

## **LEAD-BASED PAINT ABATMENT METHOD THAT ELIMINATES SANDBLASTING FOR STEEL STRUCTURES**

*Rust Grip® eliminates sandblasting minimizing containment and disposal costs of hazardous waste.*

### **INTRODUCTION**

The United States Army Construction and Engineering Research Laboratory (CERL) contracted with Manta Industrial, Hammond, IN to conduct field demonstration and implementation of a cost-effective lead-base paint encapsulation procedure for the protection of steel structures, such as hangars, tanks, and bridges that contain lead-base paint using Rust Grip®. The maintenance and lead base paint encapsulation procedures include surface preparation, environmental protection requirements and paint application.

Rust Grip® is patented (Patent #5,695,812) as an effective abatement method of bio-hazardous material including lead-based paints, asbestos and rust. Rust Grip® is a moisture-cure urethane coating with special additives and resins. It is these additives and resins that separate Rust Grip® from the other moisture-cure urethanes and allows it to be applied directly over existing, firmly bonded paint or rust without any loss of performance. Since the greatest expense in the coating of lead-base painted steel structures comes from the surface prep (abrasive blasting, etc.) and the containment of that residue, Rust Grip® will greatly reduce the overall costs of the project. Rust Grip® was developed to withstand the harshest environments and has a history of excellent performance.

### **EXECUTIVE SUMMARY**

The U.S. Army Construction Engineering Research Laboratories (USACERL) continues to research the issue of lead base paint (LBP), the methods of abatement, the containment and disposal procedures, and the long- term fate of lead after disposal. LBP abatement and disposal is problematic and the U.S. Army maintains a large inventory of steel structures coated with lead-based paint (LBP) and corrosion. An inspection of steel structures at Simmons Army Airfield at Fort Bragg indicated problems with atmospheric corrosion of the existing LBP system.

The removal of aged paint systems containing lead pigments is very costly, often exceeding \$15 per square foot. The objective of this project is to demonstrate and implement a LBP abatement method that reduces the amount of waste generated from steel structures that are contaminated with LBP. This cost-effective lead-base paint encapsulation procedure uses an industrial surface-tolerant coating called Rust Grip®. Rust Grip® is a patented abatement method for the encapsulation of bio-hazardous material including lead-based paints, asbestos and rust. Associated higher costs of sandblasting equipment and labor, worker protection, containment, and waste disposal prohibit the use of traditional paint removal methods for removing LBP. Cost-effective measures are necessary to control and abate sources of lead hazards exposure and contamination as well as to safely remove, characterize, handle, store, transport, and dispose of lead-contaminated debris.

The surface-tolerant, LBP abatement technology of Rust Grip® recommended under this project is advocated as corrosion protection for structures. The technology is applicable for multiple regions and installations, especially those in hot and humid environments where atmospheric corrosion is a concern.

## THE PROBLEM

Lead-based paints (LBP) and primers have been used in the past by the Department of Defense (DoD) to protect steel structures from corrosion. LBP abatement and disposal is problematic because the removal of this paint creates hazardous dust and waste.

The DoD owns about 2 billion sq ft of buildings coated with some lead-based paint and about 200 million sq ft of steel structures coated with lead-based paint, such as aircraft hangars, tanks, and bridges. The Army owns 95,400 target facilities in the United States and 26,200 in foreign countries. The average age of these structures is 36 years; 90,000 were built before 1978 and probably contain lead-based paint. Furthermore, about 2600 of these facilities are on or eligible for the National Register of Historic Places, and require special procedures for preservation.

The removal of LBP is generally performed by abrasive blasting and abrasive blasting creates its own environmental hazard. Containment and disposal of surface preparation debris, worker protection, and other regulatory compliance costs combine to make removal of LBP very expensive. The residual waste from LBP removal often contains enough lead to be considered a hazardous waste, thereby requiring special handling and disposal.

## OBJECTIVE

The total cost of Army-wide lead abatement would be prohibitive using conventional methods, especially considering the large stock of older Army facilities. This investigation is to evaluate the performance and cost-effectiveness of using Rust Grip® for the encapsulation of lead-base paint on steel structures coated with LBP. Eliminating costs associated with the need to control and abate sources of lead hazards exposure and contamination as well as to safely remove, characterize, handle, store, transport, and dispose of lead-contaminated debris will reduce the cost of lead hazard control and abatement for Fort Bragg and the DoD. Cost-effective technologies are needed and Rust Grip, an innovative lead-abatement technologies and management system,

## APPROACH

Introduction of a proprietary product, Rust Grip®, which is a patented method suitable for the abatement of lead-based paint systems from most surfaces. The water, from the 3,500 psi power wash surface prep, will stabilize the lead in the residual waste so that the waste does not exhibit the Resource Conservation and Recovery Act (RCRA) toxicity characteristic for lead. The waste will be collected and disposed of according to federal and state regulations. Both laboratory and field evaluations confirmed the feasibility and cost-effectiveness of using Rust Grip® to encapsulate LBP. The finish coat will be Enamo Grip.

## ENCAPSULATION AND PROTECTION COATING

Rust Grip® is patented (#5,695,812) as an abatement method of bio-hazardous material including lead based paints and rust. Rust Grip® has passed ASTM E1795, which is the EPA product test for encapsulating coatings. One of the requirements of this test is that the coating last twenty years or more. The ability to encapsulate allows Rust Grip® to be applied directly over lead based paint without removal or exotic containment.

Rust Grip® is a metallic-based, moisture-cure polyurethane (MCU) and MCUs are a popular and successful group of surface tolerant materials. They have been recommended for use on many Corps of Engineers projects. The difference between other surface tolerant coatings tested and Rust Grip® is a surface coating does not have the solvent carrier to allow penetration into the pores of a substrate and to carry the body of the coating with it. A surface coating will simply adhere to anything above the pore area and

attach to the profile or roughness on the surface. This works well in most areas until the surface of the coating is exposed to weathering and elements over time. This exposure increases the permeability of a surface coating and allows moisture (in the form of vapor or humidity), salts, and acids to penetrate into the pores of the substrate. As a result, corrosion forms and migrates under the coating itself.

In addition, the corrosion process creates off-gassing that causes pressure that may be as high as 1200 psi. Surface coatings, when totally cured, have only a surface tensile strength of 600-800 psi. Therefore, as pressure increases from the off-gassing, the surface coating will separate and lift from the surface exposing an already rusted surface underneath.

Rust Grip® is made with special solvent carriers that allow the coating to penetrate into the pores carrying the body of the coating with it. Once the body of the coating is in the pores, it begins to absorb the moisture from the atmosphere and gases itself or does a microscopic swell inside the pores. This action allows Rust Grip® to become part of the actual surface of the substrate, which is different than most all other industrial coatings.

When cured, Rust Grip® maintains an extremely low permeability which eliminates the penetration of moisture, salts, and acids and the opportunity for corrosion to develop. Also, because Rust Grip® is an aromatic urethane with a high molecular weight, it is extremely tough and resistant to acids. Its non-leaving metallics allow an encapsulation of the surface and add additional toughness and UV control to its surface. Because Rust Grip® hardens to a minimum surface tensile strength of 6780 psi, any pressure that may develop from any off-gassing from remaining rust on the surface is not sufficiently strong to cause RUST GRIP® to separate from the surface of the substrate.

Rust Grip® requires minimal surface preparation and NO WHITE METAL SANDBLASTING, although any pack rust or scale (which will hold moisture) should be removed by a hammer or hand-tool. The surface must be free of all grease, oils, and salts and must be completely dry before coating. Any remaining tight rust or flash-rust will not cause a problem and, in most cases, is beneficial in creating a tough, durable coating.

## PROJECT SPECIFICATIONS

### Description of Steel Structure located at Simmons Army Airfield, Ft. Bragg, NC

Deluge Tank #1 is a 6,590 sq ft domed-roof water tank coated with LBP.

Deluge Tank #2 is a 4,770 sq ft flat-roof water tank coated with LBP.

P-3262 Hangar is 70,000 sq ft aircraft hangar coated with LBP.

### Project Specifications

The Rust Grip® LBP project specifications for the hangar and deluge tanks 1 & 2:

#### Surface Prep:

*Power wash at 3,500 psi to remove rust, loose paint, chalk, and dirt. Spot clean if necessary.*

#### Environmental Controls:

*Impermeable ground tarps overlaid with semi-permeable ground tarps.*

#### Encapsulant & Primer:

*Rust Grip® applied at 8 mils wet/4 mils dry*

#### Finish Coat:

*Enamo Grip applied at 8 mils wet/4 mils dry*

**Initial Condition of Structures**

The initial condition of the LBP surfaces of the hangar and deluge tanks are depicted in the photographs.



**WORK PRACTICES – COATING APPLICATION**

**Surface Prep**

***Deluge Tank #1 & #2***

Both exterior tank surfaces were power washed at 3,500 psi to remove, dirt, loose paint, oxidation and any other contaminants. After power washing, any areas that showed surface rust or remaining loose paint were prepared according to SSPC-SP3. Additional surface preparation was performed after Rust Grip® was applied in areas where existing paint lifted. These areas were hand-tooled cleaned in accordance with SSPC-SP2 and spot primed. All signage was removed and reinstalled after the final coat was applied. Weld beads, collars on tanks, etc. were stripe-coated using soft bristle brushes prior to power rolling. Check for lifted edges after Rust Grip® application. If existing, use scraper to eliminate.

***P-3262 Hangar***

The hangar surface was power washed at 3,500 psi to remove, dirt, loose paint, oxidation and any other contaminants. After power washing, any areas that showed surface rust or remaining loose paint were prepared according to SSPC-SP3. Additional surface preparation was performed after Rust Grip® was applied in areas where existing paint lifted. These areas were hand-tooled cleaned in accordance with SSPC-SP2 and spot primed. All signage was removed and reinstalled after the final coat was applied. Hard to reach places such as crevices, weld beads, etc. was stripe-coated.

**Rust Grip® Application (primer and encapsulant)*****P-3262 Hangar and Deluge Tanks #1 & #2***

After the steel surfaces were completely dry, the hangar and deluge tanks #1 & #2 were coated with Rust Grip®, which served as a primer and is a LBP encapsulator for these applications. Apply by power roller application (1) coat, (2) passes of Superior Products Rust Grip®, which is one part moisture-cure polyurethane to all prepared surfaces at 7-9 mils wet film thickness, 3.5-4.5 dry film thickness. Apply slowly using a cross-hatch method using ¾” nap rollers. Apply the first pass over approximately a 100 square foot area; return to beginning point and apply second pass to achieve the required 7-9 wet film thickness.

**Enamo Grip Application (epoxy topcoat tinted to Federal Standard Color #33617 – Desert Tan)*****P-3262 Hangar and Deluge Tanks #1 & #2***

The North Carolina weather dictated when Enamo Grip would be applied over the Rust Grip®. This was usually within (4) hours after completion of Rust Grip® application to achieve maximum adhesion. Both coats of Enamo Grip must be applied within the same day. Apply by power roller application (1) coat, (2) passes of Superior Products Enamo Grip tinted to a semi-gloss desert tan, Federal Standard Color #33617, which is two component polyurethane enamel to all Rust Grip® primed surfaces at 7-9 mils wet film thickness, 3.5-4.5 dry film thickness. If it rains, apply the second coat as soon as surface is dry. If the waiting period exceeds 48 hours, wipe with solvent prior to application. A “bubble buster” additive will be required, as with most polyurethane coatings. Back rolling may be required to eliminate bubbles.

**ECONOMIC IMPACT**

The most significant benefit of this work is optimized management of the hazards and costs associated with LBP abatement method of sandblasting. Implementation will also result in reduced O&M and life-cycle costs for painting of atmospheric exposed steel. Project delivery time is significantly less when using Rust Grip® versus complete removal and containment and disposal. CERL reported substantial cost savings will be achieved if surface tolerant coating systems were to be used Corps-wide. The Corps has over 3M square feet of steel painted with lead-based paint, and the removal of aged paint systems containing lead pigments is very costly, often exceeding \$15 per square foot. Associated higher costs of worker protection and waste disposal prohibit the use of traditional paint removal methods for removing LBP. Rust Grip® offers the benefit of maximizing the economic life of existing LBP coatings while minimizing present expenditures and reducing worker exposure and hazardous waste generation.

**Cost Comparisons**

The hangar could not be abrasive blasted because blasting creates dust that is incompatible with the functions of hangars. The deluge tanks could have been contained and dry abrasive blasted to remove the existing coating prior to repainting but added costs for worker health, environmental monitoring, waste disposal, and containment for hazardous paint removal are significant.

***A recap of how Rust Grip® can save the U.S. Army and DoD thousands of dollars while preserving assets:***

- ✓ Rust Grip® can be applied as a one-coat (primer/topcoat) system. If a color is desired, then Enamo Grip is applied.
- ✓ No sandblasting will save money in the areas of equipment, manhours and mandays, containment, disposal, and worker protection.
- ✓ Because of Rust Grip®’s ability to enter the pores and become part of the substrate, this is a permanent LBP abatement method. Unlike other “encapsulants” on the market, if Rust Grip is damaged, the LBP is still contained. So, in the future, when it comes time to demolish the steel structure, the LBP is still mitigated.

## CONCLUSIONS

Based on field testing, it is recommended that the Army and DoD use Rust Grip® as a standard practice for the overcoating and encapsulation of all steel structures that contain LBP. This advanced coating selection and implementation of a Rust Grip system will provide the benefits of restoring structures to their optimum operating conditions, as well as reducing maintenance costs, and increasing safety. Rust Grip® would be an environmentally sound decision regarding the disposal of the potentially large quantity of lead contaminated waste that the Army generates.

Rust Grip® is commercially available and ready for implementation as solutions to corrosion problems on hangars, buildings, tanks, bridges and any other type of suitable steel structures that are coated with LBP.

The technologies developed and demonstrated under this CERL project have dual use applications in the department of Housing and Urban Development (HUD) for housing and Department of Transportation (DOT) for bridges.

## REFERENCES

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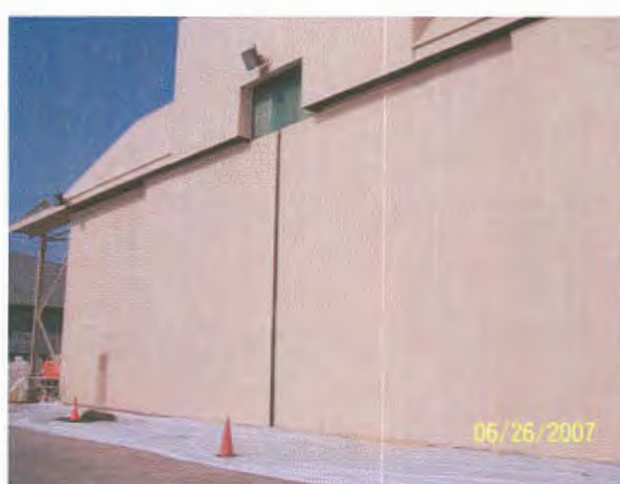
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Society for Protective Coatings

American Society for Testing and Materials (ASTM)



Pictures of the domed-roof deluge tank and the aircraft hangar at Simmons Army Airfield AFTER the Rust Grip/Enamo Grip application.