

The Concrete Testing Laboratory
School of Engineering
City University
LONDON EC1 VOHB
March 2006

An investigation sponsored by PCIS Ltd.

TEST REPORT ESRC/2006/CP/01

**EFFECTIVENESS OF CHEMSTAR EKOSORB™ ANTI-
GRAFFITI PRODUCTS AND THE INFLUENCE OF CHEM-
CRETE PAVIX CCC100™ IMPREGNATION**

Prof. Denis A. Chamberlain
Dr. Konstantinos Grigoriadis
15th March 2006

Introduction

Graffiti pollution is a major problem in the UK and wider Europe. To combat this, sacrificial coatings are being increasingly used on all types of structures. Protective Coating & Inspection Services Ltd require an assessment of the graffiti protection products Chemstar EKOSORB PR-A™ and Chemstar EKOSORB PR-C™ and the graffiti removal product Chemstar EKOSORB EX-A™. To extend the relevance of this, they require an understanding of the possible influence of hydrophobic impregnation using Chem-Crete Pavix CCC100™, an environmentally friendly alternative to Silane. Also of interest is the use of an emulsion sub-base to cover up existing graffiti prior to protective measures.

Objectives

The three main objective of the investigation are summarized as follows:

1. To assess the effectiveness of Chenstar Ekosorb PR-A and Ekosorb PR-C in protecting and cleaning surfaces polluted by graffiti paints
2. To assess the effectiveness of Chemstar Ekosorb EX-B in cleaning surfaces polluted by graffiti paints
3. To assess the influence of Chem-Crete Pavix CCC100 hydrophobic impregnation applied under UK Highway Authority provisions.
4. To access the benefit of applying an emulsion base coat in a graffiti protection system

Method

The method of investigation was to prepare 16 protected and unprotected pairs of concrete panels with a combination of paints and observe the results of cleaning them with hot water only. To cover objective 2. cleaning with Ekosorb EX-B rather than hot water was also addressed. Table 1 sets out details of the coatings used and cleaning methods.

The panels were cast as 400mm x 400mm x 50mm plain concrete slabs using a 40 N/mm² average strength concrete mix design. To avoid possible surface contamination no mould releasing agent was used. A stippled profile was cast into the slab surface.

Following 28 days curing, the panels were prepared according to table 1, with and a single application of Pavix CCC100 impregnation applied by brush at 200ml/m² dosage rate to Panels 3 & 4. This was allowed to cure for 48 hours. At the same time, a primer coat of pink emulsion (average 300µ wft) followed by a

coat of white emulsion (average 300 μ wft) was applied to Panels 5 to 8. Following 48 hours of curing between and after coats, a single application of Pavix CCC100 impregnation was applied at 200ml/m² dosage rate to Panels 7 & 8.

Following the preparation detailed above, a series of Graffiti coatings were consistently applied to all panels as illustrated in figure 1. Each coat was applied at an average dosage of 300 μ wft.

Prior to adopting the Graffiti paints, they were tested for coating adhesion values on plain untreated concrete substrate. As illustrated in figure 2, the Elcometer Model 106 Adhesion Tester (complies with emc directives 92/31/EEC & 93/68/EEC), with scale range 0.5 N/mm² to 3.5 N/mm² was used to determine these values. Three types of adhesive were investigated for bonding the pull-off dollies to the painted surface. These were (i) Regular Araldite, (ii) Scotch-weld M2000 and (iii) Loctite Multi-bond. For each graffiti paint type, these were tested to determine their possible solvent action (paint colour dissolved into liquid adhesive). Where more than one adhesive type showed no apparent solvent action, the one producing the least pull-off value was adopted to avoid possible reinforcing action by the adhesive. Using the selected bonding solution, both the graffiti paints gave adhesion values in the range of 1.0-1.5 N/mm², which implies that they would be durable on a plain dry concrete surface.

Following 14 days of graffiti paint curing the panels were cleaned according to the schedule stated in table 1. Hot water and a stiff brush were applied in a consistent manor (time & effort) in the cleaning of the panels. This is with the exception of the left hand side of Panel 1, which was cleaning using EKOSORB EX-A™.

Results

Table 2A & 2B show the outcomes of the cleaning work previously described. The main outcomes of Panel cleaning are summarized as follows:

1. Using hot water alone, emulsion paint on concrete substrate can be removed (Case 6-LHS)
2. Using hot water alone, car paint on concrete cannot be effectively removed (Case 2-LHS)
3. Using hot water alone, car paint can be partially removed from Pavix impregnated concrete (Case 3-LHS)
4. Ekosorb EX B remover is effective in removing all graffiti paints used (Case 4-RHS)
5. Ekosorb PR-A or Ekosorb PR-C protectors assist removal of all graffiti paints used (Case 1-RHS & Case 2-RHS)

6. Using hot water alone, car paint cannot be satisfactorily removed from an emulsion sub-base ((Case 5-LHS & Case 6-LHS)
7. Using hot water alone on Pavix impregnated concrete upon an emulsion sub-base results in traces of car paint (Case 7-LHS & 8-RHS)
8. Use of an emulsion sub-base to assist graffiti removal is only beneficial in association with Pavix impregnation (Case 7-LHS & 8-LHS)

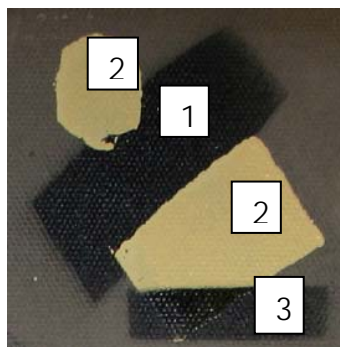
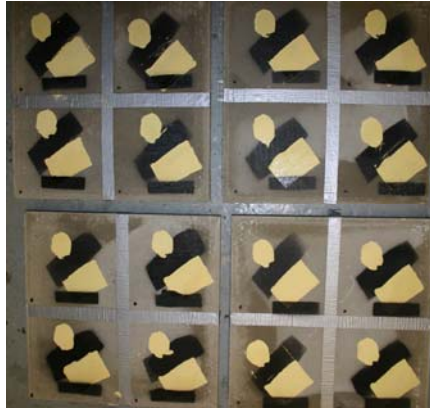
Conclusions

The main conclusions of the trial are summarized as follows:

1. Chemstar Ekosorb PR-A™ & Ekosorb PR-C™ protectors substantially assist the removal of graffiti paints.
2. Chemstar Ekosorb EX-B™ is an effective remover of the graffiti paints used in the investigation.
3. Chem-Crete Pavix CCC100™ impregnation has a advantageous influence in graffiti protection.
4. Use of an emulsion base-coat does not contribute significantly in graffiti paint removal.

| PANEL | UNPROTECTED | | PROTECTED | |
|-------|---|--------------|---|-----------|
| | PREPARATION PRIOR TO GRAFFITI | CLEANING | PREPARATION PRIOR TO GRAFFITI | CLEANING |
| 1 | Plain surface | Ekosorb EX B | Ekosorb PR-C on bare concrete | Hot Water |
| 2 | Plain surface | Hot Water | Ekosorb PR-A on bare concrete | Hot Water |
| 3 | Pavix impregnated surface | Hot Water | Ekosorb PR-C on Pavix impregnated surface | Hot Water |
| 4 | Pavix impregnated surface | Hot Water | Ekosorb PR-A on Pavix impregnated surface | Hot Water |
| 5 | Two coats of emulsion | Hot Water | Ekosorb PR-A on two coats of emulsion | Hot Water |
| 6 | Two coats of emulsion | Hot Water | Ekosorb PR-C on two coats of emulsion | Hot Water |
| 7 | Pavix impregnation on two coats of emulsion | Hot Water | Ekosorb PR-A on Pavix impregnation on two coats of emulsion | Hot Water |
| 8 | Pavix impregnation on two coats of emulsion | Hot Water | Ekosorb PR-C on Pavix impregnation on two coats of emulsion | Hot Water |

Table 1: Preparation of comparative test panels and cleaning method summary



Order of Application:

1. Car Paint (Black)
2. Emulsion Paint (Yellow)
3. Car Paint (Black)

Figure 1: Comparative test panels prepared with graffiti paints applied



Figure 2: Elcometer coating adhesion tester



Panel 1. LHS: Untreated>EX B Cleaned
RHS: EkosorbPR- C



Panel 2. LHS Untreated
RHS: Ekosorb PR-A



Panel 3. LHS: Pavix
RHS: Pavix.>EkosorbPR- C



Panel 4. LHS: Pavix
RHS: Pavix> Ekosorb PR A

Table 2A Cleaning Results



Panel 5. LHS: Emulsion
RHS: Emulsion > Ekosorb A



Panel 6. LHS: Emulsion
RHS: Emulsion > Ekosorb C



Panel 7. LHS: Emulsion > Pavix
RHS: Emulsion > Pavix > Ekosorb PR A



Panel 8. LHS: Pavix
RHS: Pavix > Ekosorb PR A

Table 2A Cleaning Results

Report authentication

All the data and information contained in this report is correct to the best knowledge of the investigators:

Signed:

Date:

Signed:

Date:

References

Impregnation

Chem-Crete Pavix CCC100™ is manufactured by International Chem-Crete Corporation, 800 Security Row, Richardson, TX 75081, USA

Paints

The following paint types are used:

Emulsion paint (brush applied)

Dulux Satinwood (Pink: Tuscan Terracota). Produced by ICI Paints, Wexham Road, Slough SL2 5DS

Emulsion paint (brush applied)

Dulux Satinwood (Matt White). Produced by ICI Paints, Wexham Road, Slough SL2 5DS

Car Paint (spray can)

Holts Dupli-Colour (Matt Black), Auto Spray. Produced by Dupli-colour Ltd, Wilmslow, Cheshire, England

Acrylic Emulsion Paint (brush applied)

Johnstones Acrylic Matt Emulsion (Buttercup Yellow). Produced by Kalon Decorative Products, Huddersfield Road, Birstall, Batley, West Yorkshire WF17 9XA

Anti-Graffiti Products

The protector products EKOSORB PR-A™ and EKOSORB PR-C™, and the graffiti removal product Chemstar EKOSORB EX-A™, are manufactured by CHEMSTAR Czech Republic, s.r.o., Alej Svobody 881/56, CZ-323 18 PLZEŇ, Czech Republic.

Adhesion Tester

Elcometer Instruments Ltd, Edge Lane, Manchester M43 6BU, England.