RESTORATIVE TECHNIQUES
Consultancy and Project Support for Masonry Cleaning and Coating Removal
Suppliers of specialist cleaning equipment and products

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12th September 2018

Cleaning Trials & Recommendations

Site: 6 Bacons Lane, Highgate, London.
On-site Trials: 6th September 2018.
Author: Jamie N. Fairchild.
Purpose: To devise a methodology for the cleaning of internal brickwork.

1.0 Introduction

The building is approximately 60 years old (completed 1959 and with *Grade II* listing) and a programme of refurbishment is being devised. The majority of the internal walls are faced in 'white' calcium silicate brickwork and this now has a generally sooty appearance, in places exaggerated by the proximity of fittings (shelving, hangings etc) now removed. There is also localized water staining from 'historic' ingress (roof leakage) together with scuffs, scarring, paint drips and other marks.

Calcium silicate bricks are 'steam cured' during manufacture, rather than traditional clay bricks which are fired, and therefore have a granular rather than vitreous surface. They are rather porous and easily marked. It is planned that certain areas of brickwork will be plastered over whilst that of the corridors and the upstairs sitting room will be retained. It is hoped that this retained brickwork can be cleaned and for this reason the author was asked to attend to provide advice.

The house is relatively compact and apparently supported a family of 5 children. The intensity of use must therefore have been high and the activity varied and the methodology has to take this into account. The greatest challenge is where liquids (water, spray cleaners etc) have drawn soiling into the substrate or induced a colour change e.g. from roof leakage, the wiping of floors or shelving etc. Over-paint or wax may require a paint remover or solvent. Not so far mentioned is whether painted concrete, set within the brickwork, should be exposed. The paint can be removed but the question arises as to why it was painted previously. Translucent silicate paints (*Lazur* or similar) could offer more of a 'mineral' appearance.

2.0 On-Site Trials

It was felt that if a site visit was to be made, it would also be useful to carry out some discreet test cleaning, not with large scale equipment but with what could be readily carried in a briefcase. The total site visit time was approximately 2 hours. The resulting panels should not be regarded as exemplars but rather as giving an indication of whether the soiling can be mobilized at all, and if any adverse colour or other change is induced in the brick.

2.1 Methodology

The following is a wide but incomplete range of options that might be considered for internal cleaning. 5 & 6 were selected for the two trial areas, but in practice these or combinations of methods may be recommended for the actual works.

1. **'Dry brush and vacuum'.**
   For fine masonry this might use a clean paint brush, soft hand brush or detail brush (e.g. tooth brush, 'Lamb Chop' or similar) to agitate, and then remove by vacuum.
2. **'Atomising water spray, brush and sponge'.**
   This would normally comprise a hand held atomising sprayer or remote pump up sprayer in conjunction with brushes described in '1'. Remove with sponge and warm water.
3. **'Alcohol Ethoxylate surfactant (Synperonic A7 or similar), brush and sponge'.**
   A 1-2% solution as appropriate applied using hand held sprayer, otherwise as for 2.
4. **'Low pressure steam cleaning'.**
   Low volume/pressure (4-6 bar) electrically heated dry steam system of 'Derotor' or similar type.
5. *** 'Latex poultice'.**
   Natural latex cleaning poultice supplied in range of cleaning strength A-E by the addition of EDTA. This provides both chemical activation and mechanical adhesion with soiling. The standard product contains ammonia but a **non-ammonia** formulation is also available.
6. *** 'Complex' Paste.**
   A proprietary range of cleaning paste containing EDTA, a sequestering or 'Complexing' agent used for the removal of metallic and water induced staining. Supplied in a range of strength; P1-P5. Brush application. Remove with sponge and warm water or ThermaVac system..
7. **'ThermaVac hot water recovery system'.**
   This provides a hot water spray (adjustable up to 150°C and 5-50bar). The spray is maintained within an enclosure and drawn off by vacuum. Rinse water can be discharged by tube to a drain or to a holding vessel. This can be used on its own for the light cleaning of surfaces of simple profile. Alternatively it can be used to rinse activated residue e.g. for 7-10.
8. **'Laponite RD Gel'.**
   Proprietary synthetic activated 'clay'. A powder, mix with water and apply as a paste. Rinse with sponge and warm water.
9. **'Clay & paper poultice'.**
   This might be used as a plain poultice (e.g. for the removal of salts) or with active components such as ammonium carbonate or EDTA. The thickness and proportions of clay and paper fibre will vary depending upon the purpose and location.
10. **'Heavy Duty Latex Poultice' (Monumentique Paste C).**
    This contains EDTA and is applied as a thick paste (2-4mm) to heavily discoloration. Remove by peeling. Rinse with warm water and sponge. Compared with 4, the EDTA content is higher and the active dwell time longer. The product will cure in external atmospheric conditions (5 will not in damp, humid or cold conditions).
11. **'Vortex Swirl Abrasive System'**
    This uses selected fine abrasive particulate suspended in a flow of compressed air. The mixture is directed to the surface, via a flexible hose. A nozzle is fitted to the hose which incorporates a device to swirl the mixture and a metering valve for water addition. A wet mixture is normally used but can alternatively be used dry. Nozzle tips can be selected of different apertures and 'spread'. The distance, angle and rate of movement of the nozzle relative to the surface are determined by the operator. Controls are also provided to select the air pressure and abrasive flow settings. The system is best suited to the removal of brittle soiling and coatings.

* *used in the trials.*

2.2 Panel Locations

Two areas were carried out, their locations chosen for being discreet and representative (i.e. exhibiting the principal soiling issues); one beneath a ventilation brick in the pantry (sample 'A' using *Complex Paste*, method 2.1.6) and another in the roof of the upstairs sitting room (sample 'B' *Latex Poultice,* method 2.1.5). *Technical Information Sheets* are attached at the end of the report for the two methods.

2.3 Test Panel A

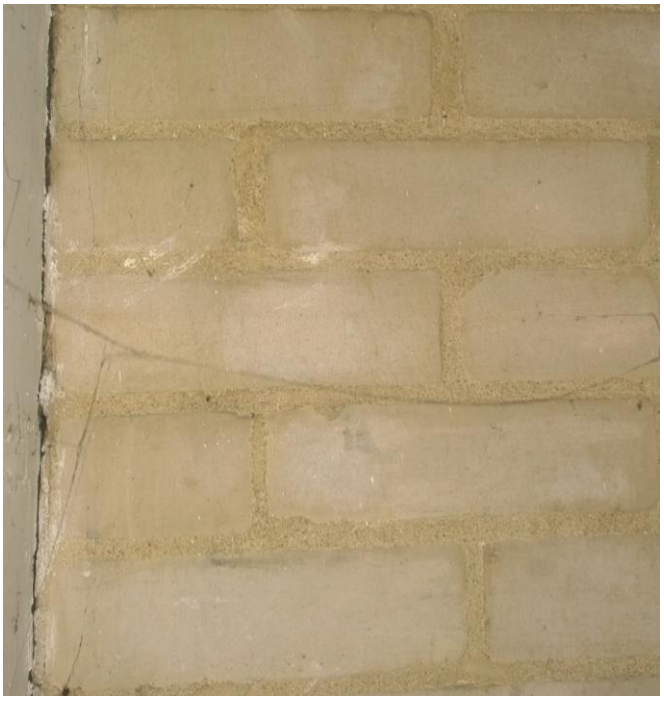
Photo 1: Area of sample A before testing. A horizontal 'shadow' can be observed from a shelf or piece of furniture now removed. The area around the ventilation brick is particularly soiled and water streaked.

Photo 2: Sample A immediately after cleaning – still damp.

Photo 3: Sample A dried. Photo 3 was taken with a different phone camera to 1 & 2.

Panel A; the margin of the sample was not masked off. The sample area was first dampened with a sponge, immediately followed by a brush application of *Complex Paste P3*, at an approximate rate of 0.25kg per m². As anticipated, the brick was rather porous and additional water and Complex Paste was required to maintain the gel in the required 'slithery' condition. The area was agitated with a paint brush from time to time but the mortar beneath the ventilation brick and the dark shadow were also further agitated with a conservator's 'lamb chop' brush. The Paste was removed after approximately 1 hour, using a damp sponge. The sponge was rung out several times in clean water and the panel re-wiped until no further 'frothing' was be observed (the product contains some surfactant, used primarily as an indicator for when rinsing is complete.

2.4 Test Panel B



Photos 4-6 (clockwise from above): Sample B before, during and after test respectively (photo 6 taken more than a day later).

The area of panel B appeared to be 'sooty' but without the water staining or 'ghosting' apparent in panel A. This was expected to be more suitable for the *Latex Poultice* which works best with this type of soiling; it is not particularly effective on water stained or greasy areas. The latex was brush applied (it can normally be sprayed or

brushed) at the rate of approximately 0.75kg per m². Strength grade C (grades A-E are normally available) was used. Brush marking can be left when the latex is applied too thinly. Spraying on the latex permits a lower rate as the application is more even. It can be observed that the overpaint has not been removed by the latex. Remedy for this is detailed in the recommendations.

3.0 Observations

- The high porosity of the brick would make 'hand' washing (such as that adopted in sample A) laborious to carry out correctly. The 'danger' is that mobilised dirt may become drawn-in, especially if the rinse water is not changed frequently enough.
- Alternatively, one could adopt the ThermaVac system which provides a flow of clean pressurised hot water that is continuously vacuumed away. However the relatively complex arrangement of masonry and fixtures, particularly of timber, would also make the technique a challenge for this project.
- Although the latex method is only effective with the sooty & particulate soiling, by removing this first it would then permit dealing with the localised paint and 'ghosting' without mobilising the 'soot'. Hand rinsing would be reduced considerably.
- For the localised staining (although the water staining is quite extensive) and paint removal, two principal reagents are envisaged; paint softener (either *Acrylic* or *Polyurethane* type) and *Complex Paste*. The latter will be most needed for the water staining but it should also be effective with reduction of 'ghosting'.
- Instead of the ThermaVac system, the reagents could be used in conjunction with a 'dry steam' unit of the *Osprey, Plyno* or *Polti* type. An advantage of this equipment is its very low water consumption and its ability to work from a standard electrical supply. The dry steam is much better at penetrating the pore structure of a substrate compared with warm water, and the high temperature at mobilising the soiling or softened paint residue. Dry steam will melt and disperse wax, emulsion paints and grease.
- Certain of the internal concrete features (lintels for example) have been painted with gloss paint. It might be considered beneficial to remove this and leave unpainted or alternatively to redecorate with a mineral based paint of Portland cement or potassium silicate types.

4.0 Recommendations

- The cleaning works should commence with the *Latex Poultice.* Strength C was used on the trial. This should be used on all of the retained internal brickwork.
- The latex cleaning to be followed by dry steam, and supplemented with chemical paint softener if necessary, for the over-paint and paint splashes.
- Water staining and 'ghosting' not removed by the latex to be treated with *Complex Paste*, agitated with light non-ferrous brushes (nylon or natural bristle or 'lamb chop' fine stainless brush) as necessary. Agitation and final dispersion aided by the use of 'dry steam' equipment (150°C, 4+bar pressure) of Osprey or Derotor type. Residues to be cleared with clean sponges and rinsed in buckets of warm water (30+ °C), changed regularly.
- As a guide for application rates and dwell times, use those adopted for the trials.

5.0 Generic Additional Guidance

- *At the earliest opportunity (before or on the first day of the main works), the operatives of the appointed contractor shall produce satisfactory trial panels in locations representative of the soiling and substrate anticipated for treatment as directed by the client's representative.*
- *The location of trial panels is to be recorded and acceptable panels retained for reference as exemplars or for a duration agreed with the client's representative.*
- *In general, work to commence at the uppermost level and proceed downwards on a given section.*
- *Fittings, cables, brackets, lighting fixtures or other paraphernalia not to be retained shall be removed prior to commencement of cleaning. Such items not removed will be appropriately protected or the cleaning regime modified to accommodate them.*

- *Adhesive, glue, 'Blue-tac', chewing gum etc first to be removed using the brush head of a 'dry-steam' cleaner such as that manufactured by Derotor, Plyno, Osprey or similar. Use of paint softener or chemical agent is permitted when expedient but preference shall be given to those of mild pH (5-10).*
- *Windows (the glass and metal but also any gap or opening around or within) are to be protected from direct hot spray and residue by the use of 'Correx' or light gauge plywood edged with foam rubber or similar.*
- *Protection is to be devised and installed for those substrates, surfaces and artefacts not to be cleaned. Particular care must be taken to protect woodwork and other vulnerable fabric.*
- *Supply of hot and cold potable water is to be secured on site.*
- *Water used for rinsing and removal by sponge is to be changed regularly. Foaming or frothing of a wet masonry surface whilst scrubbing indicates incomplete removal of the reagent.*
- *Waste water on site will be directed to foul-water drainage and **not** to surface water drainage, soil, water course or standing water. Rinse water containing chemical agents (activated poultice, paint remover etc) must be disposed of in accordance with local water authority bylaws.*
- *Solid matter is not to enter the drainage system.*
- *Operatives shall be those trained and approved by Restorative Techniques Ltd.*
- *Application method, application thickness, dwell time, removal, reapplication or supplementary treatment, disposal and all other aspects of handling and use shall be in accordance with the manufacturer's guidance and instructions or at variance to the satisfaction of the client's representative.*
- *Access to masonry obscured by scaffold or protection will be gained in a safe manner and work completed at the appropriate moment of decommissioning.*
- ***Note to be made of the points raised in the Technical Information Sheets', 'Health & Safety Data Sheets' and generic 'Risk Assessment' and 'Safe Working Procedure' documents attached.***

Jamie Fairchild.
Director, Restorative Techniques Ltd.

ATTACHMENTS;
TECHNICAL INFORMATION SHEET – COMPLEX PASTE
TECHNICAL INFORMATION SHEET – LATEX POULTICE
H&S DATA SHEET – COMPLEX PASTE
H&S DATA SHEET – LATEX POULTICE
TECHNICAL INFORMATION SHEET – THERMAVAC
TECHNICAL INFORMATION SHEET – PAINT REMOVAL

Restorative Techniques Limited design equipment and formulate products, primarily for the Building Conservation sector. Projects 2011-18 include;
Apsley House London (T+Poultice), Arundel Great Court London (T), Bath Spa Station (V+T), Banqueting House Whitehall (T+poultice), Barbara Hepworth 'Family of Man', 'Crucifixion' and other bronzes (T), Beaney Institute Canterbury (T), Belmont House Lyme Regis (Coade Stone T+P), The Market Cross Beverley (T+P), Bond Street Station (T+V), Brentford Old Swimming Baths (V+T), Bristol University Library (internal cleaning L+C), Station Arches Battersea Park Station (V), Buckfast Abbey (internal cleaning L+C), Buckingham Palace (T), Cafe Royal (T), Canterbury Cathedral (T+C+poultice), Castle Drogo (V+T), Cenotaph Whitehall (T), Chatsworth House (T), Chelmsford Old Town Hall (T+V), Cheltenham Town Hall (T), Christchurch Priory Dorset (T+V), St. John the Bapist Cirencester (poultice), Clifton College Bristol (T+V), Clifton Suspension Bridge (T), Cunard Building Liverpool (V), Cutler's Hall London (T), Downing College Cambridge (T+C), Durham Cathedral (T+P), Embassy of Japan Piccadilly (T), Exeter Cathedral (L+C), Farringdon Station London (T+V), Fortnum & Masons London (T), Filton House (former Bristol Aeroplane Company offices T+P), Freemasons Hall Covent Garden (C+L), Gloucester Cathedral (T+poultice), Guildford Cathedral (R+L+C), Hampton Court Palace (T), Harrods (T), Horse Guards Whitehall (T+V), Kensington Palace (T), Mackintosh Wing Glasgow School of Art (P), Glasshouses Royal Botanic Garden Kew (T),Lincoln Cathedral (T+V), London Wall (Roman & Medieval) Cooper's Row (T), Magdalen College Oxford (C+L), McEwan Hall Edinburgh (L), Natural History Museum South Kensington (L+T+poultice), Norwich Cathedral (T), Oldham Town Hall (T), Old War Office Whitehall (T+V), Plymouth Cathedral (R), Civic Hall Plymouth (C), Pro-Cathedral Clifton Bristol (T+P+V), Public sculptures of Jeddah Saudi Arabia (T), Queen Victoria Memorial Buckingham Palace (T), Pierhead Building of the Welsh Assembly Cardiff (T), St. Mary Redcliffe Bristol (T+L+C+P), The Ritz (T), Rochester Cathedral (T+R), Roker Pier Lighthouse (T+V+R+P), Royal Artillery Monument Hyde Park Corner (T), The Royal Crescent Bath (T+poultice), former Royal Insurance Building Liverpool (T+R+P), Sandhurst Military College (T+V), Science Museum London (T), Selfridges (T), Sheffield Cathedral (V+R), former Shoreditch Magistrates Court and Police Station (T+V+P), Christchurch Spitalfields Crypt (T+P), St. Albans Cathedral (T+V), Swansea Station (T+V), Stowe School (T), Swiss Garden Shuttleworth (T), The Royal Navy Memorial Plymouth (T), Temple Gardens Building (of the Inner Temple) Blackfriars (T), Titanic Memorial Liverpool (T), Tower Bridge Station (V+T), Tower of London inc White Tower (T+V+C), public sculptures of Trafalgar & Parliament Square (T), former Victoria Gaol and Central Police Headquarters Hong Kong (T+V+P), V&A Museum (T), Wakefield Cathedral (interior cleaning – T+R+C+L), Wells Cathedral (T), Westminster Hall (external cleaning - T) Palace of Westminster (T+R+V+P+L+C+poultice), William Booth College (Salvation Army Headquarters - T),Winchester Cathedral (V+C+poultice), York Minster (T), plus numerous other domestic, commercial and local authority projects large and small.
T-ThermaTech, V-VorTech, L-latex, C-Complex, R-ThermaVac, P-Paint Softener.

Jamie Fairchild provides consultancy for masonry cleaning and paint removal. This includes tutoring for the Masonry Cleaning, Concrete Conservation and Coatings & Surface Treatments Master Classes at West Dean College Chichester, for Weymouth College, Bath College, and the Cathedral Fellowship. Jamie has contributed the cleaning and coatings texts of the Practical Building Conservation Volume *Concrete* (English Heritage 2013). Recent articles include *Abrasive Cleaning Methods for Masonry* (Building Conservation Directory 2016) and *Cleaning Brickwork, Terracotta and Faience* (Context, Institute of Historic Building Conservation, March 2016).

Complex Cleaning Paste

Description

This document should be read in conjunction with the product ***Health & Safety Data Sheet*** to ensure safe and appropriate storage, handling and disposal.

Complex can be used for removal of soot, water induced staining and metal staining, principally from interior stonework and for some external applications. It can also be used for the controlled removal of salts and oxidation from metal substrates including those of lead and copper.

Complex Paste is supplied ‘ready to use’ in a range of cleaning strength ***P1-P5***.

Complex contains EDTA, a 'sequestering' agent that forms complexes with metallic salts enabling them to be separated and rinsed from the substrate. EDTA is widely used in cleaning products, food manufacture and medical applications.

Application and Removal

Typical usage rates: 0.2-0.4 kg per m² for flat work per application, 0.3-0.6 kg per m² for detail, per application.

Application can be made by brush, roller, or airless spray. If the surface is highly detailed or textured, spray application will be considerably quicker and may use less of the product.

Complex will be inhibited by paint, wax, pva, silicone or other non-aqueous coating or sealer. Consideration must be given to the removal of such coatings prior or during the cleaning.

Recommended ambient temperature is 10-20°C. Ensure the container of product is at working temperature before use.

For porous surfaces (e.g. medium grained/shelly limestone), it is recommended that the surface is lightly sprayed with atomised water before application of *Complex.*

Approximately 5 minutes after application of *Complex*, agitate the surface with a paint brush or natural or synthetic scrub brush as appropriate. Check the progress of cleaning by swirling a paint brush over the surface - observe the retained surface colour and the darkening of the gel.

Apply a light spray of atomised water and ‘brush in’ if the Complex is drying out prematurely.

Leave the *Complex* in place for the minimum time necessary. For some applications, the dwell time may be as short as 5 minutes. However under all conditions do not exceed 2 hours dwell before removal and rinsing.

'Roll' the surface with a clean, damp sponge to remove residue. Continue rinsing until foaming at the surface ceases. Use clean warm water (20-30°C). Change the water regularly.

Alternatively, rinsing may be accomplished by application of atomised water and 'drawing-off' of the residue with the brush-head of a 'wet-vac' or *ThermaVac* system. Incomplete removal will be indicated by foam being generated under rigorous brushing of the wetted surface.

It may be found useful to use a 'dry steam' cleaner, such as that manufactured by *Derotor, Plyno* or *Polti*, to supplement the sponging. Particularly useful for crevices, joints and fine detail to ensure dispersion of dirt and residue.

It will not normally necessary to neutralize the residue. **Ensure the product is removed by dilution and rinsing.**

It will be necessary to allow the surface to dry fully before drawing conclusions. Drying may take upwards of 48 hours depending on prevailing temperature and humidity.

Packaging

Standard packaging – 10kg tub.

Any weight can be supplied on request.

Neither Restorative Techniques Limited, nor the author, can accept liability for the relevance of this information and how it is used. Users and specifiers shall determine for themselves if the technique is applicable, its formulation and the parameters for use.

Revised 19/02/2015.

Latex Cleaning Poultice (‘Standard’ & ‘Low Ammonia’ Types)

Description

This document should be read in conjunction with the product **Health & Safety Data Sheet** to ensure safe and appropriate storage, handling and disposal.

The product is suitable for the internal cleaning of building masonry, timber and metal, particularly the removal of soot, including fire damage soot. It is supplied in a range of cleaning strength, adopted to suit the substrate and degree of cleaning required.

The product has a 'cream' consistency but once exposed to air cures slowly to a rubbery film. This can be peeled away from the substrate with the soiling adhered or absorbed into its surface.

The latex performs several functions. It allows the product and soiling to be peeled without the need for rinsing or scraping. It also limits the dwell/activation time without the supervision that would be required with a liquid or gel.

Latex Poultice is supplied in *Standard* and *Low Ammonia* types. The *Standard* type may be found to work at thinner film thickness, having greater ‘elasticity’ and lesser inclination to tear. However minimising the odour generated by the process, particularly with spray application, may dictate the use of the *Low Ammonia* type.

Constituents and Mixing

Both types, ‘**Standard’** & ‘**Low Ammonia’**, are blended in a range of cleaning strength from ‘A’ to ‘E’ by the addition of EDTA, a constituent used in cleaning, medicine and food manufacture. EDTA is a 'sequestering' agent, forming complexes with, and mobilising metallic salts and other residue.

Standard grade 'A' contains no EDTA whilst grades B-E contain EDTA by increased percentage. All grades of *Low Ammonia* version contain EDTA.

For the cleaning of polished marble, preference should be given to the minimum EDTA content.

Grades A-C are normally supplied pre-mixed, ready for use. Stronger grades are normally supplied in two parts to extend shelf life. 'Lighter' grades can be strengthened retrospectively with *Additive*.

Mixing can be made with a stick or paddle. If using a machine mixer, care must be taken not to overheat the mixture as this can accelerate the curing of the latex.

Application and Removal

Protect surfaces not to be cleaned, particularly carpet and fabrics. Do not apply to clean, gritty textured surfaces as the latex may prove difficult to remove.

Application can be made by brush, roller, or airless spray. If the surface is highly detailed or textured, spraying will be considerably quicker to apply and will normally use less product for a given area.

Thicker deposits may respond best to brush application, the soot being mixed into the latex as it's applied.

Typical usage: 0.25-0.5kg per m² for flat work, 0.5-1kg per m² for detail, per application.

It is important to achieve full coverage, better to apply thickly than too thin. Application is initially white but cures to a translucent yellow/brown.

Take care to apply full thickness to the edge and over high points in the surface to reduce tearing during removal.

To soften and reduce the tension in the latex when peeling from a carved or delicate surface, a light spray of warm water to the film 1-2 minutes before will be found advantageous.

The product is not suitable for use in low temperatures or high humidity. The recommended ambient temperature should be in the range 11-25°C.

Latex used at low temperatures, in damp conditions or semi-exposed locations (porches for example) may be slow to cure. This can greatly extend the active dwell time and can result in over-cleaning or bleaching of the substrate.

Ensure the container of product is at working temperature before use. Recommended dwell time 12-24 hours. Recommended maximum 48 hours. Shorter dwell times may be suitable but should be verified 'case by case'.

Once the latex is removed, it may be found advantageous to 'roll' the surface with a clean, damp sponge to remove any remaining residue activated but not removed by the latex. This may avoid the need for additional application of the product.

Packaging

Standard packaging – 15/17kg tub. However, any weight can be supplied on request.

RESTORATIVE COMPLEX PASTE (GRADES P1- P5)

1. Identification of the Substance/Preparation & of the Company/Undertaking

Product Name	Restorative COMPLEX PASTE
Supplier	Restorative Techniques Limited Gloucester Road Rudgeway Bristol BS35 3SG T: 0044 01454 417831 F: 0044 01454 412445
Emergency Telephone	M: 07760 197472

2. Composition / Ingredient Information

Name	EINECS	CAS No	Conc.	Classification
ethylenediaminetetraacetic acid, tetrasodium salt	200-572-9	64-02-8	5-20 %	Xn; R22 Xi; R36

3. Hazard Identification

Main Hazards	No Significant hazard

4. First Aid Measures

Inhalation	May cause irritation to mucous membranes. Move the exposed person to fresh air. Keep the affected person warm and rest. Seek medical attention if irritation or symptoms persist.
Contact with Skin	May cause irritation to skin. Wash off immediately with plenty of soap and water. Remove contaminated clothing. Seek medical attention if irritation or symptoms persist.
Contact with Eyes	May cause irritation to eyes. Rinse immediately with plenty of water for 15 minutes holding the eyelids open. Contact lenses should be removed. Seek medical attention if irritation or symptoms persist. After contact with the eyes rinse with lots of water and seek medical advice.
Ingestion	Ingestion may cause nausea and vomiting. Rinse mouth thoroughly. Drink 1 to 2 glasses of water. Seek medical attention if irritation or symptoms persist. Never give anything by mouth to an unconscious person.

5. Fire Fighting Measures

Suitable Extinguishing Media	Use extinguishing media appropriate to the surrounding fire conditions. Cool fire exposed containers with water spray.
Fire Hazards	Burning produces irritating, toxic and obnoxious fumes; Carbon oxides, Nitrogen oxides.
Protective Equipment	In case of fire and/or explosion do not breathe fumes. Wear self-contained breathing apparatus and protective clothing.

6. Accidental Release Measures

Personal Protective Measures	Ensure adequate ventilation of the working area. Wear suitable protective equipment.
Environmental Precautions	Do not allow product to enter drains. Prevent further spillage if safe.
Cleaning Method	Absorb with inert, absorbent material. Sweep up. Transfer to suitable, labelled containers for disposal. Clean spillage area thoroughly with plenty of water.

7. Handling & Storage

Handling	Avoid contact with eyes and skin. Ensure adequate ventilation of the working area. Adopt best Manual Handling considerations when handling, carrying and dispensing.

Storage	Keep in a cool, dry, well ventilated area. Keep containers tightly closed. Store in correctly labelled containers.

8. Exposure Controls / Personal Protection

Engineering Measures	Ensure adequate ventilation of the working area.
Respiratory Protection	No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment.
Hand Protection	In case of repeated or prolonged contact wear gloves. Chemical resistant gloves (PVC)
Eye Protection	In case of splashing, wear safety glasses.
Protective Equipment	Wear protective clothing.

9. Physical & Chemical Properties

Form	Thixotropic paste
Colour	Clear
Odour	Characteristic
pH-Value	ca 11.5
Solubility	Soluble in water

10. Stability & Reactivity

Stability	Stable under normal conditions
Materials to Avoid	Oxidising agents
Hazardous Decomposition Products	Burning produces irritating, toxic and obnoxious fumes. Carbon oxides. Nitrogen oxides (in case of fire)

11. Toxicological Information

Repeated or Prolonged Exposure	Prolonged or repeated exposure may cause irritation to skin and mucous membranes.

12. Ecological Information

Ecotoxicity

ethylenediaminetetraacetic acid, tetrasodium salt	Rainbow trout LC50/96h = >100mg/l
Mobility	Soluble in water.

13. Disposal Considerations

General Information	Dispose of in compliance with all local and national regulations.

14. Transport Information

Further Information	The product is not classified as dangerous for carriage.
ADR/RID	Not classified
IMDG	Not classified
ICAO/IATA	Not classified

15. Regulatory Information

Risk Phrases	No Significant Hazard.
Safety Phrases	S25 - Avoid contact with eyes. S37 - Wear suitable gloves.

16. Other Information

Text of Risk Phrases in Section 3	R22 - Harmful if swallowed. R36 - Irritating to eyes.

RESTORATIVE LATEX POULTICE CLEANER

1. Identification of the Substance/Preparation & of the Company/Undertaking

Product Name	Restorative Latex Poultice Cleaner
Supplier	Restorative Techniques Limited Gloucester Road Rudgeway Bristol BS35 3SG T: 0044 01454 417831 F: 0044 01454 412445
Emergency Telephone	M: 07760 197472

2. Composition / Ingredient Information

Chemical Characterisation	Thixotropic pre-vulcanised natural latex stabilised with ammonia.
Hazardous Components	Ammonia & ethylene diaminetetraacetic acid in some versions.
Approved Limit of Exposure	25ppm in the air (8 hours TWA)
R & S Sentences	R36-37-38 and S7 – 26

3. Hazard Identification

Important risks	Possible irritation to eyes, skin and airways. Some individuals may be allergic to the protein in natural latex

4. First Aid Measures

General Advice	Remove polluted clothing : -
Contact with Skin	Rinse skin with soap and water, shower if necessary
Contact with Eyes	Rinse with plenty of water, remove contact lenses if worn and if necessary take to physician.
Ingestion	Rinse mouth with water. Give plenty of drinking water. Transport the affected person to hospital immediately to be checked. DO NOT INDUCE VOMITING.

5. Fire Fighting Measures

Suitable Extinguishing Media	CO^2, water spray, dry chemical, alcohol resistant foam
Specific Risks	Fire may liberate toxic vapours (Nitrogen oxides, carbon monoxide, nitrogen compounds) Keep up-wind, use self-contained breathing apparatus when in close proximity to the fire.

6. Accidental Release Measures

Personal Protective Measures	Evacuate and ventilate area. Avoid breathing vapour. Avoid contact with skin and clothing
Environmental Precautions	Shut off leaks, prevent entry into sewers & open waters.
Cleaning Methods	Collect spillage in suitable disposal containers. Clean up any spills as soon as possible, using an inert absorbent material Flush residue with plenty of water. If the residue dries remove the resulting film and dispose of as a non hazardous waste.

7. Handling & Storage

Handling Measures	When using in closed rooms ensure good ventilation. Wash hands and other exposed skin before eating, drinking, smoking or leaving the workplace.
Storage	Keep only in the original containers and when not in use close the container. Keep away from oxidisers. Storage Temperature between +5ºC and +35ºC.
Packaging	Carbon Steel, stainless steel. Unsuitable packaging

Material is Aluminium,(+ alloys), Zinc, Copper,(+ alloys).

8. Exposure Controls / Personal Protection

Inhalation Protection	Ventilate area and use mask.
Industrial Hygiene	Don't drink, eat or smoke during the application. Afterwards wash hands.
Personal Measures	
Respiratory Protection	CE approved organic vapour & solvent respirator (Type A, brown).
Hand Protection	Rubber gloves
Eye Protection	Safety goggles
Skin & Body Protection	Wear appropriate clothing (overall, boots, gloves).

9. Physical & Chemical Properties

Form	Thixotropic paste
Colour	White/cream
Odour	Ammonia
Boiling Point	100° C.
pH-value	10.00 - 11.00
Relative Vapour Pressure/Density	3.7 (air = 1)
Flash Point	None
Solubility	Soluble in water (miscible).
Explosion Limits:	Not explosive
Ignition Temperature	>300°C

10. Stability & Reactivity

Stability	Stable when observing the safety rules for storage & handling.
Circumstances to Avoid	Avoid working in enclosed areas or rooms and temperatures below 2°C
Hazardous Decomposition Products	Dry rubber when heated/ignited will give off poisoned gasses/smoke

11. Toxicological Information

Acute Oral Toxicity	Irritant

12. Ecological Information

Persistence & Degradability	Good biodegradability

13. Instructions for Disposal

According to Local Regulations – can normally to be disposed of as a general landfill waste but consideration should be given to the matter removed with the Latex Poultice.

14. Transport Information

No restrictions for transport by land (road/rail), can also be sent by air, but advise the airline.

15. Compulsory Legal Information

Name of Component	EC	Symbol	R-phrases
Ethylenediaminetetraacetic	Acid Salt	Xn	22-36-52/53
Ammonia		Xi	

16. Other Information

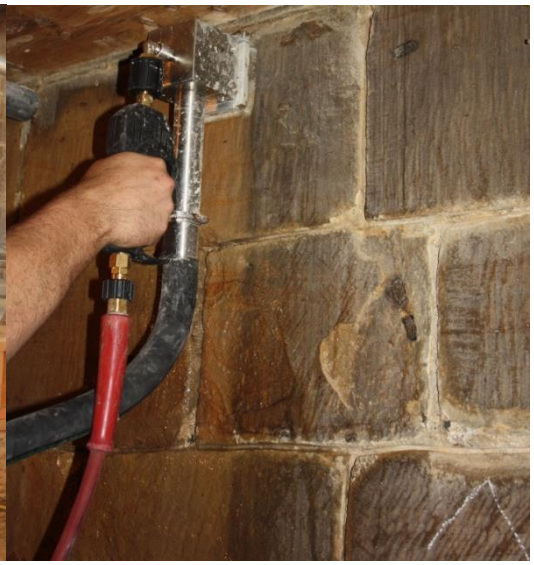
Do not use on heated surfaces. Ensure that users are adequately trained and are aware that Restorative Latex Poultice Cleaner is a latex containing ammonia and edta.

ThermaVac Recovery System

Explanation

This system has been specifically designed for use with the ThermaTech system. It enables the superheated water to be applied to the surface within an enclosure and for the waste water and residue generated to be drawn away from the substrate.

The solid is separated from liquid within the vacuum unit and a pump contained within periodically transfers the waste water to storage vessels for later transfer/treatment or to the foul drain as appropriate.



Features and Specification

- The system has been designed to enable full temperature (up to150°C) to be used.
- Maximum pressure is adjusted using the control on the ThermaTech pump but a secondary control enables a reduced pressure to be selected by the operator at the recovery head.
- The performance of one standard ThermaTech and one ThermaVac unit permits the simultaneous use of two recovery heads if required.
- The standard recovery head has a contact area of approximately 120x120 mm.
- The standard ThermaVac unit is 110v, requires 2.2kw to operate and is fitted with a 32a plug.
- The pump can be left unplugged and a cap fitted to the water outlet if it is required to keep the water within the unit.
- The waste air outlet is fitted with a screw port. This permits a ventilation pipe to be fitted and directed either to a window opening or to a condenser to minimise condensation in the working area.
- Typical water consumption of one head is likely to be around 3 litres per minute (50 mls per second.
- The recovery heads are fitted with a trigger enabling the water to turned on or off instantly.
- With the trigger released, the recovery head can continue to be used as a vacuum tool enabling immediate recovery of any excess spray.

18/01/2013.

Paint and Coating Removal - Masonry Substrates

Considerations

Through history the principal motives for painting have been decorative and protective.

A good many buildings will have been painted from first construction, others perhaps at a much later date for fashion, to obscure alterations, soiling or repair. Once paint has been applied however, this invariably results in later repainting.

Where one coating is compatible with the next, and is essentially in sound condition, new paint will normally be applied directly to the existing. This results in a layering which may eventually accumulate to a considerable thickness.

Of particular importance to historic masonry may be the ability of the paint layers, individually and collectively, to maintain effective vapour permeability. The inability to shed sufficient moisture may result in failure of the coating and more importantly, degradation of the underlying substrate or structure.

Paint removal from a listed building (internal or external and including trials) *may* be deemed an alteration requiring *Listed Building Consent* from the Planning Department of the Local Authority. For church buildings a *Faculty* may be required from the local *DAC (Diocesan Advisory Committee).*

Photo Right: Multiple layers of acrylic and other thermoplastic masonry paint removed with a *ThermaTech* system. This has exposed a proprietary cement based paint (*Snowcem* or similar). The removal has also revealed some cracking and Portland cement repair to the *Roman Cement* stucco. In this case a silicate based mineral paint was selected as the replacement. This will normally adhere well to mineral substrates including cement based paint negating need for further removal.

Complete removal of paint is often expensive and disruptive so we should first consider if a scheme will permit all or part of the coatings to be left in situ. However pertinent reasons for removing paint may include the following;

- To regain effective vapour/moisture permeability.
- To safely expose substrate or detail devised to be so.
- To remove cracked, loosely adhered or other failing coating.
- To carry out repair of underlying masonry/pointing.
- To remove toxic coatings/constituents.

Successful removal is likely to result from exploiting a significant physical or chemical difference between coating and substrate. It should be considered that in general the more complete the removal of coating, the higher the risk of damage to the substrate.

Paints and Coatings

Paints vary widely in their physical characteristics and chemical composition. Presently most paints are commercially manufactured but historically painters would obtain ingredients and prepare paints to their own or an established recipe. Despite this the majority of paints can be placed into one of two principal categories;
Organically bound – containing a resinous binder e.g. linseed oil, polyurethane, alkyd and acrylic.
Inorganically bound – containing a mineral binder e.g. lime, cement, sodium or potassium silicate.

Some treatments, 'Impregnators', are designed to absorb into the capillary matrix of a substrate and are especially difficult, often impractical, to fully remove. For this reason such treatments should perhaps be assessed for re-treatability rather than reversibility.

The earliest paints in common use for buildings are typically of lime (an inorganic binder type). In most cases these will have a 'chalky' composition, sometimes removable by rigorous brushing alone. Such coatings were also fortified by the addition of tallow or casein making them more resilient and less water permeable. For this, mechanical removal would need to be more aggressive. Casein or tallow will inhibit certain chemical reactions, making hydrochloric or other acid treatment ineffective. However, low pressure abrasive (i.e. the ***VorTech*** system) is often successful so long as any overlying flexible coatings are first removed.

Oil based paints (i.e. organic) were regularly used for painting stucco, particularly *Roman Cement,* but also for softer stone masonry in polluted environments, during the Victorian period and beyond. Linseed oil was effectively displaced by polyurethane and alkyd formulations (both organic types) during the latter decades of the C20th.

Portland Cement (inorganic) based paint came into widespread use during and after ww2 due to the scarcity of linseed and other imported oils. It became the most popular masonry paint available during the 1950s and '60s. *'Snowcem'* (inorganic) was still being recommended as a primer for brick and stone masonry in the 1970s prior to painting with *'Sandtex'* (organic), the two products then being manufactured by the *Blue Circle Cement Company*.

The basic formulations of *Sandtex*, *Dulux Weathershield* and other plasticised masonry paints are typically of acrylic binder but the tougher versions of these brands are normally alkyd/acrylic. A number of companies will be found operating in the UK to directly supply and spray apply high build textured coatings. The removal of these is normally achieved as recommended for acrylic or alkyd/acrylic formulations.

A typical scenario might therefore be to find a number of layers of acrylic paint in turn over linseed or polyurethane decoration which is over cement based paint and then over the weathered remains of lime-wash. It can be seen therefore that the more modern coatings tend to be organically bound and the newest are generally the easier to remove by a combination of chemical and Superheated Water (ThermaTech). The older coatings tend to be more brittle and may yield with careful mechanical or abrasive means. If redecorating, these inorganic coatings are likely to be the most compatible with modern silicate (inorganic) paint systems and therefore may be able to remain.

Until quite recent times some commonly used constituents of paints were highly toxic. Compounds of lead, mercury and cadmium were used for pigmentation. Lead oxide and lead acetate as 'driers', accelerate the hardening of any oil binder. Arsenic can provide mould resistance. Asbestos fibre is occasionally found in coatings, added deliberately or adhering to the wet paint when airborne from adjacent installation work. However, it would be unusual to remove paint coatings due to their toxicity but if carried out *may* require the use of a specialist contractor. The key rule is that such coatings **must not** be removed by dry scraping or sanding, a requirement incorporated in law as early as 1926.

Assessment and Trials

Following initial visual inspection, it *may* be necessary to carry out sampling and testing to identify the presence and concentration of any toxic constituents or to enable recording and possible replication of historic finishes.

Analysis aside, simple spot chemical testing on site or with a sample off site, may help establish the broad category of coating type for the purposes of removal. ***Restorative Polyurethane Softener*** will normally react with polyurethane, alkyd, linseed oil and bitumen based coatings. It will also react with acrylic types but not as strongly as ***Restorative Acrylic Softener***, which also reacts with tar and bituminous binders.

Photo Right: Within a few minutes a spot sample with *Restorative Polyurethane Softener* is beginning to mobilise after brush agitation. In this case the coating is likely to be linseed oil based but the test indicates that a combination of this softener with ThermaTech would achieve removal.
The chronology of the layering in this case indicated that the presense of lead or other heavy metal should be considered. Simple test kits for lead paint are readily available.

Most *organically bound* paints will soften at least slightly with 'moderate' heat (e.g boiling water or steam) however *inorganic (mineral)* paints generally will not.

Mineral based paints such as those of lime or cement will not react to normal paint softeners or organic solvents. However they may effervesce strongly and dissolve under test with hydrochloric acid. Strong brush marks in the coating may also be a useful indicator of lime or cement based paint. These two indicators are not definitive however as PVA (*Unibond* or similar) if added will inhibit reaction of an acid with the cement. Increased dilution of the cement or lime based paint may also permit the brush marking to smooth out.

The most useful 'tool' that can now be employed is the undertaking of on-site trials. These must be carried out at the earliest opportunity and will help decide if the coatings *can* be removed, the disruption caused and the effectiveness of containment. It should also decide the most appropriate technique or combination, including the sequence and parameters for use.

Photo Right: A test area has been prepared using an application of *Restorative Polyurethane Softener.* The paint coatings are very thick and the prevailing temperatures cold so the softener was applied thickly and the sample covered with tape and polythene and left for several days. The formulation has a slow evaporation and so has a wide 'window of removal'.

From the trials, acceptable test panels should be retained as 'exemplars'. Extrapolation of the test parameters will hopefully provide an indication of the speed and cost of a future program of works.

Exposure of the masonry by the tests will also inform the specification of work that may follow coating removal. Unfortunately it is common for the estimated cost of such repairs to increase as the true condition is revealed.

Removal Products & Techniques

Restorative Acrylic Softener
A thixotropic gel for softening plasticised masonry and emulsion paints, 'hammer finish' and some car paints. Water-soluble. Brush roller or spray application.

Restorative Polyurethane Softener
A thixotropic cream for softening polyurethane and oil based household gloss and oil, polyurethane and alkyd based masonry paints. Water-soluble. Brush, roller or spray application.

Photo upper right: Removal of 25 year old alkyd based masonry paint and primer from Portland Cement based render using *Restorative Polyurethane Softener*. Residue rinsed with the *ThermaTech* system.

Restorative Cement Based Paint/Lime Remover
A hydrochloric based gel for the removal of cement based paint and calcified lime from brickwork. **Not** generally suitable for limestone or calcareous sandstone.

Photo lower right: Removal of alkyd masonry paint using *Restorative Polyurethane Softener* exposing 'Snowcem' type cement based masonry paint. The Snowcem dissolved using *Restorative Cement Based Paint/Lime Remover.* Residue rinsed with the *ThermaTech system.*

VorTech System
A low pressure swirl abrasive system designed primarily for sensitive cleaning of historic masonry, statuary and bronze. In paint removal it is suitable for the removal of brittle coatings such as lime-wash, cement paints and silicate paints. It is not suitable for the removal of thick, flexible coatings from soft substrates.

It can be operated wet or dry but in dry mode the operator must wear an air-fed mask. The equipment must not be used dry for the removal of toxic coatings.

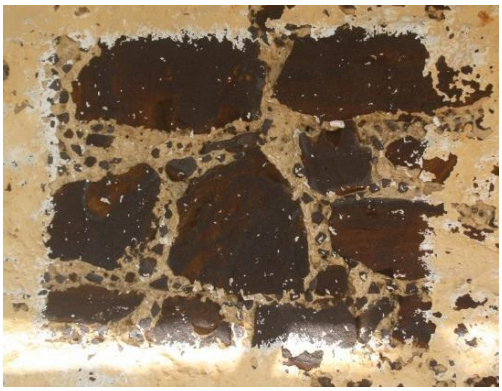


Photo Right: Removal of Snowcem type coatings from Ironstone, flint and limework masonry.

ThermaTech & ThermaVac Systems
A high temperature/pressure system producing superheated water at temperatures up to 150°C and pressures up to 160bar. The water spray is capable of softening and removing, on its own, many organically bound coatings, oil, grease and organic matter. The system is also used to rinse the softened or dissolved residue of chemical treatment. When connected to a ThermaVac system, the rinse-water and residue can be contained within an enclosure and drawn away to the vacuum unit. A pump within the vacuum can be used to automatically transfer the collected liquid to a drain or holding tank.

Photo Upper Right: Removal of acrylic based paint from brickwork and Snowcem painted stucco. No chemical treatment required. Some lime paint remaining to brickwork that can be removed by careful scraping.

Photo Lower Right: ThermaTech and ThermaVac systems connected together for use with internal work. The recovery head is pictured in the foreground.

Publications

British Standard; BS8221:(2012) Code of practice for cleaning and surface repair of buildings - Part 1: Cleaning of natural stone, brick, terracotta and concrete.
This publication includes some *consideration of paint and graffiti removal.*
BRE Digest 448: Cleaning Buildings – Legislation and good practice (2000)***.***
BRE Digest 449: Cleaning exterior masonry (2000) ***Part 1: Developing and implementing a strategy. Part 2: Methods and materials.***
English Heritage: Practical Building Conservation Series (2012-2015).

Documentation Specification and Reports

In addition to this '**Technical Information Sheet**', Restorative has produced a family of documents to support project specification and management. These include more detailed '**Technical Information Sheets**', '**Risk Assessments**' and '**Safe Working Procedures**' for the ThermaTech and VorTech and ThermaVac systems. These have been written in conjunction with our independent health and safety advisors, the NFU, and are reviewed by them and re-issued on an annual basis. These are available for architects, specifiers and contractors for the use of equipment and products supplied by Restorative Techniques Ltd. '**Health and Safety Data Sheets'** are issued for all chemical and poultice products and abrasive particulates used in conjunction with this equipment.

Restorative can be engaged to produce on-site trials and reports and to aid decision making in specification and implementation.

05/06/2015.