be agreed upon between the applicator and client prior to actual job start-up. A sample will be documented and signed off by both parties prior to job startup. A "Reference Sample Approval" form is supplied. The reference sample will be a small area of the job, which represents a typical beam or column application using recommended reinforcement.

4.14 TEMPERATURE CONDITIONS AFFECTING APPLICATION

The ambient temperature range of 70° - 90°F is the optimum condition for applying and cure of *Pitt-Char XP* Coatings. Applications above 90° F require some extra attention. Avoid heavy

film builds over, which could cause some sag problems initially, and a faster cure rate for rolling and mesh application. A slower evaporating solvent such as PM Acetate should be used for rolling.
If temperatures drop below 50° F, temporary shelters should be erected and heated to enclose steel and the spray pump. In extreme cases flexible ducts can be run from forced air heaters and applied directly to steel just prior to fireproofing and afterward to accelerate cure.

APPROXIMATE CURE RATES (TO SHORE A 50)

Ambient Temperature	Hours *PITT-CHAR XP* Coating
50° F	48
60° F	36
75° F	10
100°F	4

Humidity and direct sunlight will affect cure rates.

4.15 REMOVAL PROCEDURE

Sometimes there is a need to remove cured *Pitt-Char XP* coating from a surface because of damage or to allow attachments for supports, brackets etc. This can be accomplished by using a grinder with an abrasive disc or wire cup to remove small sections. For larger sections, use a high rpm cutting wheel or die grinder to outline area and remove coating with an air chisel. After removal follow repair procedure below.

4.16 REPAIR PROCEDURE FOR *PITT-CHAR XP*

The following procedure is to be used for damaged *Pitt-Char XP* coatings or when increasing the film build on fully cured *Pitt-Char XP* coating.

1. Remove all damaged *Pitt-Char XP* per removal procedure 4.15 above. Material should show no evidence of damage and have tight adhesion to substrate. Lead edge of *Pitt-Char XP* coating should be tapered to 45° angle.

2. Blast exposed steel to SSPC SP6 specification and abrade 2-inch boundary of original *Pitt-Char XP* coating around repair area. A white, non-glossy surface should be achieved.

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Rock Island Arsenal

3. Spot prime to original primer specification or apply mesh and *Pitt-Char XP* coating directly to blasted steel within 4 hours of blast completion if a rust bloom has not developed.

4. Application of reinforcing mesh and *Pitt-Char XP* to the repair area must be applied to achieve the original specified thickness. Areas less than 1 ft^2 do not require mesh replacement. This application may be made using trowel or spray application, as suitable.

5. The *Pitt-Char XP* application should be feathered into the abraded boundary area to aid in obtaining a uniform appearance. It should not be lapped onto the non-abraded adjacent surface.

6. Please consult your PPG Technical Representative for any questions concerning above procedure.

4.17 RECOATING

1. Primer system must be fully cured before *Pitt-Char XP* coating is applied. Follow manufacturers recoat recommendations.
2. Airless applications of more than 0.31" (8mm) must be done in multiple coats for plural airless pumps. Solvent thinned applications shall be 0.11-0.2" (3-5mm) per coat. The first coat must be sufficiently cured to support the weight of additional *Pitt-Char XP* coating or sagging will occur. Generally 8 hours at 70°F are necessary. It is recommended that recoating should be done within 24 hours of previous application. If recoat is done later than 48 hours, clean surface of any dirt, grease, or chalking with a solvent wipe and/or hot water/detergent wash if necessary. When recoat is done later than 14 days after first coat, brush blast or hand sand surface with #50 grit sandpaper to remove shine from surface and blow off dust with clean, dry, compressed air.

4.18 TROWEL APPLICATION

Trowel application of *Pitt-Char XP* coating may be a cost effective method to do small jobs, tie-ins or repairs. *Pitt-Char XP* coating 97-194/195 has a weight ratio of 3.25 epoxy to 1.00 catalyst. Sufficient amounts of each should be weighed out separately. This will be accomplished easier if the material is preheated to 80-100°F. Add catalyst to epoxy with up to 5% PM Acetate. The solvent will extend the pot life and also promote easier mixing. Mix the batch using suitable heavy duty air or electric mixer and a paddle type blade capable of scraping the sidewalls and bottom of container. Agitate coating until a uniform gray color is obtained. **Over mixing will induce excess heat greatly reducing pot life.** Apply coating using standard plastering techniques in 0.1" (3mm) coats. Pitt-Char XP 97-194/195M is packaged in a two pail kit for solvent thinned applications.

4.19 EQUIPMENT CLEANUP

Pitt-Char XP coatings are chemical resistant, two component epoxy materials. When allowed to cure in or on equipment, it obtains excellent adhesion. This is detrimental to subsequent functioning of moving

parts. Allowing *Pitt-Char XP* coating to cure in or on equipment can result in substantial downtime and equipment loss. Steam or high pressure hot water are the most effective means for removing *Pitt-Char XP* coatings from application equipment and over sprayed areas. **Using this method before full cure takes place is highly recommended.**

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Rock Island Arsenal

4A Approved *Pitt-Char XP* Coating Finish

Rolled Finish

Sprayed Finish

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4B Non Acceptable *Pitt-Char XP* Coating Finish

Birdnesting" Poor Fan Pattern

"Roll over" Poor Spray Angle

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Application Tools

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- Solvent Resistant short nap (3/16-1/4") rollers 1-2" diameter
- Paint brush
- Various trowels for coating touch-up and removing residual Pitt-Char XP coating from pails

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Section V

REINFORCEMENT

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Taiwan Power Company

REINFORCEMENT FOR *PITT-CHAR XP* FIRE PROTECTIVE COATING

5.1 GENERAL DESCRIPTION

Pitt-Char XP fire protective coating has been formulated to be used in conjunction with fiber mesh for structural steel reinforcement.

5.2 MESH TYPE

Mesh is a fiberglass fabric specifically tested and supplied by PPG Industries

Description	Roll Size	Uses
Fiberglass Mesh 238-2/66	4 x 150 feet	All areas

5.3 "I" SECTIONS

Columns shall have flange edges covered with mesh. A first coat of Pitt-Char XP, approximately half the specified thickness shall be applied to the steel and completely troweled to ensure good wetting to the substrate. The fabric mesh is then applied to the uncured Pitt-Char coating which acts as an adhesive. The mesh shall completely cover the outer edges and extend half the distance to the web on both sides of the flange face as a minimum. The mesh shall be lapped 2 inches at all seams. Short nap paint rollers dipped in solvent may be used to roll the mesh. Rolling is required to provide 100% contact with coating. Wrinkles, gaps and air voids under the mesh are not acceptable. Apply second coat to achieve total film thickness. See attached drawing.

5.4 TERMINATIONS

All coating terminations shall have the mesh stopped 2 inches prior to the termination point. The lead edge of *Pitt-Char XP* coating should be tapered to a 45° angle. This pertains to all block-out areas and tie-in areas.

Revised 1/07
Rock Island Arsenal

Section VI

Application QA/QC Procedures

6.1 SURFACE INSPECTION

6.2 SHELF LIFE

6.3 PRODUCT APPLICATION TEMPERATURE

6.4 PUMP RATIO CHECK

A. Volume
B. Weight

6.5 REFERENCE SAMPLE PREPARATION

6.6 INSPECTION EQUIPMENT

A. Bridge Gauge
B. Digital Thermometer
C. Dry Film Primer Thickness Gauge
D. Hygrometer
E. Elcometer

Tool Photo

6.7 FORMS

a. Reference Sample Approval
b. Daily Application Log

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6.1 SURFACE INSPECTION

Surfaces primed in accordance with Surface Preparation shall be inspected immediately prior to the application of *Pitt-Char XP* coating. The surface must be clean and dry. All contaminants must be removed. Inspect carefully for oil or grease contamination and remove by solvent cleaning using a PPG approved thinner. Do not apply *Pitt-Char XP* coating under conditions where condensation, frost or icing is present or forming on the surface. Do not apply *Pitt-Char XP* coating to surfaces where the surface temperature is below 40°F or when surface temperature is less than 5°F above the dew point.

6.2 SHELF LIFE

97-194/97-194M	18 months from date of manufacture
97-195/97-195M	24 months from date of manufacture

Store below 90°F. Keep material out of direct sunlight.

Pitt-Char XP coating is a stable material; however, material aged over its recommended shelf life must be quality checked by PPG and approved for use.

6.3 PRODUCT APPLICATION TEMPERATURE

Plural Airless Applied: For proper metering and spray fan to be achieved, "A" and "B" must be pre-heated to a minimum of 120°F to reduce viscosity before use in plural airless spray units. Begin pre-heating the number of pails "A" and "B" needed for the next shift approximately 24 hours ahead of time. Put pails in hotbox with space between the pails for proper air circulation. The heat should be thermostatically controlled and evenly distributed. DO NOT HOLD PAILS AT 140°F OVER 4 DAYS. In cold conditions, pre-heat to 60°C. "A"'s viscosity reduces but it is not readily pour able, "B"'s viscosity reduces and is readily pour able. At 140°F, if "A" remains extremely stiff and "B" is not easily pour able, do not use before consulting with your PPG Tech Representative. The representative may suggest mechanical agitation or using a different batch of "A" or "B". When they are too viscous, miss metering and loss of spray fan pattern usually occurs.

6.4 PUMP RATIO CHECK (Plural Airless Pump)

A. VOLUME

Pitt-Char XP coating is a two-part material whose volumetric ratio is 2.3:1. The "A" (white) part is packaged in a tall pail. The "B" (black) part is packaged in a standard 5 gallon pail. The pails are filled at the factory so that mixing 2 pails of "A" with 1 pail of "B" produces the proper 2.3:1 volume ratio. The spray ratio of the pump should be verified. This can be accomplished by confirming that 2 pails of component A and 1 pail of component B are emptied at the same time.

B. WEIGHT

Pitt-Char XP coating 97-194/97-195 has a weight ratio of 3.25 parts by weight epoxy base 97-194 to 1.0 part by weight catalyst, 97-195. A full hot can of each should be pumped through before checking weight to ensure any cold material is cleared from lines and material is flowing freely. Follow weight ratio check as stated in "Material Handling (Airless Application).

6.5 REFERENCE SAMPLE PREPARATION

A section of the project will be prepared at startup to represent the surface finish of the fireproofing. The sample shall be approved by all parties. This area shall be documented on the reference sample form attached.

6.6 INSPECTION EQUIPMENT

A. BRIDGE GAUGE

A bridge gauge is used to monitor wet thickness during spraying operation. It is made by notching a piece of metal to the desired depth and continually probing the *Pitt-Char XP* coating while wet. This made be made from a 1" putty knife.

B. DIGITAL THERMOMETER

A thermometer should be used to measure the surface temperature of the substrate before *Pitt-Char XP* is applied and also measure the temperature of the hotbox and pre-heated material. It should be calibrated to the manufacturer's specification and have a hand held probe.

C. DRY FILM PRIMER THICKNESS GAUGE

This gauge is used to measure the dry film thickness of paint on a steel substrate.

D. HYGROMETER

This device is used to determine relative humidity. A hygrometer consists of two thermometers in a frame. One is a wet bulb and the other dry.

The wet and dry readings are then taken and a circular or slide rule type of guide is consulted to give the relative humidity.

E. ELCOMETER

This gauge is a portable microprocessor that measures dry coating thickness by the electromagnetic induction principles. It is a convenient device for checking the finished job. Only trained inspectors should use this tool. It cannot be used on areas where metal mesh reinforcement has been installed.

QA/QC Tools

Photo Removed

- Elcometer dry film gauge, 500 mil range for primer and Pitt-Char XP coating (nondestructive)
- Hydra-cone thickness gage for drilled thickness testing (destructive)
- Bridge gauge – Custom made from scraper cut to 190 mil thickness.
- Psychrometer for RH measurement
- Digital thermometer to measure hotbox and coating temperature
- Wet film gauge for primer or topcoat measurement

6.7 FORMS

See attached.

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PPG PITT-CHAR FIRE PROTECTIVE MATERIALS

PITT-CHAR XP® **COATING** **REFERENCE SAMPLE APPROVAL**	DATE_____ PAGE ___ OF_____
PROJECT:	
LOCATION:	
APPLICATOR:	
DESCRIPTION OF SAMPLE:	

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PPG PITT-CHAR FIRE PROTECTIVE MATERIALS

LOCATION OF SAMPLE:
APPLICATION EQUIPMENT (✓): PLURAL AIRLESS ( ) SINGLE POT ( ) HAND TROWEL ( )
PITT-CHAR THICKNESS: (mm) (inches)
REINFORCEMENT TYPE (✓): FIBER GLASS MESH ( ) CARBON MESH ( ) STEEL MESH ( ) PINS/WASHERS ( )
SURFACE FINISH (✓): ROLLED ( ) SPRAY ( )
FINISH DESCRIPTION:

APPROVAL SIGNATURES

	SIGNATURE	TITLE	COMPANY	DATE
APPLICATOR				
FABRICATOR				
CLIENT				
OTHER				
PPG				

FORM # 4 REVISED 3/97

Daily Application Log

Customer:_____ Date:_____

Location:_____ Applicator:_____

Project:_____ Report By:_____

Personnel
Site Manager:_____ Foreman:_____

Sprayers\Pump\Trowel\Roll:

_____ _____ _____
_____ _____ _____

Revised 1/07
Rock Island Arsenal

Appendix C: Outdoor Coupon Tests and Accelerated Weathering Laboratory Test Data

Outdoor test panel results

Pairs of duplicate test panels of each of the coating systems were placed on the outdoor exposure rack at Building 227, Rock Island Arsenal in August 2007. These panels will remain in test for at least 2 years, and the detailed analysis of the 2-year performance will be provided in a supplementary report in late 2009. An inspection after 7 months of performance was conducted on 7 March 2008. The results are provided in Table C1.

The evaluation of the test panels was conducted in accordance with ASTM D 1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subject to Corrosive Environments. A rating of 10 for blisters and chalking indicates that no failure has occurred. The rating for rusting indicates the degree of undercutting of the coating at the scribe line, as follows:

Rating	Millimeters
10	0
9	0 – 0.5
8	0.5 – 1.0
7	1.0 – 2.0
6	3.0 – 3.0
5	3.0 – 5.0
4	5.0 – 7.0
3	7.0 – 10.0
2	10.0 – 13.0
1	13.0 – 16.0
0	1.0 – 2.0

Accelerated weathering test panel results

Selected systems were exposed to 2000 hours of a salt fog/ UV condensation cycle in accordance with ASTM D5894 - Cyclic Salt / UV Exposure of Painted Metal (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet). After the exposure, the panels were evaluated in accordance with ASTM D 1654. Table C2 shows these results.

Table C1. Outdoor coupon exposure results.

Coating System	1	2	3	4	5	8	9	10	11	12	14	15	16	17	18	19	20	21
Initial Gloss 20° / 60°	4 / 30	16 / 62	4 / 23	12 / 45	5 / 32	10 / 45	76 / 95	28 / 75	52 / 86	34 / 74	6 / 34	21 / 62	26 / 74	63 / 92	56 / 84	29 / 74		
Gloss on 3/7/08																		
20°/60° panel -1	4 / 25	19 / 62	3 / 22	15 / 55	6 / 30	12 / 51	78 / 94	21 / 69	53 / 91	35 / 75	5 / 32	25 / 70	28 / 75	75 / 92	62 / 90	23 / 70	4 / 26	4 / 29
20°/60° panel -2	5 / 31	13 / 57	3 / 22	10 / 48	8 / 39	14 / 56	72 / 92	19 / 65	53 / 90	35 / 74	6 / 35	25 / 70	30 / 76	72 / 93	62 / 90	24 / 73	3 / 25	4 / 29
Blisters	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Chalk	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Rusting	9P	9P	9P	9P	9P	8P	9P	7P	9P	7P	9P	8P	9P	9P	9P	9P	9P	9P
Comments			Panel #1 has two 1/4" spots where topcoat was is gone (panel dropped). Adhesion is good	Slight yellowing on coating under flap			Slight scribe undercutting ~0.05"	10-2 looks slightly darker. Dirt pickup?				Yellowing on coating under flap. 15-2 is the more yellow than 15-1				Scribe undercutting ~0.05"		

Panels were inspected and placed back on exposure on March 7, 2008.

All panels were washed and rinsed before gloss readings and visual measurements.

All panels showed pinpoint rusting/spotting which is most likely due to metal particulates resulting from the cutting of the scribe line rather than a rust through condition.

Table C2. Accelerated weathering laboratory results.

Coating System	1	2	3	4	5	8	9	10	11	12	14	15	16	18	20	21
Initial Gloss 20° / 60°	4 / 30	16 / 62	4 / 23	12 / 45	5 / 32	10 / 45	76 / 95	28 / 75	52 / 86	34 / 74	6 / 34	21 / 62	26 / 74	56 / 84	3 / 18	3 / 17
Gloss on 3/7/08																
20°/60° panel -1	3 / 25	21 / 73	1 / 8	7 / 39	4 / 31	3 / 21	61 / 91	2 / 24	26 / 78	25 / 73	1 / 10	1 / 11	12 / 54	34 / 77	1 / 8	1 / 7
20°/60° panel -2	3 / 23	14 / 54	2 / 10	8 / 44	6 / 31	4 / 28	58 / 86	2 / 24	26 / 75	22 / 74	1 / 7	1 / 15	10 / 52	26 / 70	1 / 8	1 / 6
20°/60° panel -3	2 / 18	14 / 64	1 / 10	7 / 37	4 / 22	4 / 24	58 / 87	2 / 30	34 / 81	26 / 74	1 / 9	1 / 13	8 / 43	37 / 81	1 / 8	1 / 6
Blisters	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Chalk	10	10	8	10	10	8	10	10	10	10	8	8	10	10	8	8
Rusting	10	10	10	10	10	3	3	3	2	2	3	3	3	2	6	6

Note: All panels were washed and rinsed before gloss readings and visual measurements.

Appendix D: Suggested Implementation Guidance

The following language is recommended for incorporation into Unified Facilities Guide Specification (UFGS) 07 81 00, *Spray-Applied Fireproofing*.

> The fire protective coating shall be a two-component epoxy based intumescent coating. On curing it shall form a flexible and tough epoxy barrier which transforms into a ceramic-like, insulating char to provide thermal protection of the substrate in the event of a fire. When applied as a system with the manufacturer's recommended surface preparation, primer, fire protective layer, and a topcoat if required, it shall also protects the substrate from corrosion and retain its fire protection properties under aggressive chemical environments. It shall be resistant to solvents, acids, alkalis, salts and abrasion while retaining its fire protective properties. It shall also exhibit the following properties:

Percent Solids by Weight	100%
In Service Temperature Restrictions	Up to 150°F (65°C)
Application Method	Air spray or specialized plural component airless equipment approved by the manufacture. Troweling can be used for small areas or touch-up work.
Drying Time	Approximately 24 hours to achieve a Shore D hardness of 25.
Shelf Life	Minimum shelf life under proper storage condition is 1 Year from date of manufacture
Pot Life	At 77°F (25°C) and 50% relative humidity: Approximately 40 minutes. (Pot life is not a factor when using specialized plural component airless spray equipment.)
Flash point	Greater than 212°F (100°C) Pensky-Martens for each component.

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14. ABSTRACT

Fire protective coatings have historically lacked sufficient durability to maintain the coating in good condition and protect the substrate from corrosion. New, innovative epoxy intumescent coatings are much more durable and inhibit corrosion of steel. This project demonstrated the performance of this type of coating system on two structures at Rock Island Arsenal where fire risk and corrosive conditions are significant, and included outdoor exposure testing and accelerated weathering tests at the ERDC-CERL paints and coatings laboratory. Additional research was conducted to further develop engineered siloxane-epoxy coating technology as fire protective and corrosion-resistant coating systems with improved durability. The coating system successfully demonstrated in this project has the potential to provide the benefits of this protection to many types of structures across the DoD.

15. SUBJECT TERMS
corrosion prevention and control, intumescent coatings, fire-resistant coatings, Rock Island Arsenal, IL

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