TROWEL TIPS *Information*

Cleaning Masonry

Introduction

Cleaning is usually the last operation performed on newly constructed masonry. Unfortunately, it is sometimes performed as an afterthought, without proper planning or selection of cleaning procedures and techniques. Improper cleaning can virtually destroy the appearance and serviceability of new masonry. Usually, problems associated with the cleaning of masonry relate to: using the wrong kind of cleaning procedure for the specific masonry materials being cleaned, overcleaning in an attempt to compensate for poor workmanship during construction, or improper execution of recommended cleaning procedures. With careful planning, preparation, and application, these kinds of mistakes can be avoided and satisfactory cleaning accomplished.

Throughout the process, cleaning should be guided by the principle that "less is better"—meaning that it is better to underclean than overclean. Minor mortar smears and efflorescence associated with new masonry construction will often weather away as the building ages. In contrast, damage to the masonry from overcleaning can be virtually irreparable.

Planning

Attention to cleaning requirements should begin with preparation of the contract documents. Evaluate proposed cleaning procedures and techniques giving consideration to: the masonry materials used in the construction, the effect on adjacent materials (such as metal, wood, or glass), the logistics of the construction project, and any other site-specific factors that may affect the cleaning process. Next, perform the selected cleaning procedure(s) on a mock-up panel to verify suitability. The mock-up should be of the same materials intended for use in the construction and built with the level of workmanship expected on the project.

Acceptability of procedures selected based on evaluation of a mock-up should finally be confirmed on a trial section of the completed masonry before cleaning the whole project. The same individuals who will clean the entire masonry should first employ the proposed cleaning procedure on an inconspicuous area of the masonry. Not only will this step allow modification of the procedure to accommodate actual job conditions, but it will assure that all involved understand what is expected.

Materials

Mortar is usually the primary substance being cleaned from the face of masonry units in new construction. High-strength mortars (Type S and Type M) are generally more difficult to remove than lower-strength mortars. Unfortunately most methods that will remove mortar from the face of masonry units will also remove mortar from the surface of mortar joints. This fact can result in significant deterioration of mortar joints during the cleaning operation, particularly when less labor-intensive procedures such as acid cleaning, high pressure spray cleaning, or abrasive cleaning are employed. Measures need to be taken to minimize the effect of the cleaning operation on the surface of mortar joints. Focus scrubbing efforts on unit surfaces, not mortar joint surfaces. If acid solutions are used, the mortar should be allowed to cure at moderate temperatures for about seven days prior to cleaning. Pressure water sprays should only be used with extreme caution. Keep pressure sprays moving over the masonry surface. Angle sprays to avoid hitting the surface of mortar joints with a perpendicular stream of water.

Note 1: The use of cleaning solutions (particularly acidic solutions), high pressure spray cleaning, and abrasive cleaning techniques require special safety precautions for workers (such as eye protection and protective gloves and clothing) that are not discussed in this publication. Consult appropriate product labels, product information literature, and material safety data sheets for information on products and equipment used to clean masonry.

The principles involved in cleaning of masonry constructed using white or colored mortars are fundamentally the same as those for masonry using natural gray mortars. However, effects of cleaning that are not noticeable in gray mortar joints may be strikingly obvious on a white or colored mortar joint. As noted above, cleaning procedures can remove the surface layer of a mortar joint. Often the cement paste is dissolved, leaving exposed sand particles at the surface. In addition to creating a more porous joint surface, this can result in a change in the appearance – particularly if the sand color is significantly different from that of the cement paste. Overcleaning of masonry should always be avoided, but this is especially critical

when colored mortars are used. Manufacturers of proprietary cleaning solutions often provide different products for application on projects using dark-colored mortars than for projects using light- or white-colored mortars. The manufacturers of both the cleaning solution and the colored mortar materials should be consulted prior to selecting a cleaning procedure or solution. Cleaning procedures should then be evaluated as indicated in the previous discussion.

Masonry constructed using concrete masonry units usually requires no further cleaning than what is outlined in the construction section of this document. Mortar color is typically similar to that of concrete block. In addition, the block masonry surface is often either painted or plastered (stuccoed) to provide the desired finished appearance. If further cleaning is required where colored or architectural units are used, the manufacturer of those units should be consulted before selecting a cleaning procedure. Acidic cleaning solutions can dissolve cement paste from the face of concrete masonry units, altering the appearance and texture.

Consideration must be given to unit characteristics when selecting a cleaning procedure for masonry constructed with clay masonry. Once again, the manufacturer of the unit should be consulted for recommendations. Generally, a range of cleaning options is appropriate. Bucket and brush cleaning with a dilute acid or proprietary cleaning solution can be used on red/red flashed brick. High pressure water cleaning may also be used but is not recommended on sand finish or surface coated brick. Dilute hydrochloric acid (muriatic) cleaning solutions, including proprietary cleaners containing hydrochloric acid, are not to be used with brick that contains manganese or vanadium.

Construction

Good construction is integral to obtaining a clean masonry job. Excessive mortar smears are often a symptom of poor overall workmanship. They should trigger closer scrutiny of the masonry construction by the mason contractor's project supervisor or other members of the construction management team. An accomplished mason will construct masonry with a minimum of mortar droppings or smears on the face of units. The mason should take the following steps to reduce cleaning requirements:

- **Keep Units Clean:** Protect stored units from mud, dirt, or other contaminants.
- **Cover the Bottom:** Use straw, sand, or plastic to protect the base of the wall from rain splashed mud and mortar splatter.
- **Minimize Mortar Droppings:** Carefully cut excess mortar off with trowel as units are laid. Minimize amount of mortar droppings and smears on face of wall.
- **Time the Tooling:** Allow mortar joints to stiffen to "thumbprint hardness" before tooling. Tooling at the proper time will help to minimize mortar smears. (IMG13632)

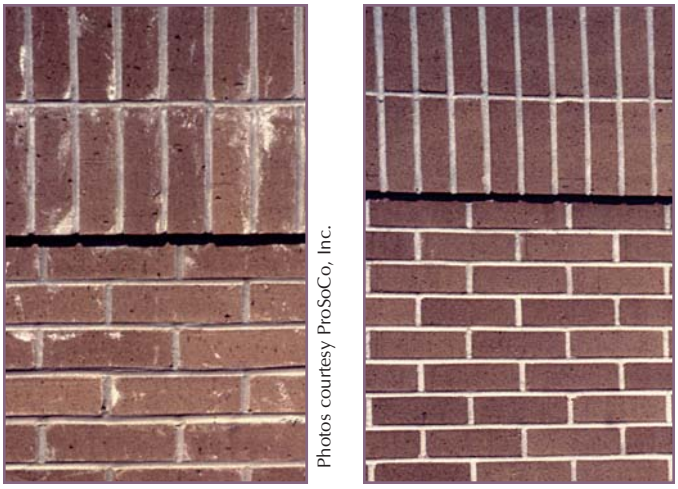
- **Trim with Trowel:** After tooling, use trowel to trim mortar burrs off flush with the face of the wall. (IMG13633)

- **Brush after Tooling:** Remove dust and loose mortar from face of masonry with a soft brush. (IMG13634)

- **Clean As-You-Go:** Remove mortar protrusions or droppings from masonry surface after mortar has set to avoid smearing mortar into masonry, but do not leave mortar droppings on masonry for an extended time as they will become difficult to remove. Non-metallic scrapers may be required to avoid damaging the surface of clay masonry units or architectural block units. Often a small piece of a similar unit will function as a satisfactory scraper. (IMG13635)

- **Cover the Top:** Prevent rain from entering walls by covering the tops of walls at the end of each working day. This practice helps reduce the possibility of efflorescence. (IMG13636)

- **Put the Inside Edge Up:** Turn the inside scaffold board on edge at the end of each working day to prevent rain from splashing mortar and dirt onto the masonry wall.
- **Spot-Clean Smears:** When practical and compatible with the masonry unit, use a stiff fiber brush and water (with or without sand) to scrub mortar smears off the masonry surface. This is most effective when performed within a day or two of the occurrence of the smear.



Photos courtesy ProSoCo, Inc.

Careful selection of cleaning agents and techniques is required to remove mortar smears like these (left) without damaging units or mortar (right). (IMG13637, IMG13638)

Cleaning Procedures

Dry brushing is perhaps the least aggressive cleaning procedure available. It is effective in removing loose dust, sand, and some types of efflorescence from the surface of newly constructed masonry. On small projects, or where meticulous care has been taken to limit and remove mortar smears during construction, dry brushing is often adequate.

Dry brushing is not sufficient on larger projects with more demanding cleaning requirements. The use of "bucket-and-brush" with a cleaning agent may provide the best alternative. The cleaning agent can be water, detergent and water, a dilute acidic solution, or proprietary solutions manufactured specifically for masonry cleaning. Selection of an appropriate cleaning solution requires: consideration of the masonry units, evaluation of the substance(s) intended to be removed from the surface, and consideration of building elements and materials next to the masonry. Select the cleaning solution that will provide adequate cleaning without significantly eroding the surface of either the units or mortar. Obviously, if cleaning with water, or water and a detergent, will satisfactorily remove objectionable substances from the masonry, acidic solutions (including acidic proprietary solutions) should be avoided.

A dilute solution of hydrochloric (muriatic) acid is often used to clean mortar smears from the face of clay masonry construction. Some architectural concrete masonry may be cleaned in the same way. Mix the acid with water in a non-metallic container at a ratio of 1:19 (5% solution) or 1:9 (10% solution). Never add water to concentrated acid. As an alternative, proprietary acid-based masonry cleaning solutions may be used. Such cleaning solutions often incorporate detergents and wetting agents in their formulation. They are usually sold as concentrates and must be carefully mixed with water in accordance with the manufacturer's recommendations. Before using an acid or proprietary cleaning solution, always check with the manufacturer of the masonry units to confirm that the proposed solution will not damage those units.

Adjacent building elements and materials that could be etched or stained by the cleaning solution must be protected. In particular, metallic and painted surfaces should be covered with polyethylene or another effective barrier to the cleaning solution.

Thoroughly wet masonry surfaces with clean water before applying a detergent or acid based cleaning solution to the masonry. This presoaking will prevent the cleaning solution from being absorbed deep into the pores of the masonry where it may react with masonry materials, resulting in chronic efflorescence or staining. The cleaning solution should be applied liberally with a stiff bristle brush (non-metallic) and allowed to stand for approximately five minutes. Start at the top of the wall and work down. Make sure that masonry below is pre-wet and other surfaces are protected. Work with small sections, concentrating on removing smears from the face of units, not on the surface of mortar joints. The cleaning solution must be thoroughly rinsed from the masonry with clean water before it starts to dry into the masonry. Failure to adequately wet the masonry prior to application of the cleaning solution, and failure to completely rinse the masonry after application of the cleaning solution often result in a white scum residue on the surface of the masonry. Compounds dissolved by the cleaning solution when dried into the masonry surface may no longer be soluble in a conventional acidic cleaning solution and can be virtually impossible to remove without damaging the masonry.

Prewetting and careful rinsing are key steps for successful cleaning with a cleaning solution. (IMG13639)

Photos courtesy ProSoCo, Inc.

Apply cleaning solution to small sections of masonry with a stiff bristle brush. (IMG13640)

Pressure water cleaning should be used only with extreme caution. Too much water or pressure can saturate a wall, causing efflorescence. Improper use of pressure water sprays can also damage the face of masonry units and erode mortar joints. When used in conjunction with a cleaning solution, the same preparation is required as with the bucket-and-brush method outlined previously. The masonry must be presoaked with clean water prior to application of the appropriate cleaning solution. The cleaning solution may be applied to the masonry surface under pressure just sufficient to carry the solution to the masonry face. After the cleaning agent has been on the wall for about five minutes, the pressure water spray may be used to clean and rinse the wall. Nozzle pressures should be limited to less than 700 psi. Use a fan nozzle to produce a flat spray. Keep stream of high pressure water moving over the surface. Angle spray to avoid hitting the surface of the masonry with a perpendicular stream of water.

Abrasive cleaning techniques include dry and wet abrasive blasting. The abrasive material most often used is sand. While wet blasting tends to be less destructive than dry, both methods function on the principle of cleaning by eroding the surface of the masonry. Neither is generally recommended for cleaning new masonry construction. For additional information on abrasive cleaning techniques and cleaning special stains see the references listed below.

References

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