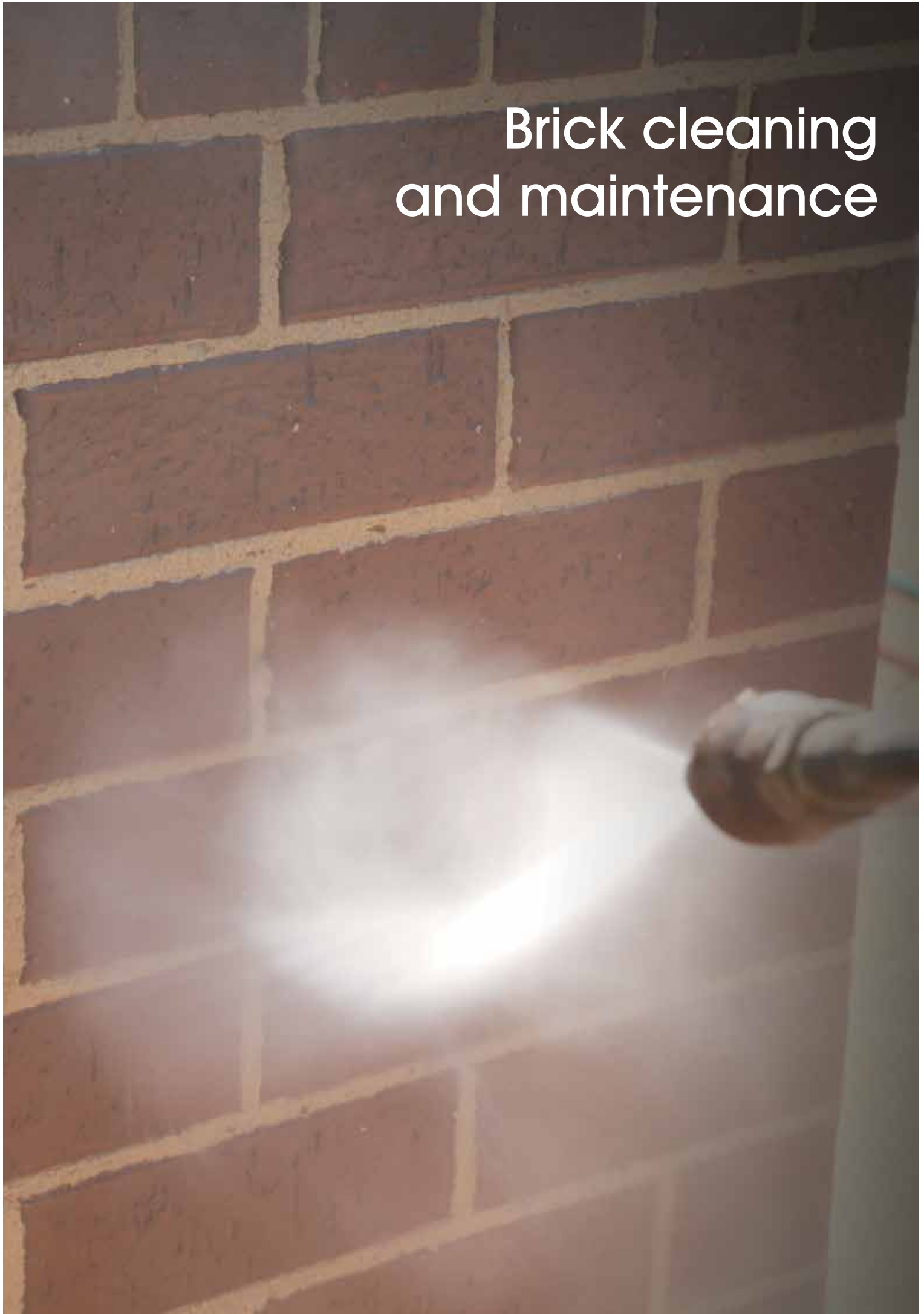


# Brick cleaning and maintenance



# Brick cleaning and maintenance

The following information provides advice on the correct cleaning procedures and ongoing maintenance of brickwork to ensure the best possible results.

## BRICK PROPERTIES

The appearance of a brick building can be permanently spoilt by bad cleaning techniques or by the use of the wrong cleaning agent. For this reason, it is important to ensure that the correct cleaning methods are utilised for the best results and to help reduce the associated problems with brick cleaning.

It is important to remember, that the services of a professional cleaner should be sought if a stain is too large or too difficult to remove.

## SAFETY PRECAUTIONS

The chemicals used during cleaning are highly corrosive (some are classified as S6 poisons). The manufacturer's instructions and safety precautions should always be followed when using acids and other proprietary cleaning chemicals. The few points below should be followed to avoid serious personal injury:

- Always wear protective clothing and protective equipment such as gloves, safety glasses, etc.
- Do NOT use high pressure cleaners to apply cleaning chemicals as it is dangerous to the operator and to those nearby.
- Store acid and acid solution in heavy duty plastic containers supplied by the manufacture and ensure that the containers are correctly stored (eg away from children)
- If the cleaning solution comes in contact with the body, irrigate the area with water immediately to remove all traces of the cleaning solution. If irritation continues seek medical advice immediately.

## CLEANING MORTAR STAINS WITH HYDROCHLORIC ACID

Hydrochloric acid is only used to remove mortar stains from clay brickwork. Generally, hydrochloric acid should not be used to treat any other stains or at any other time during the life of your brickwork. If used incorrectly, it can cause unsightly staining that is more difficult to remove.

In particular, care should be taken to treat any vanadium stains prior to cleaning with hydrochloric acid. It is very important that protective clothing be worn and that the safety and chemical storage precautions necessary for working with hydrochloric acid are followed.

The following procedure is recommended when cleaning with hydrochloric acid:

1. All mortar dags should be removed using either a metal or wooden scraper.
2. Protect all areas which may come in contact with the cleaning agent as recommended by the manufacturer of the proprietary cleaner. Special care should be taken with window frames, aluminium dampcourses and gutters.
3. Saturate the area of brickwork to be cleaned and all adjacent areas below with water.
4. Use the correct ratio of hydrochloric acid and water:
  - Light coloured bricks - 1 part hydrochloric acid to 20 parts water
  - Dark coloured bricks - 1 part hydrochloric acid to 10 parts water
  - Under no circumstances should more than 1 part hydrochloric acid to 10 parts water be used. It is better to scrub more vigorously than to use more acid.
5. When cleaning, try not to work in direct sunlight.
6. Always begin at the highest point and work down the wall.
7. Only clean small areas at a time, for example one square metre, so as to allow adequate time to wash off the cleaning solution, to ensure no staining occurs.
8. Allow solution to remain on wall for 3-6 minutes before scrubbing. Be sure not to scrub the joints.
9. Rinse thoroughly, making sure all cleaning solution has been removed.

Note: light coloured bricks should be rinsed with a neutralising solution, such as bicarbonate of soda or washing soda, instead of water.

**Note:** Bricks manufactured in Queensland, especially light-coloured bricks, may be more susceptible to acid burn, due to large amounts of iron oxide present in the raw materials. The following ratio could be substituted into Step 4 when acid cleaning these bricks: 1 part hydrochloric acid, 1 part phosphoric acid and 10 parts water. Contact Austral's local technical department for further details.

Further details of the recommended cleaning procedure and the various techniques used are available in the CBPI Cleaning Clay Masonry Code of Practice.

### Hand Cleaning

Hand cleaning is appropriate for small jobs or for when the use of a high pressure water jet is likely to cause damage. Dry press bricks should be generally cleaned by hand. The following procedure should be followed:

1. Allow mortar to harden (clean 24-36 hours after completion of masonry work) and remove any large mortar particles with hand tools.
2. Protect adjacent materials as recommended by the manufacturer of the proprietary cleaner.
3. Saturate the wall with clean water. Never let the wall dry out during cleaning; work on small areas.
4. Test a small unseen section prior to full-scale cleaning.
5. Apply the acid solution (as described previously) to the wall using a brush or spray.
6. Allow solution to remain on wall for 3-6 minutes before scrubbing vigorously.
7. Rinse thoroughly as small areas are cleaned.

### High Pressure Water Jet Cleaning

High pressure water jet cleaning can be used on clay masonry, but precautions must be taken so that the bricks and the mortar joints are not damaged by the process. The following procedure should be followed:

1. Allow mortar to harden (must be older than 3 days) and remove any large mortar dags with appropriate hand tools
2. Protect adjacent materials as recommended by the manufacturer of the proprietary cleaner.
3. Saturate the wall with clean water. Never let the wall dry out during cleaning; work on small areas.
4. Test a small unseen section prior to full-scale cleaning.
5. Apply acid solution (as described previously) by hand  
**Applying chemicals with high pressure cleaners is dangerous and is NOT recommended for safe and successful cleaning.**
6. Wash the wall with high-pressure water after allowing the solution to remain on the wall for 3-6 minutes. When operating the equipment ensure to:
  - Keep pressure low - maximum 7000kPa (approximately 1000psi)
  - Use a wide fan spray nozzle (15°)
  - Operate the nozzle at generally 500mm from the wall or never closer than 300mm

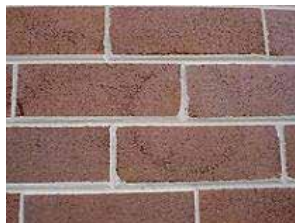
- Use 'runs' of approximately 1m in width and double clean to ensure the best clean
- Keep the gun moving constantly or surface abrasion in one spot will result

**Warning:** If the mortar joints or the bricks are being damaged, either the pressure is too high or the water jet is too close to the wall.

It is strongly recommended that a test area should be used to check the impact of the high pressure cleaning on the bricks and mortar. High pressure cleaning is NOT recommended for dry press bricks and increased care should be taken with slurry coated bricks. Examples of the damage that can be caused by high pressure cleaning dry press bricks are shown below.



(a) dry press brick damage due to high pressure cleaning



(b) damage resulting from the use of a turbo head

### Cleaning Internal Brickwork

Extra care should be taken when using hydrochloric acid to clean mortar stains on internal masonry. Acid fumes produced during cleaning should be ventilated adequately. The likelihood that the acid fumes will persist into the period of occupation can be reduced by:

- Cleaning the internal masonry early in the construction period, thereby allowing the walls to be rinsed sufficiently
- Ensuring adequate ventilation apply a neutralising solution to the wall

## EFFLORESCENCE

Efflorescence is a powdery deposit of salts which forms on the surface of bricks and mortar. It is usually white but efflorescence can be yellow, green or brown. A temporary efflorescence is particularly common on new brickwork as soluble salts are transported to the surface of the brickwork by water. The picture below shows efflorescence on brickwork.



Efflorescence can occur from a variety of sources. New bricks contain minimal, if any, soluble salts, but mortar and concrete have relatively high soluble salt contents. Ground waters that are naturally salt-bearing can be drawn into base brickwork. A faulty or bridged damp-proof course (refer to Brick Manual 2) will allow the salts to migrate up the wall. Render that has been applied over a damp-proof course can also allow salt to migrate up the face of the brickwork. Water allowed to enter uncovered cavity walls during construction is also likely to cause efflorescence, so brickwork must be protected from water entry during construction.

The amount of efflorescence that occurs is related to the amount of water in the bricks, and their drying time. The more water in the bricks, and the longer it is there, the more chance salts will have to dissolve and be brought to the surface as the bricks dry out.

Efflorescence on new brickwork may be unsightly, but it will not cause damage unless it persists for a long time. Persistent efflorescence should be taken as a warning that water is entering the wall through faulty copings, damp-proof courses or pipes. If allowed to continue unchecked, the salts carried to the face of the wall may eventually attack the bricks and cause deterioration (refer to fretting within this page).

## Remedy

Laying dry bricks and providing good ventilation to speed up the drying process after the bricks have been laid can minimise efflorescence. Forced ventilation and heating of the premises may be necessary to ensure drying during cold winter months. The best removal method is simply to brush off the deposit with a stiff dry bristle brush after the wall has dried out.

Collect the removed salts with a dust pan or a vacuum cleaner to prevent the salts re-entering the brickwork. Alternatively, an absorbent cloth could be used to sponge down the surface. Use only a small amount of water and rinse the cloth in clean water regularly to remove the salts.

Wetting the wall by methods such as hosing usually dissolves efflorescence back into the brickwork, allowing it to reappear again when the wall dries out. Acid or alkaline treatments are not recommended as they do more harm than good because they add to the total salt content of the wall. The application of kerosene or oil does little or nothing to hide the efflorescent salts and prevents their subsequent removal by brushing and washing.

## BRICKWORK STAINS

This manual gives a description of a number of typical stains. The CBPI Cleaning Clay Masonry Code of Practice can be referred to for a detailed description of the typical stains and techniques used to clean brickwork. Always wear protective clothing and take the safety measures recommended by the chemical supplier when using any chemicals to clean the stain.

### Cleaning Procedure

1. Identify the type of stain. Make sure you know the type of stain you are trying to remove, to ensure you are using the most effective cleaning method.
2. Select the correct cleaning method. Once you have identified the stain, use the appropriate cleaning method to remove the stain.
3. Follow the procedures. Follow the written instructions as well as those shown on the labels of proprietary cleaners. A good tip is to clean a small test area first, this will ensure that the cleaning method is working and not causing further damage.
4. Safety precautions are essential. Make sure you thoroughly read the safety precautions for the chemicals used, which should be provided by the chemical company. Wear protective clothing and equipment and ensure that chemicals are stored safely (refer to the chemical company for details).



## INSOLUBLE WHITE DEPOSITS (SCUM)

Insoluble white deposits appear almost as a milky film on the brickwork. The hard white deposits are insoluble in water and are invisible when wet. Do not confuse these deposits with efflorescence, which is soluble in water. An extreme example of insoluble white deposits is given below.



Most commonly this staining can arise from the products of the setting reaction of Portland cement, which are leached out of concrete elements such as sills, lintels, copings, cement render or from insufficiently-dense mortar. They combine with carbon dioxide from the atmosphere to form white deposits that are insoluble in water but soluble in dilute hydrochloric acid.

The combination of clay from the mortar with calcium and silica residues from the cement forms calcium silicate, which could also produce the insoluble white scum. Calcium silicate is highly insoluble in most acids and is white in colour. When wet these calcium deposits are invisible. Kaolin, a clay mineral present in most bricklaying sands, can also form a hard deposit. It is insoluble in most acids except hydrofluoric acid (which is a restricted product).

However, the main cause of these insoluble white deposits is bad cleaning practice; allowing mortar made with sand containing too much clay to remain too long on the surface of the bricks and then removing it with too much acid and/or too little water. Refer to the section on mortar stains within this page for details on the correct method of cleaning with acid.

When not enough water is used before and after the acid wash, the products of the reaction between the acid and the mortar can be absorbed into the face of the bricks instead of being washed off the wall.

### Remedy

Apply full strength Noskum to stained bricks and allow the solution to stand for four to six minutes if the reaction is not immediate. Scrub vigorously and wash off with plenty of water whilst still scrubbing. There is no guarantee that this will resolve the problem in severe cases, as scum is extremely hard to remove.

## IRON STAINS (ACID BURN)

Dark patches (usually yellow to deep brown in colour) of iron oxide staining can occur on the face of the brick or in the mortar joints. Iron stains are more noticeable on light coloured bricks and in the mortar joints of dark coloured bricks.



Iron Staining on Brick Faces



Iron Staining in Mortar Joints

'Acid burn' is caused by the use of an incorrect cleaning procedure when treating mortar stains with hydrochloric acid. The acid reacts with iron oxides in bricks or mortar to cause the stains. Common errors in the cleaning procedure include:

- Insufficient pre-wetting of the wall prior to applying hydrochloric acid
- The application of an acid solution that is too strong
- Insufficient rinsing of the brickwork following cleaning

Staining can also be caused by contact with rusting iron or steel such as lintels, nails and bolts, railings and packaging straps. Regular wetting from bore water used for irrigation and by welding splatter from welding near brickwork may also cause iron staining.

### Remedy

Acid burn stains can be treated using a solution of phosphoric acid, in the ratio of one part acid to four parts water. The solution should be applied and allowed to stand. The stain will normally disappear in 30 minutes to 24 hours.

The treated area should be washed off and then neutralised. A solution of sodium bicarbonate should be applied to neutralise the area and should not be washed off. Proprietary neutralisers such as Neutril are also available.

An oxalic acid solution of 20-40 grams per litre of water is another solution that could be used in the place of phosphoric acid. However, the substitution of oxalic acid for phosphoric acid is not commonly performed. After the application of either solution, the area should be neutralised as described previously. Proprietary cleaners, such as Noskum, could also be used to treat iron stains.

Phosphoric acid will bleach any iron oxides used as colouring pigments. For this reason pigmented mortars will fade, so the entire wall will need to be treated to maintain a uniform appearance. Alternatively keep the solution off the mortar.

## VANADIUM STAINS

Vanadium stains are evident by a yellow-green discolouration on the face of a brick resulting from the vanadium salts naturally present in most clay materials used to produce light coloured bricks.

Vanadium stains are not powdery crystalline deposits and cannot be simply brushed off. They are often mistaken for moss or algae, which usually grows in damp areas across the whole face of the bricks and mortar. By contrast vanadium stains (as shown below) appear on dry walls, normally as patches on the brick only. Vanadium is a metallic salt present in most light coloured clays throughout the world. It is present in very small quantities.



Vanadium salts are put into solution by excess water migrating through the bricks and are brought to the surface as the bricks dry out. As the water evaporates from the drying bricks the vanadium salts are left on the brick surface. The vanadium salt turns green when it crystallises in an acidic environment, such as after acid cleaning or upon exposure to rainwater (naturally acidic). Vanadium salts are colourless until they are exposed to an acidic environment.

This process can occur whenever the bricks are subjected to excessive water from rain either before or (more often) during the bricklaying process. If vanadium stains are not removed prior to cleaning with hydrochloric acid (for the removal of mortar stains), they may turn a darker colour and be more difficult to remove.

These stains are neither harmful, nor permanent and do not indicate any defect in the product. They are a thin film on the surface of the brick or paver and will weather away with time. However, the removal of the stains can be hastened by chemical treatment.

## Remedy

Hydrochloric acid should not be used, as it will aggravate the problem. There are a number of different methods for removing vanadium stains, including:

- Method 1: Spray or brush on sodium hypochlorite (found in household bleach or pool chlorine) onto the stain without wetting the area initially. Allow the solution to stand until the stain disappears and then rinse with water.
- Method 2: Apply a solution of oxalic acid (20-40 grams per litre of hot water) to bricks that have not been pre-wetted. Finally, neutralise the acid with a solution of 15 grams per litre of washing soda (or suitable neutraliser). Do not wash off the neutralising agent. Neutralising is very important, as further staining could result if this step is omitted.
- Method 3: A solution of potassium or sodium hydroxide (150 grams per litre of water) could also be applied to the stain. Wash off the solution and any white residue formed once the stain has disappeared.

Proprietary cleaners, such as Noskum, could also be used to remove the vanadium stains. Apply Noskum to the dry bricks.

Wash off after the stain disappears and neutralise with a 15 grams per litre solution of washing soda (or suitable neutraliser).

## OTHER COMMON STAINS

Most common stains can be removed by scrubbing with a stiff brush and an industrial strength detergent. High pressure water cleaning can be used, but there is the risk that you will remove the mortar or damage the surface of the bricks, especially with new masonry. If the stains persist there are a number of chemicals that can be used to treat and remove the stains. Some of the simpler, more effective chemical treatments are described below. The CBPI Cleaning Clay Masonry Code of Practice provides detailed descriptions of the cleaning techniques used for common stains. If staining persists after applying these chemicals, further options may be available by consulting Austral Bricks™.

### Adhesive Tape

Wipe with a suitable solvent, such as petrol, or a paint stripper agent.

### Bitumen and Tar

Scrape off the excess material and scrub the surface with scouring powder and water. Chilling the surface with ice or solid carbon dioxide (dry ice) can assist removal. These stains usually need two treatments with a commercial emulsifying agent (or degreaser). First, mix the emulsifier with kerosene to remove the stain. Then clean the kerosene off, with emulsifier mixed only with water.

### Blood

Wet the stain with water then cover it with an even layer of hydrogen peroxide powder. Sprinkle with water or cover with a water soaked bandage and leave for five minutes. Scrub vigorously with clean water and then neutralise using a five percent solution of acetic acid (vinegar) and rinse with water at the end of the treatment.

### Coffee Stains

Apply a cloth that has been saturated in a solution of one part glycerine to four parts water. When the stain is drawn into the cloth, rinse with water.

### Egg

Wipe the stained area with acetone until the stain is removed.

### Ink and Biro

Different inks require different treatments. Wipe with white spirits, acetone or apply an acetone poultice to help draw out the stain.

### Marker Pens

Wipe off with acetone or a poultice made by mixing acetone and an inert material such as talc, whiting, kaolin or diatomaceous earth. The paste should be applied to the area to be cleaned and washed off when dry. It may be necessary to repeat the process until the marks are gone.

### Mortar Stains

Cement stains arise from the presence of mortar residue left on the surface of the brickwork. Mortar stains and dags on bricks can be prevented by removing the mortar before it is set. Old mortar can be acid treated using the same method as for new mortar. Hardened mortar needs to be scraped and rubbed off as much as possible, with sandpaper or a piece of the brick, before treatment.

The cement stains left by mortar can be removed by scrubbing with a solution of 100ml of hydrochloric acid in 1 litre of water. The brick masonry must be wet thoroughly ahead of the acid treatment and the wall must be hosed off immediately after treatment.

Work on small areas - no more than 1 square metre at a time. Start at the top of the wall and work your way down. Do not leave the acid on for extended periods - 3 to 6 minutes should be enough time. Then thoroughly wash the wall down to remove excess acid. A full description of this cleaning technique is available in the Cleaning Mortar Stains with Hydrochloric Acid section of this manual.

### Oil, Grease and Animal Fats

Petrol and lubricating oil stains should be mopped up immediately with paper towels. Wiping should be avoided as it spreads the stain and tends to force oil into the masonry. Hardened oil must be scraped off. The area affected should then be covered with a dry absorbent material such as diatomaceous earth, fine white clay, kaolin or whiting then brushed off. The procedure should be repeated until no more improvement can be seen. Any residual stains can be treated with a commercial oil stain remover, or with a mixture of kerosene, detergent and hot water.

### Organic Growths - Fungus, Mould and Moss

Porous masonry may provide an environment for organic growth when it is continuously moist, especially in light but shady conditions and when there are plenty of nutrients available. If brickwork is continuously moist, inspect the downpipes and the damp proof courses for possible sources of the problem. If the brickwork dries, organic growth should not occur.

Clean off the growth as much as possible with a dry bristle brush. Organic growths should be treated with liquid chlorine, or common household chemicals such as Exitmould and WhiteKing or a proprietary weed killer. The solution should be left for several days and then brushed off with hot water and detergent. Repeat as necessary.

### Paint and Graffiti

These can be difficult stains to remove, particularly if they have aged. Therefore, it is best to treat them when fresh. Specialty graffiti removal products are also available to assist in the removal of these stains.

**Wax Crayon:** can usually be removed with acetone. It should be applied with a rag or tissue on smooth surfaces or with a small brush on textured surfaces. If it tends to spread, try using a poultice and brush off when dry.

**Acrylic Paint:** a commercial paint remover should be used. Oil-Based Paints or Enamels: burn off and follow with scraping and wire brushing.

**Fresh Aerosol Paint:** a commercial paint remover should be used.

**Dried Paint:** flood the stained area for a few minutes with a paint remover of the methylene dichloride type. Scrub to loosen the paint film. Flush with water to wash away the loosened paint. Scrub with scouring powder until the stain is removed. Flush with water.

If these methods do not remove the paint a poultice of a strong solution of sodium hydroxide in an inert base should be applied. The poultice should be about 5mm deep and should be left for a day before hosing off.

**Soils:** Mix a strong detergent solution of one cup detergent to five litres hot water. Saturate the area with water and scrub with a bristle brush. Rinse well after cleaning.

#### **Soot and Smoke**

Minor stains can be removed with sugar soap. Mix 500g sugar soap with 2 litres hot water and apply liberally with a brush. After stains disappear, scrub with a mixture of detergent and a household scouring powder containing sodium hypochlorite. For stubborn stains treat the area with undiluted sodium hypochlorite for 10 minutes before scrubbing and hosing.

A poultice of sodium hypochlorite solution in an inert base (such as diatomaceous earth) could be used for severely affected areas. The poultice should be left for 1 to 2 days before scrubbing and removing.

#### **Timber Stains**

Avoid leaving timber resting against the brickwork as the tannin may leach from the timber and cause staining. Wipe timber stains off with a solution of 120 grams oxalic acid per 4 litres of hot water. Neutralise the wall after this treatment.

## **CHEMICAL DISTRIBUTORS**

Some of the chemicals recommended may be available in a hardware store. There may also be a chemical distributor in your local area who can supply the chemicals required for cleaning brickwork stains. Some of the chemical distributors available include:

- **Marld** Ph: (02) 9736 2233 or (02) 9809 7184
- **APS Chemicals** Ph: (02) 9839 4000
- **Glendale Chemicals** Ph: (02) 9756 2300
- **Deschem** Ph: (03) 9889 4278
- **Calmarc** Ph: (08) 9378 2022 NB: Noskum is available from the chemical supplier Marld.