



Introduction

This ARRISCRAFT•NOTE discusses cleaning materials and methods for masonry walls and, more specifically, their relevance to Arriscraft masonry products. These recommendations are appropriate both during building commissioning and throughout the building's life cycle.

The first step in assuring an aesthetically-pleasing wall surface is to keep the masonry clean during its construction. Careful laying of the masonry materials combined with on-site protective measures and the progressive removal of hardened mortar will make post-construction cleaning a simple task.

It is understood that even the most beautifully designed and constructed wall can be irreparably damaged if not properly cleaned. There are many factors which must first be considered to determine the appropriate materials and methods before actual cleaning operations can commence.

It is always recommended that prior to the start of any cleaning operation the masonry manufacturer should be contacted to ensure the proposed cleaning method will not have an adverse effect on the appearance of the wall.

Factors Affecting Cleaning Choices

The science of cleaning masonry units depends upon striking a successful balance between removing the undesirable material and not harming the substrate. Before undertaking masonry cleaning projects, it is important to recognize the sensitivities of the substrate and to identify the nature of the substances being removed.

Methods for the removal of stains must also be taken into consideration relative to the cleaning materials being proposed. All cleaning methods are not equally efficient with different cleaners. Thus, the nature of the stain will dictate the cleaning method required.

The nature of the substrate will play a major part in determining the appropriate combination of materials and methods. Many manufactured masonry products, including Arriscraft masonry units, are classified as acid-sensitive. When brought into contact with acidic solutions, their colour will darken.

Failure to Clean and Cleaning Failures

Failure to Clean: Defining "clean" is an essential step during the cleaning process in order to determine the success or failure of the cleaning operation. Many stains may not be totally removed after having been

cleaned but rather, may only fade. As well, the appearance of the cleaned substrate may be altered to some extent from its original condition. Because of this, it is important everyone involved agrees ahead of time on a definition of "acceptably cleaned". To do this an inconspicuous patch of wall of the jobsite mock-up panel should be cleaned using the proposed methods and materials to determine their applicability and the level of clean deemed acceptable.

Cleaning Failures: Inconsistent cleaning (resulting from improper or inappropriate cleaning operations) can typically be attributed to four major causes:

- failure to uniformly saturate the wall surface prior to the application of a cleaning solution;
- failure to thoroughly rinse the cleaning solution from the wall's surface once cleaning operations have commenced;
- failure to use a suitable combination of cleaning materials and methods relative to the substrate's nature; and
- failure to protect adjacent materials from the effects of the cleaning solution or operation.

General Cleaning Guidelines

The first step towards achieving clean masonry walls is careful workmanship during the masonry construction. It is advisable to keep the masonry free from mortar smears. We recognize that at times, where jobsite conditions are challenging, this can sometimes prove difficult.

Some general precautions that can result in cleaner walls are:

- protect the base of the wall from rain-splashed mud and mortar splatter. Use straw, sand, sawdust, pine needles or plastic sheeting spread out on the ground, extending approximately 1 metre (3 ft.) from the wall surface and up the face of the veneer;
- at the end of each day's work turn any scaffold boards near the wall on their edge to prevent possible precipitation from splashing mortar and dirt directly onto the completed masonry;
- cover walls at the end of each work day with protective waterproof coverings to prevent mortar joint wash out and entry of water into the completed masonry;
- store masonry products on skids, off the ground and under protective coverings; and
- prevent excessive mortar droppings by cutting off excess mortar with a trowel as the masonry units

are laid. Tool mortar joints when they are “thumbprint” hard. After tooling, any excess mortar and dust should be brushed from the masonry surface using a soft bristle brush. Avoid rubbing or pressing the mortar into the units. Do not attempt any “wet” removal methods such as sponging.

Before any cleaning operations are permitted to commence, it is essential that the proposed materials and methods are tested. Such testing should be conducted either on a mock-up panel, or if no mock-up panel is available, then on a small, inconspicuous part of the wall area. Sample testing should be conducted under similar environmental conditions as those anticipated for final cleaning operations. Temperature and humidity are the two critical environmental factors which could impact on the appropriateness of the proposed cleaning operations. The test area should be at least 2 m² (20 ft².) in size to adequately implement the proposed procedures and solutions; however, larger areas may be necessary to accommodate the needs of different cleaning procedures. The effectiveness of the cleaning operation should be judged by visual inspection of the tested area once it has been allowed to fully dry.

Proper wall preparation is essential prior to the commencement of cleaning operations. If required, metal, glass, wood, and other surfaces should be properly masked or otherwise protected to prevent damage.

Regardless of the cleaning method being contemplated, it is essential to pre-wet the masonry surface before applying any type of cleaning solution. Pre-wetting the masonry units will help minimize their absorption of the cleaning agent. It is equally important to keep the units wet during cleaning operations, and upon completion to thoroughly rinse any cleaning solution from the wall surface. This must be done in a timely manner to ensure minimal exposure of the masonry to the cleaning agent.

Cleaning operations should always commence at the top of the wall and work their way progressively down the wall surface. This will prevent dirt or stains from being washed onto areas that have already been cleaned.

Heat, direct sunlight, warm masonry and drying winds will all affect the drying time and reaction rate of cleaning solutions. It is advisable to always clean areas of wall that are shaded to avoid rapid evaporation of the cleaning solution.

Sequence of Cleaning

To achieve the best results when cleaning masonry units it is recommended that the gentlest means possible be used. The strength and intensity of the cleaning procedure should be increased incrementally until the stain is effectively cleaned.

There are essentially four basic types of cleaning methods commonly used. In order of increasing severity, they are:

- pressurized water;
- hand scrubbing with water and detergent;
- repeated applications of chemical cleaning solutions; and
- mechanically applied abrasives.

Pressurized Water: is the application of clean water to the wall surface under a specified amount or pressure, sometimes by the use of pressure gun and nozzle equipment. The Brick Industry Association (BIA), in its Technical Note 20 – Cleaning Brick Masonry, describes three distinct categories of pressurized water cleaning: low, medium and high. Low-pressure is defined as 700-2100 kPa (100 – 300 psi), medium-pressure as 2100-4850 kPa (300 – 700 psi), and high-pressure as any pressure greater than 4850 kPa (700 psi).

Initial cleaning of masonry using anything greater than low-pressure water is not recommended. Medium-pressure may be effective provided the nozzle spray is fan-shaped or conical and the nozzle is maintained an adequate distance from the face of the masonry. High-pressure methods should be avoided for cleaning manufactured masonry products as it may result in the removal of the surface finish of the masonry unit. High-pressure methods may also damage mortar joints and under severe conditions potentially damage the masonry units themselves.

Hand Scrubbing with Water and Detergent: although the most tedious and labour intensive, it is also the safest and most effective method of cleaning masonry. Detergents are commonly available and are not considered high environmental risks. They are generally safe to handle and represent a minimum amount of risk to the masonry due to their mild cleaning nature. Examples of detergents to use include laundry detergent and trisodium phosphate (TSP).

A masonry cleaning brush should be used to scrub the masonry vigorously with repeated scrubbing sometimes being necessary before the wall becomes clean. The success of this method is directly proportional to the amount of “*elbow-grease*” applied. Once a section of

wall has been cleaned, it should then be thoroughly rinsed of any remaining cleaning solution.

Repeated Applications of Chemical Cleaning

Solution: include alkaline- and acid based cleaners, usually in the form of proprietary cleaning products. Most acid-based detergents and proprietary cleaners will darken the colour of the masonry units. Caution must be exercised whenever using such cleaning solutions. If improperly or inconsistently prepared or used, they could result in unsightly streaking of the masonry.

Proper dilution of these chemicals with water is essential to ensure the cleaning solution will not be too harsh for the particular substrate. Proprietary chemicals should always be diluted in accordance with the chemical manufacturer's recommendations for the particular substrate being cleaned. In the case of materials not listed by the chemical manufacturer then the manufacturer of the substrate material should be consulted for its recommendation.

Where buildings incorporate both clay brick and Arriscraft calcium silicate products, care must be taken during the cleaning of the brick to protect the Arriscraft products from inconsistent exposure to strong cleaning solutions.

Repeated applications of the chemical cleaning solution may be necessary and are commonly applied using similar methods to those used when cleaning with low-pressure water. It is possible for cleaning solutions to be driven into the masonry when applied under pressure, thus becoming a potential source for streaking and inconsistent colouration. If the walls are sufficiently saturated with clean water prior to the application of the cleaning solution, then the risk of penetration is reduced. It can be expected that this cleaning method will darken or alter the texture of some masonry products and any other acid-sensitive materials allowed to come into contact with the cleaning solution.

Mechanically Applied Abrasives: include sandblasting, wet sand cleaning, wet aggregate cleaning, and other such methods, wherein an abrasive agent is used to assist with the removal of the stain. Such methods should only be used when all other milder methods of cleaning have been unsuccessful. The effects of such cleaning can be damaging to masonry products, including mortar, and extreme caution must be exercised with their use. Slight modifications in the finished appearance of the masonry are inevitable as they accomplish their cleaning action by removing a very thin layer of material from the face of the masonry. This will

expose new material and aggregate in both the masonry units and the mortar which could result in changes in colour and texture.

Cleaning New Masonry

The need to clean new masonry is inversely proportional to the care and quality of work exercised by the mason during the erection of the walls. Careful workmanship will in most cases limit the extent of necessary cleaning; whereas, sloppy, hurried work will necessitate more extensive cleaning operations.

The extent and nature of the stains will dictate the appropriate materials and methods needed to properly clean the wall.

Certainly, before any cleaning operations are allowed to commence, proposed materials and procedures should be tested. This can usually be accomplished by test-cleaning the jobsite mock-up panel. Refer to the test cleaning criteria discussed as part of the General Cleaning Guidelines.

The following factors should also be considered when cleaning new masonry:

- schedule cleaning operations no sooner than seven days after the masonry has been completed to allow the mortar to achieve sufficient strength so as not to disturb the masonry during cleaning operations;
- keeping the first point in mind, schedule cleaning operations relatively soon after wall construction has been completed as mortar smears and splatters that are allowed to remain on the wall surface for extended periods of time (over one month) can cure on the masonry and become difficult to remove; and
- remove larger mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

Removing Efflorescence

The removal of efflorescent salts is relatively easy compared to some other types of stains as most forms are water soluble and will generally disappear on their own under normal weathering conditions.

It is usually not advisable to *wash* efflorescence from masonry except in warm, dry weather, since washing introduces considerably more water, which could bring more salts to the surface. However, if immediate removal is required, then salt deposits might be removed by dry brushing with a stiff fibre brush. Heavy accumulation or stubborn deposits may be removed using a chemical cleaning solution but caution with such methods must be used. Such methods should typically only be used with careful supervision by knowledgeable applicators.

There are other types of stains, sometimes improperly identified as efflorescence, which may occur as a result of other factors. Two such stains are commonly known as “Green Stain” (resulting from the presence of vanadium salts), and “Brown Stain” (resulting from the presence of manganese). These are more commonly found with clay brick and are not a concern when using Arriscraft products.

Summary

This ARRISCAFT•NOTE discusses cleaning of unit masonry walls and more specifically cleaning of Arriscraft manufactured masonry products. Care must be taken whenever cleaning masonry walls not to use materials or methods which could potentially harm the masonry. It is always prudent to contact the masonry manufacturer prior to commencing cleaning operations in order to ensure the proposed cleaning methods will not adversely affect the wall.

The information and suggestions contained herein are based upon the available data and information published by the listed references and the experience of Arriscraft International architectural and engineering staff. More detailed information may be found by referring to any of the related references listed below.

The information contained herein must be used in conjunction with good technical judgement and a competent understanding of masonry construction. Final decisions on the use of the information contained in this ARRISCAFT•NOTE are not within the purview of Arriscraft International and must rest with the project designer or owner, or both. It remains the sole responsibility of the designer to properly design the project, ensure all architectural and engineering principles are properly applied throughout, and ensure that any suggestions made by Arriscraft International are appropriate in the instance and are properly incorporated through the project.

Related References

1. Brick Industry Association, Technical Notes on Brick Construction 20 (Revised), Cleaning Brick Masonry, November 1990 (Reissued March 2000).
2. Brick Industry Association, Technical Notes on Brick Construction 23A (Revised), Efflorescence, Prevention and Control, Part II of II, June 1985 (Reissued January 2000).
3. Ritchie, T., Cleaning Brickwork, NRCC Canadian Building Digest, April 1978.
4. Weaver, Martin, Cleaning Masonry, Canadian Heritage Magazine, December 1981; pp 39-42.
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