

mon atmospheric pollutants. It also increases the risk of freeze-thaw damage in the winter and the growth of “micro-vegetation” in warmer conditions. Water that gets into the wall from other sources is also trapped because it cannot evaporate at the surface, so concealed metal components and structural supports are subject to accelerated corrosion and failure. And moisture damage, of course, can go beyond the masonry wall itself to interior finishes and other adjacent elements.

If cleaning has been determined as a necessary and desirable part of the restoration or preservation process, the first step in developing a cleaning program and specification must be one of testing and evaluation. Rudimentary field examinations and laboratory chemical analysis can determine the relative inertness or reactivity of the masonry and the nature and composition of the dirt or stains.

Dirt (or soiling) generally refers to particulate surface deposits, while *stains* are produced by foreign matter that has penetrated into or permeated the masonry. Dirt may include such solids as dust, sand, grit, carbon soot, and inorganic sulfates. Stains include those of metallic origin such as iron or copper; industrial stains of grease, oil, and tar; biological and plant stains caused by lichens, moss, algae, and fungal growth such as mildew; and internally activated stains such as efflorescence, calcium carbonate, vanadium, and manganese. Surface coatings such as paint, wax, or water repellents may also be present.

There is no such thing as typical urban dirt, nor is there typical masonry when dealing with historic buildings. An extraordinary variety of geological and man-made materials have been used in masonry construction, and often in combination with one another. A single facade may incorporate several textures and colors of brick, terra cotta copings, or decorative elements, and two or more types of stone used as lintels, sills, cornices, or belt courses. Side and rear elevations that are less exposed to public view may also be of less expensive, softer materials. The degree of soiling also varies with geographic orientation, location relative to street and pedestrian traffic, height above ground level, and configuration of projecting elements. The cleaning program must be designed to preserve the integrity of the entire building fabric (including non-masonry materials such as wood, glass, and metal), as well as to protect adjacent buildings, the surrounding landscape, occupants, workers, and passersby. Each building presents a unique set of problems—some known and some unexpected—and each requires a unique solution. There *are* no standard specifications. The Construction Specifications Institute (CSI) and the Association for Preservation Technology International (APT) have jointly published a technical document entitled *Guide to Preparing Design and Construction Documents for Historic Projects* (CSI Document TD-2-8), which provides in-depth information on documenting existing conditions and preparing drawings and specifications for the restoration or rehabilitation of historic structures.

16.4.1 Testing

A cleaning program should be initiated with carefully planned, on-site testing of specific materials and cleaning methods, begun well in advance of necessary completion dates. An experienced preservation consultant or cleaning contractor should be hired to perform the testing separate and apart from the cleaning contract itself, even if the same contractor will be used for the actual cleaning.

Because of the number of unforeseeable factors and the uncertainty of the results, most test patches should be located in an inconspicuous area of the building. Paint removal testing, however, should be done near the front entrance to the building where the most layers of paint are likely to be. Test patches should also be representative of the different types of substrates involved, and the (often dissimilar) substances to be removed. To ensure the most accurate test results, remove as much of the dirt or stain as possible by hand scraping with wooden paddles or brushing with non-metallic bristle brushes before test cleaning—and follow the same procedure when full-scale cleaning begins.

Start with what the Secretary of the Interior's standards for historic rehabilitation call "the gentlest means possible." Carefully document each tested procedure as to number of applications, cleaning material and equipment, dwell time, and wash/rinse pressures. Even small buildings may require a variety or a combination of cleaning methods. The best approach is to find the gentlest technique that will remove the prevailing substance, and augment it with more aggressive localized cleaning in difficult areas. It is always better to under-clean rather than over-clean. If you are testing chemical cleaners, non-staining pH papers should be held on the surface of the masonry before and after to determine if any acidic or alkaline residue remains.

Test patches serve as the standard by which full-scale cleaning is judged. But do not evaluate the test areas until they are dry and have weathered as long as possible. Ideally, exposure to a complete 1 year weathering cycle will give the most accurate and reliable information. When this is not feasible, a minimum of 1 month should be allowed, during which there are several wetting cycles and a number of temperature variations. Tests should also be conducted under weather conditions similar to those anticipated during actual cleaning, particularly when using chemical compounds that are affected by weather. The dilution ratios and dwell times used successfully in one season may not be as effective in another. Remember, too, that tests are usually performed under optimum conditions. It is always easier to effectively clean small areas at ground level than to achieve the same results from a scaffolding or swing stage at higher wind elevations on a Friday afternoon when everyone is tired. Expectations should be realistically based on actual field conditions.

16.4.2 Cleaning Methods

There are several different levels of intervention that can be implemented, using prudent combinations of water, hand scrubbing, detergents, and chemicals. *Do not use abrasives.* Grit blasting, wet or dry, whether it uses sand, crushed nut shells, rice hulls, egg shells, silica flour, ground corncobs, or any other medium, removes dirt and stains by tearing away the surface of the substrate itself. It accelerates deterioration of the brick or stone, disintegrates mortar joints, and irreversibly damages the masonry, shortening the remaining life of the building.

Grinding and power sanding can be equally destructive. Most historic brick is soft by today's standards. Any cleaning method that removes or abrades the durable outer layers formed in the firing kiln or the protective crust formed by weathering exposes the soft inner body to harsh environmental deterioration. The cost is prohibitive in terms of damage to historic building materials that are neither indestructible nor renewable.