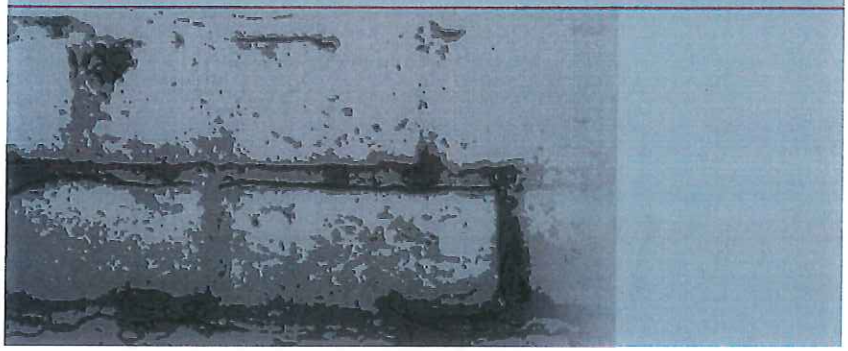
The maintenance series



Information sheet

6.2

NSW Heritage Office

Removing paint from old buildings*

Before stripping any historic surface, ask yourself if it is really necessary. Stripping may well remove interesting earlier surfaces, and the wrong method can damage the fabric underneath. In some cases it may be unjustified on historical or aesthetic grounds, particularly if the intention is to leave items stripped that were always meant to be covered.

Introduction

In many old houses and cottages there may be paintings on plaster, stone and timber (such as panels, doors and beams) that are hidden beneath layers of subsequent paintwork. They may represent scenes, patterns or texts with dates that range from the medieval period up to 19th-century stencilwork. There could also be paint types of antiquarian interest or valuable colour schemes which have remained undisturbed for centuries and which contribute to the archaeological interest of the building. Where there is a likelihood that such paintwork exists, records should be kept and both investigation and treatment should be done by a specialist conservator. Modern paint removers can destroy layers of history.

Where old paintwork on the interior of an old building is sound it is best left undisturbed.

Where old paintwork on the interior of an old building is sound it is best left undisturbed. The adhesion between coats of paint and between paint and substrate is thought to decrease once paint strippers (all methods) have been applied prior to repainting. If repainting involves the use of modern lead-free or low-lead paints, it is necessary to remove the old leaded paintwork where it is adhering well. Also, a change of colour does not usually need removal of a coating. Slightly wrinkled or blistered paint will often require no more than a rubdown; mildly chalking surfaces can be washed and rubbed down with fine, wetted abrasive paper. Pure beeswax polish applied to old paintwork on an interior surface that is not to be repainted may help to revive some of its former appearance.

* *Information sheet prepared by Adela Wright for The Society for the Protection of Ancient Buildings, London.*

Lead carbonate paint has been banned in the UK under the Environment Protection Act 1992, except in the maintenance of Grade I and II listed buildings, but old paintwork may contain lead, cadmium, arsenic, etc., which may pose a serious health hazard when disturbed. Some paintwork in older properties may have a lead content of up to 40%. Dry sanding, especially with a power sander, can spread contaminated dust. Heat removal methods can cause toxic fumes. The greatest care is needed when disturbing old lead paint, because this is when it is most dangerous.

Softwoods in Georgian and Victorian buildings were intended to be painted. Internal doors and areas of panelling have sometimes been spoilt as a result of the present vogue for burning off paint back to the natural finish; subsequent applications of polish or irreversible varnishes have been absorbed by the grain of the wood, which will be difficult to remove if the surface is ever to be restored to its original paint finish. Prolonged soaking of items, such as doors, in caustic baths, particularly where the treatment is rough and ready, can cause lasting damage.

All forms of paint removal are laborious and slow; technique is more important than method.

Paint removal may be necessary where multiple layers of paint have been built up over a number of years and have obscured architectural detail. Similarly, where many coats have been applied to an opening window, this can interfere with its proper operation, and can greatly thicken glazing bars.

Numerous coatings of exterior painting will often appear sound, but may be unable to tolerate thermal stresses and the coat may not be adhering to the substrate. Many layers can also pose a fire hazard. The choice of removal has to be balanced against retention of historic paintwork.

A hard paint coating applied over a softer one can result in poor adhesion and cracking of the upper layer. Soft paint over hard does not normally affect the performance of the new work, but the more impervious lower coat will continue to inhibit evaporation of moisture within the substrate. (See information sheet titled The Need for Old Buildings to Breathe.)

Damp problems are frequently introduced into an old building by applying a modern cement-based render, or other impervious-type paint, to a wall that had previously been limewashed. Removal of the modern paint can damage the wall to a certain extent, and it may be preferable to allow the paint to erode naturally and patch with limewash in the meantime.

Methods of removal

All forms of paint removal are laborious and slow; technique is more important than method. Different paints respond to different methods and it is therefore helpful to be able to identify the thickness and the type of paint (ie, water or solvent thinned, bitumen or polyurethane based, etc.) that has been applied, also the nature of the substrate, before deciding upon its means of removal. Manufacturers of the paint can often provide useful advice. It may be necessary to try several techniques, or a combination of methods, to achieve success. 'Response tests' should be made over small trial areas in the first instance to see if the paint can be lifted and to ensure that the substrate will not be damaged.

If the wrong removal technique is used it can make the eventual removal of the paint more difficult.

Manufacturers' instructions as to methods of application and the possible dangers to operators are important.

Where the problem appears complex, or where the building concerned is of considerable historic value, specialist advice or services should be sought. SPAB may be able to advise or, in Australia, the NSW Heritage Office.

1. Water washing

Water washing can be helpful in removing paints, but caution is needed to prevent water being absorbed into the substrate. Soda, soft soap and other highly alkaline soaps will leave harmful residues and attack new paintwork. Non-ionic detergents are more suitable. Limewash, whiting and soft (size-bound) distemper can usually be removed with warm water. With other water-thinned coatings adhesion is likely to be loosened when thoroughly wetted. Copolymer emulsion paints can be softened with hot water, then sponged, scrubbed or scraped off. Where moisture is able to penetrate behind a paint film that has been lightly scored or is flaking, adhesion will be weakened. However, if only a small section is to be removed from an otherwise sound area, there is risk that moisture may become trapped and spread behind the good paintwork and cause blistering.

2. Steam stripping

Where the problem appears complex or where the building concerned is of considerable historic value, specialist advice or services should be sought.

An appliance designed mainly for stripping wallpaper can be useful in removing paint; it generates steam at low pressure and the steam is applied to the paint film via a hose capped with a perforated metal concentrator. The water-vapour gun, recently introduced to the market, is said to be successful in removing thick layers of paints and limewashes from plain and decorative plaster surfaces.

Water-thinned paints are softened by steam and then removed with a sponge, brush, scraper and water. Steam in conjunction with a solvent stripper can be effective in removing multiple applications of old emulsion paint, including polyvinyl emulsion that has resisted other forms of treatment.

Steam stripping can be faster and more effective than water-washing methods over large areas. But it can also be slow and laborious in removing multiple layers of some types of old encrusted paint and results are sometimes patchy. The surface of plaster may blister if the appliance is held too long in one position. This can be particularly damaging to old friable plaster.

3. Chemical paint removers

There are two main types of chemical stripper: solvent (non-caustic) and alkaline (caustic). Both are available in liquid, gel and poultice form. Instructions on application, removal and methods of disposal are provided by manufacturers.

All chemical paint removers constitute a health risk. Some may be banned under future EC legislation. Chemicals can burn on contact with

the skin. Vapours and sprays are toxic if inhaled. Operators should work in well ventilated areas, wear protective clothing and face masks. The strippers are also flammable.

Solvent (non-caustic) removers

Solvent removers are usually based on methylene chloride; waxes are included to retard evaporation. They are very effective in removing oil-based paints but can be less effective with other types of paint. Proprietary brands of stripper vary, and some makes can be more useful than others in removing a particular type of paint such as emulsion.

The paint remover is applied with a brush; the solvent swells and softens the paint, which is then removed with a scraper. Several applications may be necessary where old hard paint has built up in a number of coats, and in these circumstances the stripping can be very slow. Preliminary scraping can sometimes be helpful.

Operators should work in well ventilated areas, wear protective clothing and face masks.

Proprietary brands that are available are either water-rinsable or spirit-rinsable. Where a surface is to be repainted waxy residues must be removed according to manufacturer's instructions. Water-rinsable removers contain an agent that enables the wax to be removed by a thorough wash down with water. With other types, wax deposits are removed with a rag soaked in white spirit followed by a gentle rub down.

Alkaline (caustic) removers

Alkaline removers are based on caustic soda, potash, washing soda or similar material. They are effective, but they can create severe problems and should only be used where paints cannot be removed by other means. They are easily absorbed by porous surfaces and the harmful residues are very difficult to remove. Application should be restricted to small areas. They are NOT SUITABLE for gesso, plywood, veneers or hardboard. They can be harmful to brickwork, stonework, metal and most types of plaster or putty. They may raise the grain of timber and they may also darken or bleach some woods.

These removers are effective on oil-based paints; they break down the oil or resins that bind the paint. The softened paint is then removed by scraping or scrubbing with a hard brush and water. This is followed by a thorough wash down with several applications of clear water to remove all traces of alkali which may attack subsequent coats of paint. The surface is tested for any deposits that may remain by placing pink litmus paper against the damp surface; if the paper turns blue the surface should be washed again with water containing a neutraliser such as acetic acid.

Caustic removers are available in liquid, paste or 'blanket' form. The stripping blanket prevents the paste from drying out and the paint sticks to the blanket, which facilitates removal. This can be useful where paint is embedded in crevices. Dipping wood in a caustic tank will destroy natural oils in the timber; it can cause cracking, shrinkage and opening up of the joints. Proper neutralisation of the alkali is important.

Poulticing

This may be necessary for stubborn areas of paintwork where paint is embedded in pits and grooves, such as brickwork, stone ashlar and timber beams. The poultice may be made up by using powdered clay, such as attapulgite or sepiolite, which is added to water and mixed to a paste together with a solvent stripper. Once applied the mix is covered with a thin plastic film, which helps to impede evaporation of moisture in the paste. The paste is removed with a knife and the surface is washed down thoroughly with clear water; a sponge or bristle scrubbing brush may be necessary to remove any paint residues. Proprietary caustic-based poultices are also available.

4. Abrasive methods

Manual abrasive methods

Hand scraping, for small areas, using a paint scraper or putty knife, should be considered before mechanical methods. Paint was often applied to original ground without sanding the surface. If the paint or varnish has become brittle it should flake off when scraped. Hand-sanding using wetted medium-coarse glass paper wrapped round a wood block is suitable for removing a thin film of paint from timber. The careful use of carborundum blocks and water, another method, is laborious but often effective.

Mechanical methods

Hand-powered tools used with sanding attachments, such as disc and drum sanders, flap wheels or rotary strippers, are generally only suitable for flat surfaces or for fences or claddings which are to be stained rather than repainted. Working along the grain is important; scratches and ripples on the surface are a common problem.

Mechanical methods should only be used as a last resort and only if removal of paint can be done without risk of damage to the substrate, as the surface can easily be removed in the process. The system is sometimes used to remove multiple layers of old paintwork or certain two-part paints that do not respond to other forms of paint removal. Blast cleaning should be in the hands of an experienced contractor and careful supervision is necessary. Most damage is caused by the technique used rather than the system. The selection of grits for air- or water-abrasive methods, and of air and water pressures to suit the job, is important.

Mechanical methods should only be used as a last resort and only if removal of paint can be done without risk of damage to the substrate.

High-pressure water-cleaning methods when used to remove paint can be aggressive. Saturation of walls can occur if the water is not carefully controlled; pressure is critical.

5. Hot air paint stripper

This system is basically the same as the burning-off method, but fire risks are less because the temperature is lower.

Hot air is produced by an electric filament and the heat can, in some cases, be adjusted to any of five settings, with temperatures ranging from 20°C-600°C.

Multiple layers of oil-bound paintwork have prevented evaporation of moisture within the wall. Limewash would have allowed the wall to 'breathe'.

This tool is designed to soften and blister oil-based paints and varnishes. The paint is then scraped away with a stripping knife or scraper. For awkward crevices and delicate work a shave-hook is used.

Hot air strippers are not suitable for removing water-based paints, some primers and undercoats, or for removing paint from metal or plaster. They should only be used on masonry when thick layers are to be removed. Special nozzles should be used on window frames and the glass should be protected against cracking by heat. It is best to avoid this method on frames containing old glass, as this is now irreplaceable.

The method is fast and effective on wood surfaces, but it is easy to damage mouldings with the scraper if hurried. The absence of flame decreases the risk of fire damage, but the surface of wood can become slightly scorched if the tool is directed too long in one place. Also this system has been known to ignite flammable materials such as thatch or dust in sash boxes.

6. Burning-off methods

Blowlamps or blowtorches are used to soften paint prior to scraping with a knife, scraper or shave-hook. The method is quicker than other forms of removal but IT POSES SERIOUS RISKS TO AN OLD BUILDING WHERE FIRE HAZARDS ARE GREATER. There is a danger not only that the paint itself may catch fire but that rotted timber below the paint film may ignite without being immediately noticeable – timber may smoulder unseen for several hours. Electrical insulation may also be damaged unwittingly. Stripping a sash window can be particularly dangerous where dust in the sash box may ignite and not be visible. Also it is easy to scorch wood and crack glass.

The method is effective on oil-based paints but not water-based coatings. It should never be used to remove flammable coatings (e.g. some cellulose enamels). With some emulsion paints minute explosions can be caused, resulting in showers of hot particles. Paint is difficult to remove from crevices. The risks involved in using this method on old buildings are so great that some contracts ban blowlamps and blowtorches on site.

All methods of removing paint from brick or stone will damage the base material to some extent. Although removing the paint should benefit the wall, the ideal course would be to allow the paintwork to weather and disintegrate naturally.

Specific problems

1. Brick and Stone

All methods of removing paint from brick or stone will damage the base material to some extent. Although removing the paint should benefit the wall, the ideal course would be to allow the paintwork to weather and disintegrate naturally. During the intervening period a coat of limewash of a similar colour will improve the appearance of the wall.

Moisture in an old wall can become trapped behind a paint film and weaken its adhesion. Alkali from lime mortar and soluble salts may also attack oil-based paints. Breakdown of paintwork on damp or eroded brick or stone is likely to be within five years for many modern paint types.

Solvent strippers can be successful in softening many types of modern paints. Poultice treatment may be necessary where paint is embedded in grooves. Deposits are removed with water under pressure (keeping

A modern paint coating, consisting of fine aggregate bound with resin, spalling less than two years after application to an 18th-century wall.

water to the minimum). Layers of paint can be difficult to remove from very porous brick or stone. Hot air, alkaline strippers and air abrasive methods may damage the substrate.

2. Plaster

To remove paint from plaster KEEP WATER TO THE MINIMUM; prolonged soaking will soften plaster, especially gypsum-based plasters. Water-washing, hand sprays, steam and solvent strippers help to loosen paintwork. The choice depends upon the type of paint to be removed.

It is an advantage when repainting old plaster, particularly decorative work, to use limewash, whiting or soft distemper (size-bound, non-washable). These can be washed off between applications, which will prevent a build-up of paint and loss of detail.

3. Timber

Solvent strippers are successful in removing oil paints, tar and some emulsions. Used in poultice form they help to dislodge paint embedded in grooves.

After stripping, the RESIDUES SHOULD BE WASHED DOWN WITH WHITE SPIRIT, as water can raise the grain and darken the timber. Rubbing down should follow the direction of the grain. Steel wool is best avoided for this purpose, as fragments of metal can become lodged in fissures and, where moisture is present, cause staining.

If results are patchy after removing paint from beams, 'liming' might be considered. Although it will change the nature of the timber, it will help to mask the residues.

Mechanical methods, such as grit blasting, will spoil the surface of the wood and should never be used on an old building.

4. Metalwork

Non-ferrous metals. Solvent strippers based on methylene chloride are more effective if applied in poultice form and left in position for about two hours. Traces of residue are removed with white spirit.

Ferrous metals. Solvent or alkaline-type strippers or mechanical systems are used.

Mechanical methods, such as grit blasting, will spoil the surface of the wood and should never be used on an old building.

An alkaline (caustic) stripper in poultice form can be successful; it slows down corrosion and does not roughen the surface. Neutralising with acetic acid is necessary after application. If the caustic solution becomes embedded in crevices and joints it may be difficult to neutralise, and corrosion is likely in these areas if moisture penetrates.

Mechanical methods include the use of a chipping hammer or mechanised needle hammering – both methods are slow. Air- and water-borne abrasives are useful on cast iron. A fine grade of crushed copper slag is normally used as the grit. The surface of the metal should be primed immediately after blasting to prevent rust formation. Grit blasting will destroy a smooth surface on wrought iron.

Paint and mill-scale can also be removed by using the oxy-acetylene flame-cleaning system.

5. Graffiti

There is no general solution to the removal of graffiti, but it is important to begin treatment as soon as possible so that the paint does not have time to harden. Long-standing aerosol paints are almost impossible to remove from porous surfaces such as brickwork and stonework. There is also a risk of spreading the paint and increasing absorption in the process. Cleaning with an air abrasive pencil using a suitable fine abrasive, followed by toning down the cleaned patch by rubbing with stone or brick dust, may be successful.

There is no general solution to the removal of graffiti, but it is important to begin treatment as soon as possible so that the paint does not have time to harden.

A solvent-based (non-caustic) poultice should be tried; if this fails an alkaline (caustic) remover in poultice form might be effective. The brick and stone must be thoroughly washed afterwards. A second poultice (without the chemical incorporated) can be applied to help draw out the residual salts.

Anti-graffiti coats are available to protect walls but they can create problems by trapping moisture and salts behind an impermeable membrane.

Paint types and some methods of removal

Consult manufacturers of paint if known

Bituminous paints and tar

There is no wholly satisfactory method.

Water-thinned bituminous emulsions: steam cleaning in conjunction with a solvent stripper.

Solvent-thinned bitumen paints and tar (solution type): naphtha will help to soften and dissolve but mechanical methods may be necessary.

Cement paint

Difficult to remove without damage to the substrate. Low-pressure wet abrasive to remove surface of coating, and a solvent stripper to remove lower layers, can be successful.

Chlorinated rubber-based paints

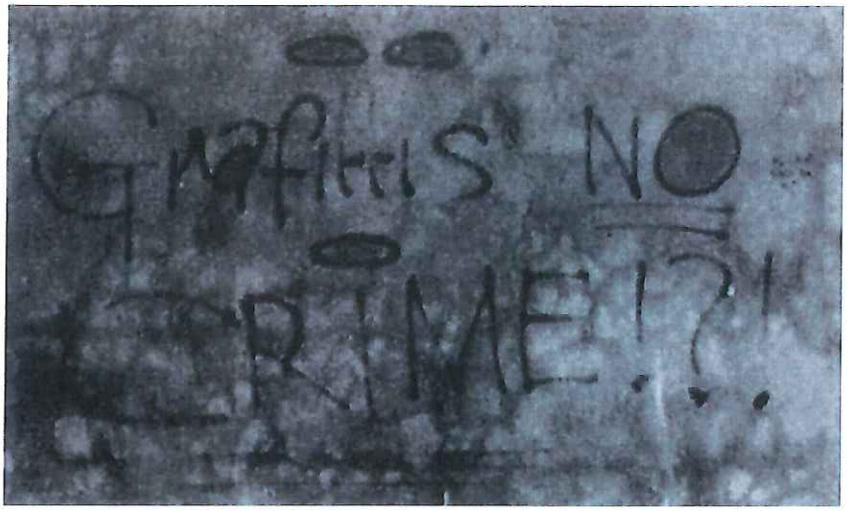
Difficult to remove. Consult manufacturer if known. Try naphtha.

Creosote

Difficult to remove. Solvent strippers in poultice form can be effective if penetration of coating is shallow. It is usually best to allow creosote to weather and fade naturally. 'Bleeding' can occur if painted over with other paints.

Distemper, oil-bound (washable distemper)

Can be difficult to remove. Steam stripping together with scraping using a knife is usually successful. Hot-water washing and scrubbing, together with a non-ionic detergent, can loosen adhesion of some types of distemper.



It is extremely difficult to remove graffiti from a porous surface. An old building may be permanently disfigured.

Distemper, size-bound (soft distemper). Also whitewash

These distempers are generally removed by washing down thoroughly with warm water. A hand-spray, to soften coating, used prior to washing, will aid removal. Keep water to minimum and do not add alkaline soaps or detergents, as harmful residues can be absorbed by porous surfaces. Steam stripping may be necessary for stubborn coatings.

Emulsion paints (based on PVA and acrylic copolymers) mainly for internal use.

Removal depends upon the type of emulsion and the number of coats. Some coatings can be softened with hot water followed by scraping and scrubbing. Some respond to a solvent stripper (non-methylene chloride based). Steam stripping and scraping is effective on one or two coats.

Steam stripping in conjunction with a solvent stripper may be necessary for removing multiple layers of old paint, including polyvinyl emulsion, that have resisted other forms of treatment. A solvent stripper in poultice form is sometimes successful.

Brushing down loose, powdering coatings, followed by washing, sponging and scrubbing, is usually effective.

Preliminary hand rubbing will reduce encrustation and ease stripping. Paint and chemical residues on plaster should be removed with water, not turpentine.

Limewash

Brushing down loose, powdering coatings, followed by washing, sponging and scrubbing, is usually effective. Limewash containing tallow or linseed oil can be difficult to remove. Hot-water washing and steam will help to soften coatings. Old sulphated limewash in multiple applications may respond to a wet poultice maintained in position over a long period. But a low-pressure wet abrasive cleaning system may be necessary as a last resort.

Masonry paints

This term covers a wide range of coatings of variable compositions and textures. They may be solvent- or water-thinned. Consult manufacturers if known or paint suppliers on means of removal. Many types respond to solvent strippers in paste form, but large quantities would be required for textured masonry paint. Mechanical methods may be necessary.

Oil paints (alkyd), flat, gloss and enamel paints

Solvent removers, hot air strippers and abrasive methods.

Textured coatings

Water-thinned for internal plaster. See above for textured masonry paint.

'Plastic' textured coatings, gypsum based: hot-water solution, containing a mild detergent, using a hand-spray, followed by scraping. Do not abrade dry.

Emulsion-type coating. Hot-water softening or steam stripping, together with scraping.

REFERENCES

Ashurst, John 1986, *Cleaning stone and brick*, 2nd edn, Society for the Protection of Ancient Buildings (SPAB), London.

Ashurst, Nicola 1994, *Cleaning historic buildings*, Vol II, Cleaning materials and processes, Donhead Publishing, London.

BRE Digest 197. 1982, *Painting walls*, Part 1: Choice of paints.

Powys, A. R. 1981, *Repair of ancient buildings*, Society for the Protection of Ancient Buildings (SPAB), London.

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S·P·A·B

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