REPORT

EPO-CHEM™ RA 500M

SOLVENT-FREE, WET TOLERANT GLASSFLAKE SYSTEM

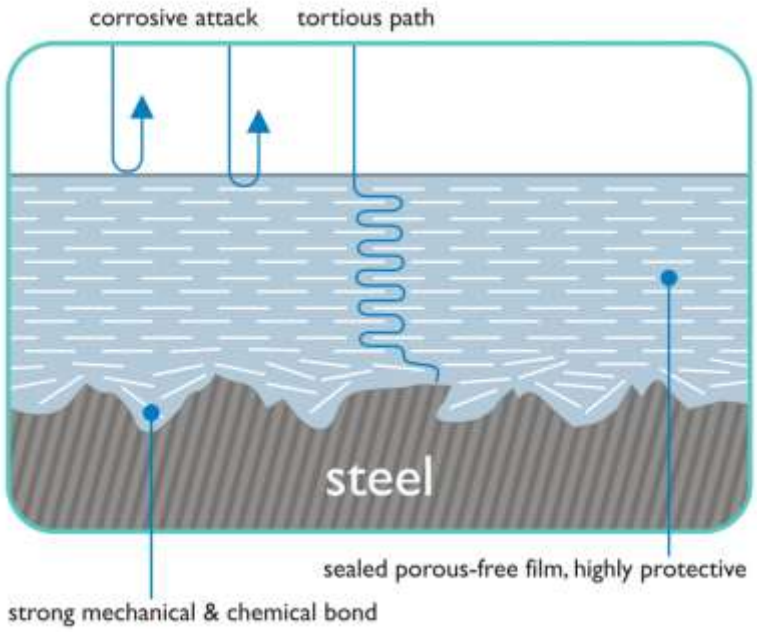
Marine Industry

December 2015

Contents

INTRODUCTION

Epo-chem™ RA 500M is suitable for a wide range of applications, including tanks, vessel linings and deck coatings.
Epo-chem™ RA 500M is a **solvent-free, wet tolerant** and highly chemical resistant epoxy single / topcoat. The glassflake systems have been utilised over the last 30 years as tank lining in the most aggressive environments because they offer total barrier against moisture and corrosive ions. These are typically applied as a one-coat system or as a topcoat on the primers with DFT of 200-300µ. Minimum surface preparation standard required: Sa2, WJ-2, St3.



MATERIAL CHARACTERISTICS

- It has been designed to work in damp, humid and poorly ventilated areas that are typically found in ballast tanks
- Used as a stripe coat to repair and protect high corrosion areas, i.e. welds and sharp edges
- Adhesion test results on wet substrates far exceed industry norms attaining over 1300psi before cohesive failure
- **Wet tolerant** – Can be applied on wet and soaking surfaces, no requirement for any dehumidification equipment
- **RA 500M** is 100% solid **solvent-free**, no requirement for any ventilation equipment Reduces the risk of MIC (Microbiological Induced Corrosion) and SRB (Sulphate Reducing Bacteria) as it does not contain the nutrients contained in solvent-based coatings
- Excellent chemical resistance
- Coating compatible with virtually all coal tar epoxy or other traditional ballast tank coatings
- Compatible with all shop primers
- Unlimited over-coating intervals
- Fast turn-around, can be put back into service almost immediately (as soon as touch dry, 6-12 hours) the system is capable of 'continuing' to cure underwater
- Glassflake technology ensures superb corrosion resistance and a long service life
- Ideal for poorly and hand prepared surfaces - reducing the downtime and back-in service time
- Apply in any environmental condition, no humidity restrictions
- Zero VOC; no fire hazard or odour
- Hot-work, e.g. welding, cutting and grinding can be carried out without interruption
- No storage hazard
- Preparation and application works can be carried out by ships' crew, riding crew, alongside quay-side or in dry-dock
- User friendly

CERTIFICATES AND APPROVALS

- ABS Certificate – RS 500P/RA 500M on bare steel and blast cleaned steel surfaces (Including on wet & rusty steel)
- Lloyds Approval:
    - Lloyds Approval – Ballast Tank Maintenance Coating – **RA 500M**
    - Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare Steel
    - Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Shop Primer
- NSF Certificate – Fresh Drinking Water System (when used in conjunction with RS 500P)
- FDA Approval:
    - FDA Approval – Food Contact – **RA 500M**
    - FDA Approval – Potable Water – **RA 500M**

APPLICATION AREAS

- Multi-purpose tank lining: sea water ballast, potable water, grey/black water
  crude oil, refined oil, cargo/grain, mud/brine
- Decks: Internal & External
- Void Spaces & Cofferdams
- Swimming Pools
- Engine Rooms - Bilges/Under Gratings
- Bulkheads
- Rudders
- Topsides/Boottops
- Underwater areas

CASE STUDIES

CASE STUDY 1: Water, Sewage & Ballast Tanks, Bilges and Decks – HMS Bristol

Case Study

Client:	*Royal Navy*	**Industry:**	*Marine*
Vessel:	*HMS Bristol*	**Date:**	*November 2008*
Location:	*UK*	**Products:**	*Epo-chem™ RA 500M & RS 500P*

Overview

The Royal Navy required an environmentally friendly coating for one of their vessels in UK and asked Chemco to specify a solution.

Challenge

The Royal Navy required a fast re-fitting program for their vessel in a UK port. Water, sewage, sea water ballast tanks and ballast bilge areas, along with non-slip deck coatings, had to be carried out in an environmentally friendly way i.e. no grit blasting or solvent-based systems allowed.

Solution

The only viable solution was to use water jetting as the surface preparation method followed by application of a **wet & rust-tolerant** system. High pressure water wash @ 500 bar was used to remove all contaminants to a WJ4 standard; followed by application of a special primer **Epo-chem™ RS 500P solvent-free wet & rust-tolerant** system @ 100µ and 1 coat of **Epo-chem™ RA 500M** solvent-free wet-tolerant glassflake topcoat @ 200-250µ DFT.

Outcome

The on time completion of the work was to the total satisfaction of the customer and was passed by all relevant authorities. Due to the ease and the quality of work carried out, subsequent orders from the Royal Navy have materialised. Not only the quality and long-term corrosion protection of the system was significant, but the minimal environmental impact has become of major interest to this and many other shipyards throughout UK; many contracts can now be carried out where it would not have been possible using conventional methods and paints; strict local environmental legislation no longer allows such activities.

Benefits

- Solvent-free
- No girt blasting, ventilation or dehumidification
- Reduced H&S and Fire Precaution
- Reduced cost of plant and equipment
- Application can be carried out in very high humidity or on wet substrate

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Photographs:

- Nos. 1 & 2 Ballast tank before and after application
- Nos. 3 & 4 Ship deck before and after application
- Nos. 5 & 6 Void space before and after application

Rev: November 2015

Ref: M19

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CASE STUDY 2: Ballast Tanks and Cargo Holds – Dallington Vessel

Case Study

Client:	*Stephenson Clarke Shipping*	**Industry:**	*Marine*
Vessel:	*Dallington Bulk Carrier*	**Date:**	*2005, 2007 & 2010*
Location:	*UK*	**Product:**	*Epo-chem™ RA 500M*

Overview

Stephenson Clarke manage and own a fleet of bulk carriers which require fast re-fitting program to meet with the charterers' requirements. They required a fast refurbishment of ballast tanks and holds in the Dallington in order to retain class.

Challenge

Historically, Stephenson Clarke had utilised solvent-based paint systems for their ballast tanks and cargo holds. Preparation to Sa2.5 by dry-grit blasting and subsequent humidity and temperature controls to maintain ideal painting conditions is both tedious and expensive. This, combined with the strict adherence to re-coating intervals of conventional paints, leads to slow return to service.
Stephenson Clarke required an alternative system to fast forward their re-fit programs; based on their experience, they chose the revolutionary **Chemco wet- tolerant** systems.

Solution

Epo-chem™ 500 Series, solvent-free, wet tolerant, single coat was specified. The preparation was high-pressure wash to WJ-3, followed by application of one coat of **Epo-chem™ RA 500M** @ 250µ DFT. **RA 500M** is FDA approved for the carriage of foodstuffs. The same coating was used in the ballast tanks after high-pressure washing (800 bar).

Outcome

A total area of over 10,000m² was coated, ballast tanks were ready in 24 hours and cargo tanks in 72 hours to be put back into service. The total project cost was estimated to be 30% lower than the normal conventional system of grit blasting and painting. Additionally, the vessel was back in service and earning revenue much quicker than it would have been if solvent- based paint had been used due to the reduction in preparation, equipment, staging and de-staging and fast cure of the **Chemco** system.

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Benefits

- Vessel back in service significantly faster
- Greatly reduced H&S and Fire Precaution
- Vastly reduced environmental impact
  - No grit blasting
  - No requirement for de-humidification
  - No extra ventilation requirements
  - No requirement for heating
- Project cost reduced by 30% versus traditional paints
- **Chemco International** system will protect the steel substrate in excess of 10 years

Follow up in 2007 & 2010

During re-fit operations in 2007, the Superintendent-in-charge and Lloyds Register's representative inspected the fore-peak and aft-peak tanks which had been coated with **Epo-chem™ RA 500M** in 2005 and stated that these tanks were in excellent condition. Further inspection in 2010 showed no deterioration (see photographs Nos. 2, 3 and 4 on page 2).
No maintenance required from 2005 until 2012 in all areas coated with **Epo-chem™ RA 500M.**

Photographs:

- No. 1 Surface in tank 2005, prior HP Wash
- Nos. 2 - 4 Tank condition after 5 years

Rev: November 2015

Ref: M01

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CASE STUDY 3: Ballast Tanks – MISC FPSO

Case Study

Client:	*Talisman Malaysia*	**Industry:**	*Marine*
Vessel:	*MISC Bhd.*	**Date:**	*January 2008*
Location:	*Malaysia*	**Products:**	*Epo-chem™ RA 500M & RS 500P*

Overview

The MISC FPSO required her ballast tanks to be coated in order to achieve class certification. However, the vessel was in constant use and the owners required a solution which did not require dry-grit blasting or involve solvent-based paints due to the risk of explosion and fire. Furthermore, the requirement for a large number of equipment, e.g compressor, dehumidifier etc., would make the contract impractical and expensive. **Chemco** was approached as the only company that could match the customer's requirements.

Challenge

Preparation of the tanks at sea with high pressure washing and coatings to be carried out in high humidity and on rusty steel. Application of **solvent-free** coatings capable of application on poorly prepared substrate, some without any profile and with mill scale, and still achieve class certification whilst the vessel is in full production/operation.

Solution

High pressure-wash (800 bar) to remove loose rust and loose mill scale. First/Primer coat and stripe coat was carried out with **Epo-chem™ RS 500P solvent-free, wet & rust tolerant** system @ 100µ DFT followed by the topcoat with **Epo-chem™ RA 500M solvent-free, wet tolerant** system @ 250µ DFT.

Outcome

The work was successfully supervised by **Chemco Speciality Coatings (SEA)**, **Chemco**'s subsidiary in Singapore. Class certification was achieved with zero downtime.

Benefits

Chemco was the only company which could provide the solution and did so in a cost-effective manner. The client gained class certification with no loss of production. They were also delighted to receive **Chemco**'s comprehensive guarantee.

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Photographs

- No. 1 Talisman on station
- Nos. 2 & 3 Surfaces ready for coating
- Nos. 4 & 5 Stripe coating with RS 500P
- No. 6 Full coat RS 500P
- No. 7 RA 500M being applied on wet surface
- No. 8 Completed RA 500M topcoat

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CASE STUDY 3: Ballast Tanks – MISC FPSO (cont.)

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CASE STUDY 4: Ballast Tanks – MV Auxis

Case Study

chemco

Client: IBL - Ireland Blyth Ltd	**Industry:** Marine
Vessel: M/V AUXIS	**Date:** October 2013
Location: Durban, South Africa	**Products:** Epo-chem™ RS 500P & RA 500M

Overview

The ballast tanks of the vessel M/V AUXIS required a full refurbishment for over 6,000m² (double bottoms tanks, wings tanks and deep tank) after the original coatings had failed.

Challenge

Some areas of the ballast tanks were heavily corroded with limited access. There was also a very limited time-scale for completion of this project and as a result, grit blasting was not permissible.

Solution

Utilise water jetting as the surface preparation method to WJ-3 standards. Apply one stripe coat of solvent-free, wet & rust tolerant epoxy Epo-chem™ RS 500P followed by one full coat of Epo-chem™ RS 500P @ 200µ DFT. In some localized areas, where most of the existing paint was still adherent, one primer coat of Epo-chem™ RS 500P in all the bare steel areas was applied, followed by one topcoat of solvent-free, wet tolerant epoxy Epo-chem RA 500M applied @ 250µ DFT.

Outcome

The work programme was successfully completed, within the timeframe given and to the satisfaction of all concerned: Owner, Classification Society and Shipyard.

Benefits

- Solvent-free
- Environmentally friendly system (no grit blasting)
- Reduced H&S and fire precautions
- No dew point or humidity restrictions
- No overcoating limitations
- No delays
- No disruption to other on-going work (hot)

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Photographs

- No. 1 Deep tank before surface preparation
- No. 2 Wing tank before surface preparation

Rev: November 2015

Ref: M05

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Photographs

- No. 3 Double bottom tank after surface preparation
- No. 4 Deep tank after surface preparation
- No. 5 Double bottom tank after stripe coat
- No. 6 Double bottom tank after full coat.
- No. 7 Wing tank after full coat

CASE STUDY 5: Void Tanks – Surfer Boats

Case Study

Client:	*Bourbon Offshore Asia*	**Industry:**	*Marine*
Scope:	*Void Tanks - Surfer Boats*	**Date:**	*June & October 2013*
Location:	*Singapore & Indonesia*	**Products:**	*Epo-chem™ RS 500P & RA 500M*

Overview

The aluminium void tanks onboard Bourbon Offshore Asia's Surfer Boat 2612 & Surfer Boat 2601, required to be refurbished as they were showing signs of deterioration.

Challenge

Providing a suitable coating system capable of adhering to a aluminium surface. The tanks are located within a very small confined space only accessible through crawling. Grit blasting and water jetting could not be utilised due to monetary constraints of the client. Working within a tight timeframe also added to the difficulty of this project.

Solution

The preparation method and the **Chemco** coating specification was the same for both Surfer boats. Utilise mechanical preparation as the surface preparation method. Apply **solvent-free, wet & rust tolerant** epoxy **Epo-chem™** RS 500P as a primer @ 100µ DFT by roller, followed by a topcoat of **solvent-free** epoxy **Epo-chem™ RA 500M @** 200µ DFT.

Outcome

This project was carried out on time with no delays. The **Chemco** system and the speed of the contract was to the satisfaction of all concerned.

Benefits

- Solvent-free
- Chemco system capable of adhering to a stainless steel surface
- No humidity or dew point restrictions
- Reduced H&S precautions
- Reduced contract duration
- Reduced cost of plant and equipment

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Photographs

- Nos. 1 & 2 Surfer boats 2612 & 2601 before surface preparation, respectively
- Nos. 3 & 4 Surfer boats 2612 & 2601 after surface preparation, respectively
- Nos. 5 & 6 Surfer boat 2612 after application of Chemco system
- Nos. 7 & 8 Surfer boat 2601 after application of Chemco system

Rev: November 2015

Ref: M35

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CASE STUDY 6: Swimming Pools – Navigator of the Seas

Case Study

Client:	*Royal Caribbean Cruise Lines*	**Industry:**	*Marine*
Vessel:	*Navigator of the Seas*	**Date:**	*February 2014*
Location:	*Bermuda*	**Products:**	*Epo-chem™ RS 500P & RA 500M*

Overview

The swimming pools on-board Royal Caribbean's Navigator of the Seas cruise vessel had to be refurbished as the existing tile system required regular maintenance and this was causing major problems.

Challenge

Removing the existing tiles and concrete backing to expose the steel. Utilising an alternative surface preparation method to grit blasting, which could not be considered due to problems of excessive dust contamination to the surrounding areas. The client was looking for a system offering a long-term solution which did not require regular maintenance. Working within a strict time-frame also added to the difficulty of this project.

Solution

Both mechanical preparation and water jetting were utilised as the surface preparation methods to St2 and WJ-3 standards respectively. Chemco's solvent-free, wet & rust tolerant primer Epo-chem™ RS 500P was applied followed by two coats of solvent-free, wet tolerant Epo-chem™ RA 500M.

Outcome

The project was completed in 20 days, much quicker than the given time -frame. The quality of the smooth, high gloss finish and the speed of the contract were to the satisfaction of all concerned. The surface preparation method utilised and the unique solvent-free properties of the Chemco system also allowed other work to continue nearby without disruption.

Benefits

- Solvent-free
- No grit blasting
- Reduced down-time and equipment cost
- Wet & rust tolerant properties of the Chemco system
- H&S compliant
- No disruption to other work
- Chemco system offers a long-term and easily repairable solution

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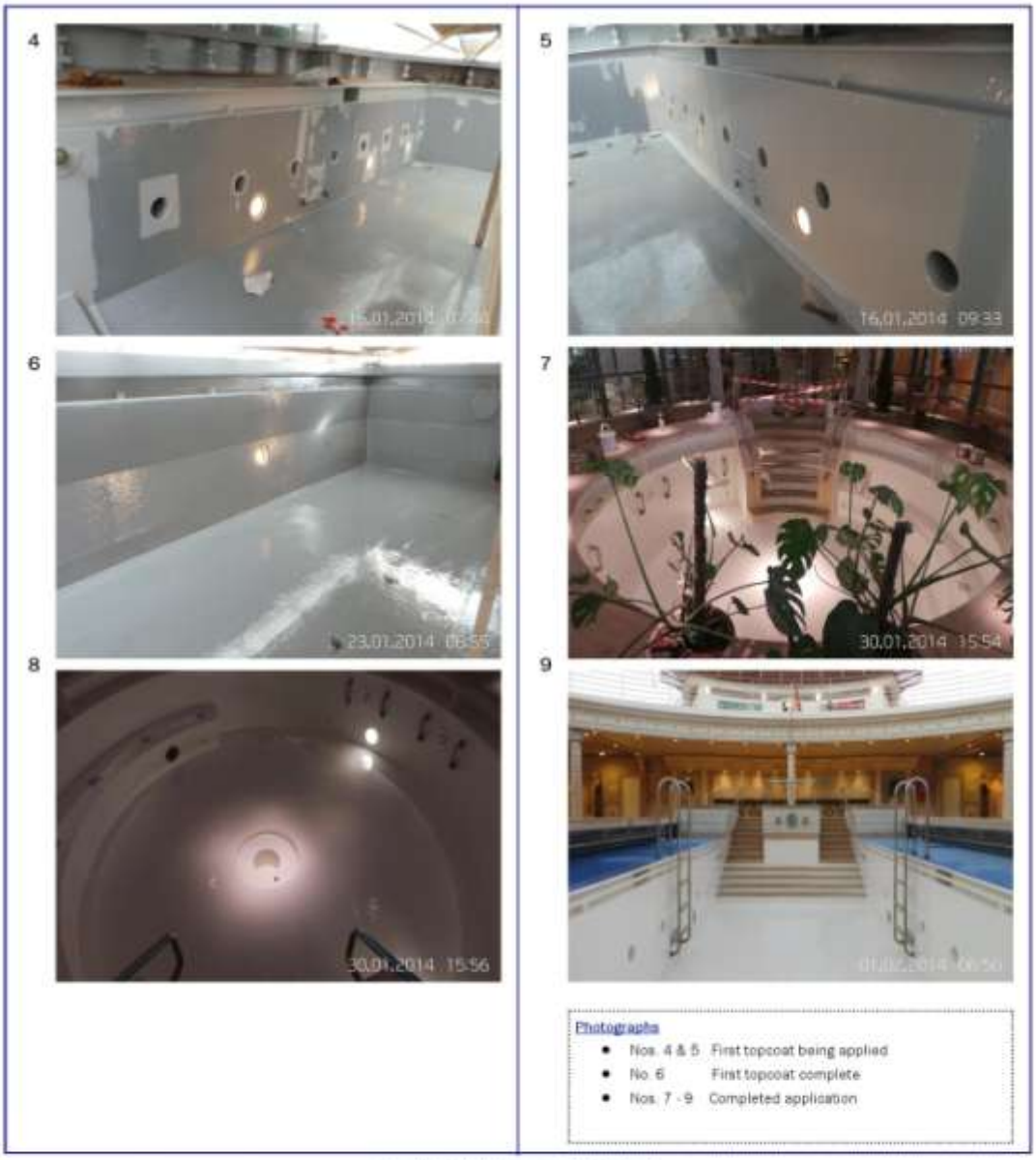
Photographs

- Nos. 1 & 2 After surface preparation
- No. 3 Topcoat being applied on top of primer

Rev: November 2015

Ref: M33



Photographs

- Nos. 4 & 5 First topcoat being applied
- No. 6 First topcoat complete
- Nos. 7 - 9 Completed application

Solvent-free • Water-based • Wet-tolerant
• Rust-tolerant • Zero VOC
• Tank & Pipe Linings • Under-water & Marine • Glassflake
• Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
• Approved for Contact with Food, Drinking Water & Beverages • Damp or Green Concrete Primers
• Concrete Repair Systems • Elastomeric System
• High Temperature Systems • Fire Retardant • Insulation Systems

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 7: New Build (Shop Primer) – MV Lerrix

Case Study

Client:	*Rix Shipping*	**Industry:**	*Marine*
Vessel:	*MV Lerrix*	**Date:**	*2012*
Location:	*UK*	**Products:**	*Epo-chem™ RS 500P & RA 500M*

Overview

The New Build, MV Lerrix, required to have the double skin ballast tanks (over 5,000m²) coated with an IMO PSPC approved product. The owners decided that they required a solution which did not require grit blasting or solvent-based paints as the work had to be carried out in confined spaces. Traditionally, shop primers need to be completely removed prior to the application of a coating system. The vessel was visited by its owners and Lloyds as this was the first New Build in the UK that was coated under the new IMO PSPC regulations.

Challenge

To find a coating system which could be applied without the removal of the shop primer and without grit blasting. Working in very tight, confined spaces also added to the difficulty of this project.

Solution

Water jetting (500 bar) was utilised as the surface preparation method to remove any contaminants from the shop primed surfaces and the weld areas were mechanically prepared prior to the application of the IMO Approved Chemco System. One stripe coat of solvent-free, wet & rust tolerant Epo-chem™ RS 500P was then applied, followed by one full coat, both @ 100µ. To complete the system, one topcoat of solvent-free, wet tolerant Epo-chem™ RA 500M was applied @ 250µ.

Outcome

The work was successfully completed and supervised by Baymarine's QA and Chemco's Technical Representative, meeting all the parameters for IMO and Lloyds Register for class certification.

Benefits

- Solvent-free
- No grit blasting
- Wet & rust tolerant properties of Chemco system
- Compatibility with shop primers (IMO Approved)
- Reduced H&S and Fire Precaution
- Substantial time and cost savings

Continued overleaf

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Photographs

- No. 1 Before application
- No. 2 Stripe coating

Rev: November 2015

Ref: M26

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Photographs

- Nos. 3 & 4 During priming
- No. 5 Priming complete
- No's 6 & 7 Completed application

CASE STUDY 8: Ballast Tanks (Coal-tar Epoxy) – Yeoman Bridge

Case Study

Client:	*V. Ships*	**Industry:**	*Marine*
Vessel:	*Yeoman Bridge*	**Date:**	*2008 - ongoing project*
Location:	*Poland*	**Products:**	*Epo-chem™ RS 500P & RA 500M*

Overview

The ballast tanks onboard the Yeoman Bridge had previously been coated with coal-tar epoxy. Areas within these ballast tanks were now showing signs of corrosion damage and required to be patch repaired.

Challenge

To find a protective coating system which would be compatible with a coal-tar epoxy tank lining.

Solution

Chemco's Epo-chem™ RS 500P (primer) & RA 500M (topcoat) were selected as the protective coating system to be utilised as it is uniquely compatible with coal-tar epoxies.

The areas which required the patch repair were mechanically prepared by power tooling to St2 standards.

Upon completion of the surface preparation, one coat of **solvent-free, wet & rust** tolerant **Epo-chem™ RS 500P** was applied to the prepared areas.
This was followed by one topcoat of **solvent-free, rust tolerant Epo-chem™ RA 500M**.

Outcome

The unique characteristics of **Epo-chem™ RS 500P** allowed the system to be applied with no compatibility issues and with strong adhesion to the coal-tar epoxy.

The owners of this vessel are very satisfied with **Chemco** and issued a letter of recommendation. They also stated that after 5 years the coating is still in perfect condition.

Benefits

- Solvent-free
- No grit blasting
- Rust tolerant properties of **Epo-chem™ RS 500P**
- Compatibility with coal-tar epoxy
- Reduced H&S and Fire Precaution
- Substantial time and cost savings

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Photographs

- No. 1 Surface prepared by mechanical preparation
- No. 2 Patch repair complete

Rev: November 2015

Ref: M16

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Photographs

- Nos. 3 & 4 Patch repair complete

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 9: Potable Water Tanks – Cruise Vessel

Case Study

Client:	*Major Cruise Liner Company*	**Industry:**	*Marine*
Scope:	*Potable Water Tanks*	**Date:**	*March 2012*
Location:	*UK*	**Products:**	*Epo-chem™ RS 500P & RA 500M*

Overview

One of the world's largest cruise liner companies required to have the potable water tanks onboard one of their cruise ships refurbished as they were showing signs of age and deterioration.

Challenge

Grit blasting was not permissible. There was also a strict time frame given for completion of the project.

Solution

Water jetting to WJ-3 standards was used as the surface preparation method. This was followed by one primer coat of **solvent-free, wet & rust tolerant** epoxy **Epo-chem™ RS 500P**. One topcoat of **solvent-free, wet tolerant** epoxy **Epo-chem™ RA 500M** was applied to complete the coating system.

Outcome

The **solvent-free** properties of the **Chemco** system and utilising water jetting ensured that there was no disruption to other ongoing work within the vicinity. The unique **wet & rust tolerant** properties of the **Chemco** system also ensured that coating application could take place immediately upon completion of the surface preparation, resulting in substantial time and cost savings being achieved.

This system is **NSF Certified** for potable water applications.

Benefits

- Solvent-free
- **Wet & rust tolerant** properties
- No grit blasting
- Reduced H&S and Fire Precaution
- Reduced downtime
- Substantial time and cost savings
- No disruption to other ongoing work in the vicinity

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Photographs

- Nos. 1 & 2 Completed application

Rev: November 2015

Ref: M28

APPENDIX 1

CERTIFICATES AND APPROVALS

1.1 ABS Certificate – RS 500P/RA 500M on bare steel and blast cleaned steel surfaces (Including on wet & rusty steel)

ABS

FOUNDED 1862

CERTIFICATE NUMBER
14-LD1135810A-PDA-01

DATE
23 January 2014

ABS TECHNICAL OFFICE
London Engineering Department

CERTIFICATE OF DESIGN ASSESSMENT

This is to Certify that a representative of this Bureau did, at the request of

CHEMCO INTERNATIONAL - SCOTLAND

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

PRODUCT: **IMO PSPC Approved Seawater Ballast Tank Coating**

MODEL: **RS 500P/RA 500M ON BARE STEEL AND BLAST CLEANED STEEL SURFACES.**

This Product Design Assessment (PDA) Certificate 14-LD1135810A-PDA-01, dated 23/Jan/2014 remains valid until 22/Jan/2019 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

AMERICAN BUREAU OF SHIPPING

Andrew Worrall
Engineer

1.2 Lloyds Approval – Ballast Tank Maintenance Coating – **RA 500M**

Lloyd's Register

RECOGNISED CORROSION CONTROL COATING

Certificate No. **MATS/3810/2**

This certificate is issued to the company named below. The corrosion control coating described has been recognised for use as a tank coating in constructions built under Lloyd's Register survey. This recognition is subject to Lloyd's Register being informed of any changes in or modifications to the coating and the product being used in accordance with the manufacturer's instructions, and the relevant requirements of Lloyd's Register's Rules and Regulations.

Company	**CHEMCO INTERNATIONAL LTD. UNITED KINGDOM**
Trade name	**EPO-CHEM RA 500M**
Type of coating	**Epoxy**
Applicability	**Salt Water Ballast Tanks, Void Spaces**
Surface preparation	**ISO 8501-1, Sa 2.5**
Number of coats	**1*- 2**
Dry film thickness	**250-600 microns**
Remarks	*** Additional stripe coat to be applied to all welds, edges and other changes in section. This recognition is applicable to vessels not within the scope of IMO Resolution MSC.215(82) 'Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers' adopted on 8th December 2006.**

Valid until **1 October 2017**

Date **18 September 2012**

R Dawson
Surveyor to Lloyd's Register EMEA
A subsidiary of Lloyd's Register
Group Limited

1.3 Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare Steel

Lloyd's Register
TYPE APPROVAL

Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: **MNDE/2011/4217**

This is to certify that the protective coating system manufactured at the plant below is in compliance with IMO Resolution MSC.215(82) *Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers* (PSPC) adopted on 8th December 2006.

This approval is granted in accordance with the PSPC, IACS Regulations and LR Rules. The surface preparation and application requirements specified in the product technical data sheet (PTDS) have been reviewed and comply with the PSPC. This approval does not cover properties other than corrosion prevention, such as service life, safety or toxicity etc.

The approval is subject to Lloyd's Register being informed of any changes in the product's formulation, specification or status of manufacturing quality control accreditation. Periodic auditing of the manufacturer's quality control and assurance systems will confirm compliance. Lloyd's Register reserves the right to withdraw or re-issue this certificate.

Manufacturer:	**Chemco International Ltd.** **East Shawhead Industrial Estate,** **Coatbridge,** **Scotland,** **United Kingdom**
Coating system:	**Epo-chem™ RS 500P / Epo-chem™ RA 500M**
Product codes:	**RS 500P / RA 500M**
Curing agents:	**HR 500P / HF 500M**
Applications	**Water ballast tanks and double-side skin spaces**
Notes:	1. Surface preparation and coating application should be carried out in accordance with the manufacturer's PTDS. 2. Product approved for use with the compatible shop primers listed on page 2, or on clean blasted bare steel.
Date of issue:	**26 May 2011**
Date of expiry:	**1 June 2016**

Richard Dawson
Surveyor to Lloyd's Register EMEA
A member of Lloyd's Register Group

Issue No. 1

Lloyd's Register
TYPE APPROVAL

Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: **MNDE/2011/4217**

Compatible Shop Primers:

Primer	Product Code(s)	Manufacturer
Bare steel only		

End of list

Issue No. 1

Lloyd's Register
TYPE APPROVAL

Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: **MNDE/2011/4217**

This is to certify that the protective coating system manufactured at the plant below is in compliance with IMO Resolution MSC.215(82) *Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers* (PSPC) adopted on 8th December 2006.

This approval is granted in accordance with the PSPC, IACS Regulations and LR Rules. The surface preparation and application requirements specified in the product technical data sheet (PTDS) have been reviewed and comply with the PSPC. This approval does not cover properties other than corrosion prevention, such as service life, safety or toxicity etc.

The approval is subject to Lloyd's Register being informed of any changes in the product's formulation, specification or status of manufacturing quality control accreditation. Periodic auditing of the manufacturer's quality control and assurance systems will confirm compliance. Lloyd's Register reserves the right to withdraw or re-issue this certificate.

Manufacturer:	**Chemco International Ltd.** **East Shawhead Industrial Estate,** **Coatbridge,** **Scotland,** **United Kingdom**
Coating system:	**Epo-chem™ RS 500P / Epo-chem™ RA 500M**
Product codes:	**RS 500P / RA 500M**
Curing agents:	**HR 500P / HF 500M**
Applications	**Water ballast tanks and double-side skin spaces**
Notes:	1. Surface preparation and coating application should be carried out in accordance with the manufacturer's PTDS. 2. Product approved for use with the compatible shop primers listed on page 2, or on clean blasted bare steel.
Date of issue:	**17 January 2012**
Date of expiry:	**1 June 2016**

Richard Dawson
Surveyor to Lloyd's Register EMEA
A member of Lloyd's Register Group

Issue No. 2

Lloyd's Register
TYPE APPROVAL

Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: **MNDE/2011/4217**

Compatible Shop Primers:

Primer	Product Code(s)	Manufacturer
Interplate 937	NQA933, NQA934, NQA936	International Paint Ltd.
Sigmaweld 190	179171, 179172	PPG Protective & Marine Coatings
Cerabond 2000	N/A	Chugoku Marine Paints, Ltd.
Nippon Ceramo *(Nippe Ceramo)*	N/A	Nippon Paint Marine Coatings Co., Ltd.

End of list

Issue No. 2

1.5 NSF Certificate: Fresh Drinking Water System (when used in conjunction with RS 500P)

NSF International

789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Chemco International Ltd

Facility: Coatbridge, United Kingdom

AS COMPLYING WITH NSF/ANSI 61 AND ALL APPLICABLE REQUIREMENTS.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.

Certification Program Accredited by the American National Standards Institute

Certification Program Accredited by the Standards Council of Canada

This certificate is the property of NSF International and must be returned upon request. For the most current and complete information, please access NSF's website (www.nsf.org).

September 26, 2014
Certificate# C0184107 - 01

David Purkiss
General Manager, Water Systems

1.5 NSF Certificate: Fresh Drinking Water System (when used in conjunction with RS 500P) (cont.)

NSF International

OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

This is the Official Listing recorded on September 26, 2014.

Chemco International Ltd
13-23 Hagmill Road
East Shawhead Industrial Estate
Coatbridge ML5 4XD
United Kingdom
+44 1236 606060

Facility: Coatbridge, United Kingdom

Trade Designation [1] [2] [G]	Protective (Barrier) Materials: Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks			
Epo-Chem RA 500	>= 1000 gal.	CLD 23	EPOXY
Epo-Chem RA 500 UW	>= 1000 gal.	CLD 23	EPOXY
Epo-Chem RA 500M	>= 1000 gal.	CLD 23	EPOXY

[1] All RA500 products are used with Epo-Chem RS 500P primer.

[2] Colors: <only capitalize the first color, put the colors in alpha order>
Number of Coats: Primer 1, Top Coat 1
Maximum Field Use Dry Film Thickness (in mils): Primer: 10; Top coat: 25; Total system: 35
Maximum Thinner: 5% T5 Thinner
Recoat Cure Time and Temperature: Primer cure time is 2 hours at 30°C
Final Cure Time and Temperature: 48 hours at 30°C
Special Comments: Primer: Mix Ratio is 4.18:0.82 (Part A:Part B) by weight Top Coat: Mix Ratio is 3.67:1.333 (Part A:Part B) by weight

[G] Product is Certified to NSF/ANSI 372 and conforms with the lead content requirements for "lead free" plumbing as defined by California, Vermont, Maryland, and Louisiana state laws and the U.S. Safe Drinking Water Act.

Note: Additions shall not be made to this document without prior evaluation and acceptance by NSF International.

1 of 1

C0184103

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
1-800-NSF-MARK / 734-769-8010
www.nsf.org

1.6 FDA Approval – Food Contact – **RA 500M**

SMITHERS PIRA

Food Contact Plastics
Certificate of Conformity with the Test Requirements of USA FDA Code of Federal Regulations (CFR21) Section 175.300 (Resinous and Polymeric Coatings).

Certificate no: 2013/5091

Product Name:	*'RA 500M'*	**Date of Issue:**	17 October 2013
Manufacturer/ Supplier:	Chemco International	**Pira Reference No:**	13A12J5514
Address:	East Shawhead Industrial Estate Coatbridge Scotland ML5 4XD		

Samples of the above product have been found to comply with the following requirements, as specified in sections (1) of the USA FDA Code of Federal Regulations CFR21 Section 175.300 (Polyethylene Phthalate Polymers).

- The chloroform soluble portion of a distilled water extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 24 hours at 120°F.
- The chloroform soluble portion of an n-heptane extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 0.5 hours at 70°F.

Accordingly, the above sample is in compliance with the test requirements specified in the USA FDA Code of Federal Regulations CFR21 Section 175.300 (1) and is suitable for use in packaging, transporting or holding all non alcoholic foods, at temperatures not to exceed room temperature.

Certified by: **Allison Chambers**
Senior Analytical Chemist
Analytical Services

Smithers Pira | Cleeve Road | Leatherhead | Surrey KT22 7RU, UK | +44 (0)1372 802000 | www.smitherspira.com

1.7 FDA Approval – Potable Water – **RA 500M**

SMITHERS PIRA

Food Contact Plastics
Certificate of Conformity with the Test Requirements of USA FDA Code of Federal Regulations (CFR21) Section 175.300 (Resinous and Polymeric Coatings)

Certificate no: 2013/5093

Product Name: *'RA 500M / RP 500'*

Date of Issue: 17 October 2013

Manufacturer/ Supplier: Chemco International

Pira Reference No: 13A12J5514

Address:
East Shawhead Industrial Estate
Coatbridge
Scotland
ML5 4XD

Samples of the above product have been found to comply with the following requirements, as specified in sections (1) of the USA FDA Code of Federal Regulations CFR21 Section 175.300 (Polyethylene Phthalate Polymers).

- The chloroform soluble portion of a distilled water extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 24 hours at 120°F.
- The chloroform soluble portion of an n-heptane extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 0.5 hours at 70°F.

Accordingly, the above sample is in compliance with the test requirements specified in the USA FDA Code of Federal Regulations CFR21 Section 175.300 (1) and is suitable for use with fresh drinking water, at temperatures not to exceed room temperature.

Certified by: **Allison Chambers**
Senior Analytical Chemist
Analytical Services

Smithers Pira | Cleeve Road | Leatherhead | Surrey KT22 7RU, UK | +44 (0)1372 802000 | www.smitherspira.com
Smithers Rapra and Smithers Pira Ltd | Registered in England & Wales No. 6761324 | Registered Office: Shawbury, Shropshire, SY4 4NR

APPENDIX 2

AREAS OF A CRUISE SHIP COATED WITH CHEMCO

2.1 Areas of a Cruise Ship Coated with Chemco

THE FOLLOWING IS A COMPREHENSIVE LIST OF SPECIFIC AREAS ON CRUISE VESSELS WHERE CHEMCO COATINGS HAVE BEEN UTILISED:

- Sea Water Ballast Tanks
- Grey Water Tanks
- Sewage Tanks
- Potable Water Tanks
- Fuel Oil Tanks
- Boiler Tanks
- Hot Well Tanks
- Void Spaces
- Battery Rooms
- Fan Rooms
- Chemical Stores
- Steam Pipes (up to 150°C)
- Accommodation Spaces
- Lifeboat Davits - Scuppers
- Chain Lockers
- Engine Room Bilges
- Machinery Spaces
- Air Con Ducting
- Plenums
- Balconies/Main Decks
- Swimming Pools
- Pool Rooms
- Service Walkways/Passages
- Refrigeration Rooms
- Galleys
- Shower Rooms
- Outside Shell
- Superstructures
- Funnels
- Rudders
- Propellers

A lot of the work listed above can be completed in-service, with the technical aspects of the Chemco coatings permitting them to be utilised in areas where most solvent-based systems simply cannot; due to passenger disruption or food/laundry work being in progress.
Equally a lot of the work can be done at refit and allowed to continue despite hot work taking place nearby. Utilising solvent-based systems H&S issues would be a major concern, culminating in long time delays at refits resulting in extensive costs being obtained.

APPENDIX 3

TEST REPORTS

3.1 JE Test Report

PAINTING REPORT

JOB NO.:	Cmp/1547	REPORT NO.:	000
UNIT:	G3	INSPECTION DATE:	13/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		

DESCRIPTION OF ITEM (State Drawing Nos. where applicable):

Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint.

(1) RA 500——————————EPOXY SOLVENT-FREE SYSTEM .
(2) R I 500——————————EPOXY SOLVENT-FREE SYSTEM .
(3) RL 500——————————EPOXY SYSTEM WITH ADDED SOLVENT.
(4) RS 500——————————EPOXY SOLVENT-FREE SYSTEM .

SUMMARY

RA-500——RI——RS——————————. Are all 100% volume solids.
RL-500 ——————————————————————90% volume solids.
RA 500 looks to be the better coat when applying, and can be seen to be flashing off within 30 min. (very good).
RI 500 A Bit Harder to apply but as seen good overall coat. (good).
RL 500 This application found to sag during application using brush,(more care when applying). (good).
RS 500 This coat same as RI 500 When applying found to be a bit hard to apply. (good).

OBSERVATIONS

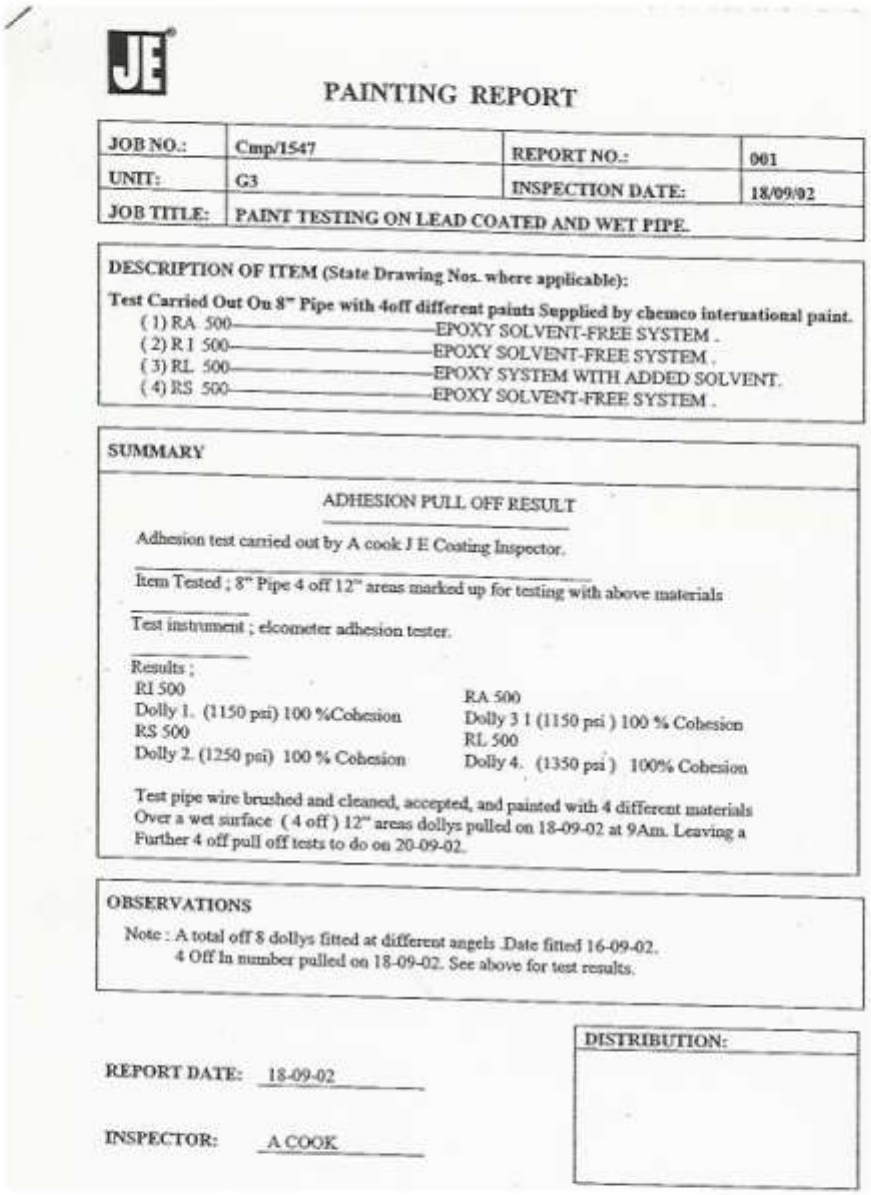
Four parts off an 8" lead coated pipe were prepared for coating. this pipe was also seen to be wet
Prior To paint application.
Remove all loose material .
To final wire brush.
To clean down.
To apply to all four areas coating with different material (all areas coated on 13-09-02) .
Today 16-09-02 dollys were attch to these areas for adhesion testing which will
Be carried out on 20-09-02.

DISTRIBUTION:

REPORT DATE: 13-09-02

INSPECTOR: A COOK

3.1 JE Test Report (Cont.)



JE

PAINTING REPORT

JOB NO.:	Cmp/1547	REPORT NO.:	001
UNIT:	G3	INSPECTION DATE:	18/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		

DESCRIPTION OF ITEM (State Drawing Nos. where applicable):

Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint.

(1) RA 500 — EPOXY SOLVENT-FREE SYSTEM .
(2) R I 500 — EPOXY SOLVENT-FREE SYSTEM .
(3) RL 500 — EPOXY SYSTEM WITH ADDED SOLVENT.
(4) RS 500 — EPOXY SOLVENT-FREE SYSTEM .

SUMMARY

ADHESION PULL OFF RESULT

Adhesion test carried out by A cook J E Coating Inspector.

Item Tested ; 8" Pipe 4 off 12" areas marked up for testing with above materials

Test instrument ; elcometer adhesion tester.

Results ;

RI 500
Dolly 1. (1150 psi) 100 %Cohesion

RS 500
Dolly 2. (1250 psi) 100 % Cohesion

RA 500
Dolly 3 1 (1150 psi) 100 % Cohesion

RL 500
Dolly 4. (1350 psi) 100% Cohesion

Test pipe wire brushed and cleaned, accepted, and painted with 4 different materials Over a wet surface (4 off) 12" areas dollys pulled on 18-09-02 at 9Am. Leaving a Further 4 off pull off tests to do on 20-09-02.

OBSERVATIONS

Note : A total off 8 dollys fitted at different angels .Date fitted 16-09-02.
4 Off In number pulled on 18-09-02. See above for test results.

DISTRIBUTION:

REPORT DATE: 18-09-02

INSPECTOR: A COOK

3.1 JE Test Report (Cont.)

JE

PAINTING REPORT

JOB NO.:	Cmp/1547	REPORT NO.:	002
UNIT:	G3	INSPECTION DATE:	20/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		

DESCRIPTION OF ITEM (State Drawing Nos. where applicable):

Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint.

(1) RA 500——————EPOXY SOLVENT-FREE SYSTEM .
(2) R I 500——————EPOXY SOLVENT-FREE SYSTEM .
(3) RL 500——————EPOXY SYSTEM WITH ADDED SOLVENT.
(4) RS 500——————EPOXY SOLVENT-FREE SYSTEM .

SUMMARY

ADHESION PULL OFF RESULT

Adhesion test carried out by A cook J E Coating Inspector.

Item Tested ; 8" Pipe 4 off 12" areas marked up for testing with above materials

Test instrument ; elcometer adhesion tester.

Results ;

RI 500
Dolly 1. (1150 psi) 100 %Cohesion
RS 500
Dolly 2. (1300 psi) 100 % Cohesion

RA 500
Dolly 3 (1150 psi) 100 % Cohesion
RL 500
Dolly 4. (1450 psi) 100% Cohesion

Further test carried out to same painted areas (different locations) .
Test carried out to 09.00 hrs on 20-09-02

OBSERVATIONS

Note : After 7 Days Further 4 Dollys Pulled , see results above.

DISTRIBUTION:

REPORT DATE: 23-09-02

INSPECTOR: A COOK