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#### **Publisher's version / Version de l'éditeur:**

<https://doi.org/10.4224/40000714>

*Canadian Building Digest, 1978-04*

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# Canadian Building Digest

Division of Building Research, National Research Council Canada

**CBD 194**

## Cleaning of Brickwork

*Originally published April 1978.*

*T. Ritchie*

### Please note

This publication is a part of a discontinued series and is archived here as an historical reference. Readers should consult design and regulatory experts for guidance on the applicability of the information to current construction practice.

During the life of a building its brick walls may need to be cleaned on several occasions, the first occurring even before it goes into service when the general dirt and dust of construction, including mortar splashed or smeared on the bricks as a result of the bricklaying procedure, have to be removed. A second cleaning will sometimes be necessary to remove efflorescence. Because mortar must be wet to render it plastic for bricklaying, brickwork becomes damp in the course of construction. As it subsequently dries, the moisture, in which the various salts derived from mortar and bricks have been dissolved, moves to the wall surface to evaporate, leaving a deposit of salts, usually as a white coating on the bricks.

When the brick walls will next need to be cleaned depends on the amount of soiling they receive in service, and this is governed by the nature of the atmosphere to which they are exposed. A brick farmhouse, for example, may well retain its original appearance over a century of service because of a relatively unpolluted atmosphere. In contrast, the brick walls of a building located in an industrial area with a highly polluted atmosphere may be dirty after only a decade or so of service. This Digest presents basic information on methods of cleaning brick walls and outlines some of the problems that can be encountered.

### Atmospheric Pollution

Of the many atmospheric agents involved in the soiling of buildings the most important in the past have resulted from the burning of coal. This produced, according to John Evelyn of London who wrote over three centuries ago, "that pernicious Smoake . . . superinducing a sooty Crust or Fur upon all that it lights . . . which obscures our Churches . . . makes our Palaces look old . . . (and) spots and contaminates whatever is exposed to it." Although old buildings in Canadian cities have probably been exposed to an atmosphere comparable to that of old London, coal smoke is now a less important atmospheric pollutant than it was in the past. Nevertheless, buildings in modern cities are exposed to atmospheres containing materials derived from coal and other fuels that can soil brickwork.

The burning of coal releases to the air materials such as soot, tarry matter, dust particles, various vapours and gases including carbon monoxide and carbon dioxide, water vapour, sulphur dioxide and oxides of nitrogen, as well as organic compounds, particularly hydrocarbons. The burning of other fuels such as oil and natural gas similarly produces soot

and vapours and gases including sulphur dioxide, ammonia, methane and acetylene, plus organic materials.

The particles of matter produced by the combustion of fuels and by such industrial processes as the heat treatment of materials may remain suspended in the air for a long time before settling out if, in the meantime, they have not collided with and attached themselves to a wall. The considerable amount of such matter in the atmosphere may be shown by dustfall collections taken in the industrial area of Windsor, Ontario. Here, average dustfall during the heating season is about 92 tons per square mile (32.2 t/km<sup>2</sup>) per month, with peak values as high as 200 tons (70.1 t/km<sup>2</sup>). In contrast, natural dustfall -- wind-blown sand, soil particles, pollen and vegetation -- probably amounts to about 5 tons per square mile per month (1.7 t/km<sup>2</sup>).

### **Other Reasons for Cleaning Brickwork**

The need to clean brickwork may arise from many causes other than those resulting from atmospheric pollution: stains from metals, particularly iron and copper used in conjunction with brickwork, and growth of lichens, moss and other vegetation. Cleaning may be necessary to remove efflorescence that forms as a result of excessive dampness resulting from some abnormal local condition, for example, spillage of water from a defective drain or eavestrough or rising dampness from earth in contact with the wall.

Brickwork that has been painted may not be aesthetically pleasing at a later date. Accidental spills of tar and asphalt, such as result from carelessness in making roofing repairs, or the intentional soiling of walls by vandals provide additional reasons for cleaning brickwork. Discoloration of the brick walls of old buildings by the tarry material that sometimes forms in chimneys built into the walls (and eventually finds its way through the bricks) can provide yet another.

### **Considerations in Cleaning Brickwork**

The materials usually employed in cleaning brickwork are highly corrosive and frequently toxic. They may require special equipment for their application and protective clothing for the operator. In addition, consideration must be given to protecting other parts of the building, nearby buildings, and trees and shrubs. For this reason the cleaning of brick walls is usually best left to specialists. Experience and the use of suitable equipment count for much in the success of a job. If, however, an individual undertakes to clean brickwork, he should read carefully and follow closely the directions given with the materials to be used.

The bricks of most buildings are made of burned clay or shale, but many structures have been built of sand-lime (calcium silicate) and concrete bricks. Acid cleaning solutions that have no effect on clay bricks may harm the others, and for these the strength of the cleaning solution must be reduced.

### **Sandblasting**

A growing interest in old buildings has led to extensive cleaning and restoration projects in many of which sandblasting has been used. A stream of air carrying sand is directed against a wall at such high pressure that the sand grains act as an abrasive. Although very effective in removing dirt and grime, sandblasting unfortunately also removes some of the brick and mortar. These materials, especially in old buildings, are relatively soft and therefore easily eroded by the impact of the sand grains. The result is usually a deep pitting of the bricks and mortar so that the original appearance of the brick is much altered. Its surface or "skin" is removed, revealing the large nodules of material in the interior of bricks as well as "fold lines" from the moulding of the clay. Not only are bricks frequently disfigured, but their resistance to weathering is reduced. The effect of the sandblasting of many buildings has been so harmful that the brickwork has been irreparably damaged from it. Unless, therefore, a particular example of brickwork is known to have been made of such dense bricks and hard mortar that they will be unaffected by sandblasting, this method of cleaning should be avoided.

### **Test Cleaning**

Before it is decided to use a particular method or even to have brickwork cleaned, it is useful to clean a relatively small area in order to assess the efficiency of the method and the resulting appearance of the brickwork. The area selected for test should be inconspicuous in case it is decided not to proceed with the cleaning. The results will not only provide an indication of the effectiveness of the cleaning procedure but may also reveal harmful effects on the bricks and mortar. If the wall is wetted after the test and allowed to dry thoroughly, possible contamination with efflorescence from the cleaning material may be revealed.

Useful information about a particular cleaning process can also be obtained by examining buildings on which it was used. Cleaning firms can provide examples of their work, of which as many as possible should be examined.

Because of the great diversity in the nature of the dirt that forms on brickwork and in the properties of the bricks and mortars affected by it, it is frequently necessary to try several cleaning methods before a suitable treatment can be found. For certain specific types of dirt and stain, however, the remedies given below are usually effective.

### **After-construction Clean-up**

The first step is to remove as much of the mortar smears and dirt from brickwork as possible, using a scraper, chisel or wire brush. The remainder may be removed by applying a solution of muriatic (technical grade hydrochloric) acid. It should not be stronger than 1:9 acid:water, for a stronger concentration may damage the mortar and stain certain bricks. The wall should be cleaned in small sections of between 10 and 20 sq ft (0.9 and 1.8 m<sup>2</sup>) at a time. Only after the area to be cleaned has been soaked with water should the solution be applied with a fibre brush and scrubbed over the brick surfaces. After 5 or 10 minutes the wall should be thoroughly rinsed with clean water.

### **Removal of Efflorescence**

Efflorescence frequently forms as fine, fibrous crystals projecting from the brick surface, so that much of it can usually be removed simply by brushing it off. If the appearance is not satisfactory the wall should be washed with water and scrubbed with a brush, followed by further rinsing with water. If this is still not satisfactory the same procedure as is used in after-construction cleaning should be employed: application of a 1:9 solution of muriatic acid after the wall has been soaked with water, followed by further rinsing with water.

If a wall that has been in service for a number of years without efflorescence develops this problem, the cause is usually a condition that has produced excessive wetting and should be corrected before the wall is cleaned.

Green efflorescence occasionally forms on brick surfaces because of certain salts of vanadium contained in the clay used to make the bricks. Such efflorescence may be removed by brushing on a solution of sodium hydroxide in proportions of 12 oz to a quart of water (300 g/L). The treatment itself will produce a white salt deposit on the wall, but this can be washed off with water three days after the cleaning solution has been applied.

### **Removal of Iron Stains**

The brown rust stain produced by iron or steel embedded in brickwork or so near it that water can run from the metal onto the bricks can usually be removed by applying a solution of oxalic acid in water (strength 1:10 by weight; 1 lb/gal or 100 g/L) to which has also been added 1/2 lb ammonium bifluoride/gal (50 g/L). If the stain is heavy, the solution should be applied hot, with a second application if necessary. In extreme cases a poultice, which holds the cleaning material in contact with the brick and draws the stain out, may have to be applied. Such a poultice may be made of sodium citrate, glycerine and water, in proportions 1:7:6, in a thick paste with a filler such as whiting and left on the stained area for several days before being brushed away.

### **Stains From Copper and Bronze**

The bluish-green stains that betray run-off of water from copper flashings and bronze fixtures can be removed from brickwork by the application of a poultice prepared from one part ammonium chloride (sal ammoniac) to four parts talc or diatomaceous earth to which is also added household ammonia. The paste is applied to the bricks and, when dried, brushed off.

### **Removing Paint From Brickwork**

A common method of removing paint from brickwork is to apply a commercial paint stripper that so softens and loosens the paint that it can be scraped off or removed by pressure from a stream of water. Paint may also be softened by means of a heat gun, propane torch or blow-torch, when it can be scraped from the bricks. Sometimes paint can be successfully removed by burning it to char and ash and brushing it off with a wire brush.

Most paint strippers contain toxic materials, however, and harmful effects may be experienced not only from breathing the fumes but also from absorbing the material through the skin. Their high flammability is also a fire hazard. They are, therefore, especially dangerous if used indoors, for example, in removing paint from a fireplace, because of restricted ventilation and the danger of fire. Even the product of paint removal may present a hazard if lead-containing paints have been used.

### **Fireplace Stains From Smoke and Soot**

Smoke stains on the bricks of fireplaces can sometimes be removed by scrubbing with soap and water; if this does not work, scrubbing with a commercial scouring powder that contains bleach and followed by a thorough rinse should be tried. In more difficult cases a poultice may be required, prepared from a filler such as talc or whiting with trichloroethylene as the active material. It may be smeared on the stained bricks and brushed off when dry. Such a poultice must be handled with care and used only where there is good ventilation because of the toxic nature of the active material.

### **Removal of Plant Growth**

Moss, lichens, vines and creepers are harmful to brickwork, particularly vines whose roots in mortar joints will eventually cause disruption and decay. Plant growth may be killed by the application of ammonium sulphamate or a 1:40 solution of zinc or magnesium silicofluoride in water. A commercial herbicide may also be used according to the directions of the manufacturer.

### **Bitumen and Tar Stains**

As much as possible of the staining material should be scraped from the wall. The remainder can be removed by applying a poultice comprising a filler of talc or whiting with a solvent such as xylene, toluene, trichloroethylene or mineral spirits. The poultice may be brushed off when dry. A repeat application is often required, but because of the toxicity of these solvents they must be used with care.

### **After Cleaning**

The main consideration in cleaning brickwork is usually its improved appearance, but another benefit may often be the uncovering of faults such as cracks and decayed material that should be repaired. In addition, repairs are best made to a clean wall, particularly if one wishes to obtain a good colour match between new and old work.

Any proposal that cleaned brickwork be "waterproofed" or "sealed" to preserve its appearance and life should be rejected unless a definite problem has been recognized for which such treatment is considered the most effective solution.

### **Conclusions**

Cleaning of brickwork at regular intervals is desirable as a means of prolonging its life, and it is often wise to establish a definite schedule of cleaning. Simply washing with water and scrubbing lightly at intervals of two or three years is frequently all that is necessary to maintain

it. various cleaning materials and methods are available, but in making a selection consideration must be given not only to the effectiveness of the method but also to the hazards involved and to possible adverse effects.