TECHNICAL INFORMATION SHEET

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 above: 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.

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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 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.

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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. 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.

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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 presence of lead or other heavy metal should be considered. Simple test kits for lead paint are readily available.

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'.

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.

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.

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.

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.

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,

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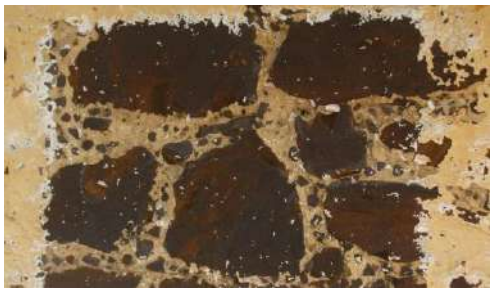
Removal of alkyd masonry paint using Restorative Polyurethane Softener exposing 'Snowcem' type cement based masonry paint. The Snowcem dissolved using Restorative Cement Based Paint/ Lime Remover. Residue rinsed with the ThermaTech® system.



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

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.

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

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.

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.

Neither Restorative Techniques Limited, nor the author Jamie N. Fairchild, 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, and the parameters for use. 2019.