TECHNICAL BULLETIN 15

RESTORATION CLEANING OF MASONRY FAÇADES



These "before and after" photos of the Pennsylvania Academy of the Fine Arts in Philadelphia illustrate one of the main reasons for restoration cleaning – a clean building looks better than a dirty building.

INTRODUCTION

One of the main reasons for restoration cleaning is also one of the most obvious: a clean building looks better than a dirty building. It is more valuable and appears to be a better place to live, work or shop. As cleaning removes decades of grit and grime, architectural treasures are often revealed where once there was only a public eyesore.

The fact is heavy surface soiling and deposits contribute to masonry decay. Some historic buildings become so covered with paint and grime, conservators cannot accurately assess the building's condition. Restoration cleaning may expose deteriorating metal anchors or flashings, subsurface staining, cracks, missing mortar joints and other serious problems. Restoration cleaning is usually the first step in analyzing and repairing the deterioration – the first step in a diagnostic process.

SELECTING A CLEANING PROCEDURE

When selecting a cleaning procedure, it must be recognized that the removal of surface soiling and subsurface staining may alter the physical condition and appearance of the substrate. The task is to select the process that provides the desired degree of cleaning resulting in the least damage to the masonry substrate.

There are five basic methods for cleaning masonry surfaces:

a. Water Cleaning

b. Abrasive Cleaning

c. Chemical Cleaning

d. Thermal Cleaning

e. Laser Cleaning

DIFFERENT TYPES OF CLEANING METHODS

A. WATER CLEANING

Steam Cleaning

Water heated in a flash-boiler is directed as a steam jet at the stained surface through a wand. The pressures generated by the jet vary from 0.7 to 3.4 bars (10 to 80 pounds per square inch) depending on the equipment employed. The combined action of the heat and moisture causes some surface staining to swell and loosen enabling them to be rinsed away.

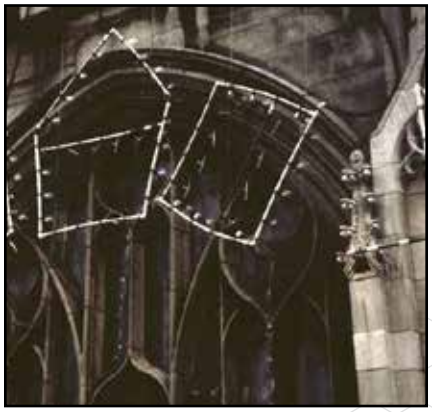
Advantages of Steam Cleaning

1. Use of low-pressure makes possible the cleaning of deteriorated, ornate stone, which would not withstand conventional pressure or abrasive techniques.
2. Allows use of the mildest possible cleaning agents and rinsing pressures for removal of carbon encrustations on calcareous or other masonry surfaces.
3. Effective in removing surface organic growth.
4. Using only water allows for the run-off to be directed to most public drainage systems instead of requiring reclamation (check local requirements).

Limitations of Steam Cleaning

1. The cost of steam-generating equipment and the amount of time required for effective cleaning make the process inefficient from a cost standpoint.
2. The use of excessively high temperatures presents a significant safety hazard to the operators.
3. The cloud of steam generated at the surface makes it difficult for the operator to monitor the process and creates visibility issues resulting in further safety hazards. The tendency to rush the cleaning process often results in incompletely rinsed, blotchy surfaces.
4. Though effective for removal of light to moderate surface soiling, this process is less effective when removing severe soiling.
5. Not effective for removal of subsurface staining.

Water Soaking



Water soaking – A custom-designed sprinkler system keeps the water running over the marble masonry of St. Patrick's Cathedral, New York City.

Soaker hoses, or specially designed spraying devices, are directed at all portions of the building façade. A slow, steady stream of water or water vapor causes the dirt deposits to swell, loosening their grip on the underlying masonry. Accumulated water cascades over the face of the masonry, washing the loosened dirt away.

Advantages of Water Soaking

1. The use of low-pressure water mists allows the cleaning of precariously deteriorated stone which would not withstand conventional water pressure or abrasive techniques.
2. Allows use of mild cleaning agents and techniques for effective removal of carbon deposits.
3. Using only water allows for the run-off to be directed to most public drainage systems instead of requiring reclamation (check local requirements).

Limitations of Water Soaking

1. Prolonged exposure to water may result in oxidation of natural components of the masonry or underlying structure causing staining or structural decay (i.e. metal fasteners).
2. Prolonged exposure to water may transport harmful salts deep into the masonry.
3. Thoroughly saturated masonries may take several months to dry.
4. Water soaking procedures must be scheduled when there is no threat of freezing temperatures throughout the cleaning and drying process.
5. Continuously cascading waters may result in surface erosion.
6. Scaffolding and rigging requirements for water-soaking operations are usually more elaborate than those required for other cleaning processes.
7. Water runoff must be controlled to prevent intrusion into basement areas and surrounding properties.
8. Water soaking is a very slow method – can take several hours or days.

Pressure Washing

When used properly, pressure washing equipment can be extremely effective for the restorative cleaning of older masonries. During the past 30 years, the design and manufacture of pressure washing equipment has grown by leaps and bounds. When considering the use of pressure washing equipment in any cleaning program, it is important to consider the amount of pressure (measured in pounds per square inch, or psi) and the amount of water discharged (measured in gallons per minute, or gpm). In restoration cleaning, pressure rates of 400 to 1200 psi, and flow rates of 6 to 8 gpm are usually effective. Determining the correct and most efficient psi and gpm depends on the condition of the masonry and the severity of the staining.

The size and type of spray tip used with the equipment must also be considered. Generally, a fan-type nozzle providing a 15 to 40 degree fan is best. Laser tips or fan spray tips with less than a 15 degree opening should not be used because of the possible damage caused by such a concentrated stream of water.



Pressure Washing – A technician uses a pressure washer to flush spent chemical cleaner and dissolved soiling from the limestone masonry of Denver's Cathedral of the Immaculate Conception. Pre-wetting is an important first step in the cleaning building with a combination of pressure-washing and chemicals.

Advantages of Pressure Washing

1. Pressure washing equipment enables the operator to quickly remove superficial surface soiling and loose surface debris.
2. Used in conjunction with chemical cleansing agents or abrasive materials, high-pressure washers may help minimize the harmful effects of any one of the cleaning systems applied independently.
3. Use of appropriate rinsing pressures and water volume can substantially reduce the amount of scraping and/or scrubbing required to achieve the desired degree of cleaning.
4. The process is effective for removal of light to moderate atmospheric and organic soiling.
5. Using only water allows for the run-off to be directed to most public drainage systems instead of requiring reclamation (check local requirements).

Limitations of Pressure Washing

1. When used without chemical cleaners or abrasives, high-pressure water rinsing is generally not effective for the removal of heavy soiling or subsurface staining.
2. Excessively high water pressures and flow rates have an abrasive effect, which may result in removal of the surface of the masonry and accelerate decay.
3. Prolonged exposure to water may result in oxidation of natural components of the masonry or the underlying structure causing staining or structural decay.
4. Water-saturated masonry may take several weeks to thoroughly dry.
5. Pressure water cleaning procedures must be scheduled when there is no threat of freezing temperatures.

6. Interior surfaces, furnishings and equipment may be damaged by prolonged exposure to water or water entering through voids in the wall system.
7. Water runoff must be controlled to prevent intrusion into basement areas and surrounding properties.
8. Damage to the façade components can result from using the pressure-washer too close to the material being cleaned. Workers must be cautious to maintain the prescribed distance from the wall as established in test cleanings.

B. ABRASIVE CLEANING

The object of abrasive cleaning is to remove the outer portion of the masonry on which the soiling has deposited, not to dissolve and wash away the soiling. Ideally only the masonry's outermost soiled surface is removed.

Included in this category are grinding wheels, sanding disks, sanding belts and the more popular grit blasting. Silica sand remains the most common abrasive blasting material. In recent years, crushed carbonate stone products have gained popularity as a replacement for sand due to concern over health hazards posed by airborne silica dusts. There is also the option to use softer, less damaging abrasives such as crushed cornhusks, walnut shells, glass beads, and others.

Some proponents of grit blasting techniques combine abrasives with moderate-to-high pressure water washing to produce wet sandblasting, frequently referred to as hydro-blasting. The theory is that water, surrounding the grit, cushions the impact of the abrasive on the substrate. The relative worth of this "cushioning" effect remains a question in the minds of many conservators. However, it is recognized that combining the dirt-softening and rinsing properties of water with the scouring effect of the abrasive may reduce the severity of the exposure required for cleaning.

Advantages of Abrasive Cleaning

1. The need to identify the nature of the masonry substrate and staining conditions properly is least important when using abrasive cleaning techniques.
2. Dry grit blasting can be employed without risk of freeze/thaw damage.



Sandblasted – this close-up of masonry subjected to an ill-conceived abrasive cleaning process shows damaged mortar joints and exposure to weather of the soft inner body of the brick.

3. The process is effective in removing a variety of surface soiling and other contaminants.

Limitations of Abrasive Cleaning

1. Abrasive techniques cannot discriminate between surface soiling and the masonry substrate. Removal of surface soiling requires removal of the masonry surface, exposing a softer substrate to more rapid deterioration.
2. Abrasive techniques are not effective in removal of subsurface staining.
3. Dust created by dry abrasive techniques makes it difficult for operators to monitor their progress.
4. Safety hazards presented by airborne silica dust have led to the banning of sandblasting operations in many municipalities.
5. The potential damage by airborne dust to surrounding and interior mechanical systems is very great.
6. Incorporating water with abrasives creates all the same limitations as traditional water washing techniques.
7. Abrasive cleaning significantly increases the exposed surface area of treated substrates to the effects of atmospheric corrosion, water absorption and related decay processes.
8. Grit blasting increases the need for repointing.
9. The aggressive nature of abrasive cleaning makes damage to masonry, stone and concrete surfaces more likely than with other cleaning processes.

C. CHEMICAL CLEANING

Employed with one of the water washing techniques already described, chemical cleaners dissolve and mobilize surface soiling and subsurface staining matters, allowing them to be rinsed away.

Though commercially available proprietary cleaning compounds may consist of a number of blended, complementary cleansing agents, the great majority fall into one of four broad types of chemistry:

a) Acidic cleaners

b) Alkaline cleaners

c) Neutral cleaners

d) Organic solvent cleaners

Though water-thin liquid or gelled cleaners are commonly used, the product consistency may be further altered to extend the surface contact time, reduce the reliance on water pre-wetting and rinsing, or to extract deep-set staining. Such alterations add two additional categories of chemical cleaning:

e) Peelable cleaners

f) Poultice cleaners

Acidic Cleaners

The most commonly encountered acidic cleaner for restorative cleaning is hydrofluoric acid (chemical symbol: HF). HF-based compounds react with surface deposits and the masonry to dissolve the interface between the stain and the masonry substrate. HF-based cleaners are particularly effective in removing heavy surface staining from acid-resistant siliceous surfaces, such as sandstone, brick, granite and others. Stains are rinsed away with pressure washing equipment.



Acidic cleaners – A restoration cleaner containing a small amount of hydrofluoric acid removes decades of atmospheric staining from the clay brick and terra cotta masonry of the County Records Building, New York City.



Acidic cleaner – The limestone masonry of the Insurance Exchange, Chicago, was cleaned with an alkaline restoration cleaner. The cleaning contractor temporarily left the 30-foot wide strip of uncleaned masonry to show the difference a good cleaning makes.

Hydrofluoric acid is particularly well suited for this type of application because it is highly effective at relatively low concentrations. HF is also desirable over other acids because it is least likely to leave potentially damaging soluble residues after rinsing.

Other acids commonly used in restoration cleaning include hydrochloric acid, oxalic acid, sulfamic acid, sulfuric acid and other organic acids.

Advantages of Acidic Cleaners

1. When combined with water rinsing techniques, hydrofluoric acid effectively removes surface staining which is not easily removed from siliceous surfaces by water washing techniques alone.
2. Selective use of acidic cleaners can significantly shorten the time period required for water-soaking or steam-cleaning operations.
3. Allows rinsing pressures to be significantly reduced when employed with pressure-washing equipment.
4. Effective in removing a wide variety of surface soiling and subsurface staining matters.

Limitations of Acidic Cleaners

1. HF acid is extremely dangerous. Care must be taken in handling, storage and application to prevent injury or damage to persons or property.
2. Used in high concentrations, HF acid and other acidic cleaning solutions may etch, stain or otherwise significantly damage masonry substrates.
3. Acidic cleaners attack calcareous surfaces such as limestone, marble and travertine.
4. Not effective in removing paint coatings.
5. May etch polished masonry surfaces and window glass.

Alkaline Cleaners

Sodium hydroxide, potassium hydroxide and ammonium hydroxide are among the alkaline cleaning agents most commonly used in restorative cleaning. Alkaline cleaners work by consuming organic compounds that make up much of the grime or accumulated paint coatings commonly encountered on older masonry facades.

Since they react more slowly than acidic cleaners, many alkaline cleaners are thickened to a syrup or gel consistency. This makes heavier application and prolonged wet contact times possible. With extended contact times, such cleaners are capable of removing heavy accumulations of grime or multiple layers of many common paint coatings.

Complete rinsing of many alkaline cleaners requires use of an acidic neutralizing rinse. Failure to properly neutralize surfaces which have been exposed to prolonged contact with concentrated alkaline cleaning solutions may result in residual staining or damage caused by the drying and crystallization of alkaline salts within the masonry surface.

Advantages of Alkaline Cleaners

1. Ideal for spot-treating heavily stained areas where carbon and mildew stains are most severe, such as horizontal surfaces, under window sills, eaves, etc.
2. When combined with water rinsing techniques, alkaline cleaners provide effective removal of heavy surface soiling and some paint coatings not reactive to water techniques alone.
3. Effective for use on acid-soluble, calcareous surfaces such as limestone, marble and travertine.
4. Significantly shortens the time period and volume of rinsing water required in water soaking or steam cleaning operations.
5. Allows water pressure to be significantly reduced when employed with pressure washing techniques.

Limitations of Alkaline Cleaners

1. Concentrated alkaline materials, whether powdered or liquid, are extremely dangerous. Care must be taken in handling, storage and application to prevent injury to persons and property.
2. Inadequate rinsing or neutralization of surfaces cleaned with alkaline solutions is likely to result in residual staining, efflorescence or a blotchy appearance due to alkaline residues left on and in the substrate.
3. Application to substrates containing relatively high quantities of iron compounds may result in the occurrence of rust staining. This includes many sandstone, some limestone and granite surfaces.

Neutral Cleaners

Neutral cleaners are the least



Neutral cleaning before & Neutral cleaning after – Decades of tobacco smoke stained the sugar-white Colorado marble of the Cuyahoga County Courthouse's ceiling and walls. Workers used a neutral-pH restoration cleaner to restore the interior's original appearance.

aggressive of the chemical cleaners, with a pH range of six to eight. These include non-ionic cleaners, soaps and other mild cleaners. They are particularly effective at removing light to moderate soiling and can be used on acid-sensitive calcareous substrates like limestone, marble and travertine.

Advantages of Neutral Cleaners

1. Mild with limited adverse effects on substrates or applicators.
2. They remove light to moderate soiling.
3. Significantly shortens the time period required for water as well as the amount of rinsing water required in water soaking or steam cleaning operations.
4. Allows water pressure to be significantly reduced when employed with pressure-washing techniques.

Limitations of Neutral Cleaners

1. Limited to light to moderate soiling and may not perform adequately on heavy soiling.
2. May leave residue on surface if not rinsed properly.
3. Some products may have environmental concerns.

Organic Solvents

Aromatic hydrocarbons and chlorinated hydrocarbons are sometimes used in restorative cleaning programs to remove synthetic treatments, such as paint coatings, caulking compounds, oils, grease or bituminous materials. Organic solvents may also be used to remove other non-water-soluble staining matters.

Advantages of Organic Solvents

1. Effectively remove staining matters that are not soluble in water.
2. Used with poultices, organic solvents can remove deep-seated staining without damage to the masonry.
3. Safe for use on calcareous surfaces.
4. Effective in removing some paint coatings.

Limitations of Organic Solvents

1. May require mixing with diluents (aliphatic hydrocarbons) to bring the strength of the solvent to a usable level.
2. Solvent cleaners may evaporate rapidly, limiting the effective working time.
3. Solvents may dissolve and disperse staining matters deeply into the masonry substrate.
4. Many solvents are highly flammable. Care must be taken when handling, storing and applying such solvent types.
5. Areas to be cleaned must be well ventilated. Use in close quarters may produce light-headedness or serious injury.
6. Some industrial solvents are known carcinogens and must be handled with extreme caution.

Peelable Cleaners

Peelable cleaners are fluid-applied surface coatings formulated for application to dry masonry surfaces where use of conventional water or chemical cleaning procedures is problematic. Used primarily on building interior or overhead surfaces, peelable cleaners dry to form an opaque, peelable film. When removed from the surface for disposal, loosely bound surface contaminants and light surface stains adhere to the film. A wet sponge is then used to remove any remaining traces of mobilized stains.

Advantages of Peelable Cleaners

1. Little to no water needed for cleaning.
2. Effective for removal of lightly adhered, superficial surface soiling.
3. The low odor of some peelable cleaners make them practical for use in occupied buildings.
4. Can be sprayed or brush applied to ornate surfaces.
5. Dried film easy to dispose of.

Limitations of Peelable Cleaners

1. May damage water-sensitive substrates.
2. May be difficult to remove from porous or heavily textured surfaces.
3. Though different formulations can be produced to address specific types of soiling, peelable cleaners are not suitable for removal of deep-set stains.
4. May not be suitable for removal of surface coatings.

Poultices

Poultice cleaning is commonly used for the controlled removal of surface soiling and deep-seated stains or salts



Poultice Cleaning – This limestone column cap (L) in the Tennessee State Capitol, soiled by decades of tobacco smoke and dust was cleaned with a poultice stain remover. A similar cap (R) waits for the same treatment.

from interior or exterior masonry. A poultice consists of a liquid blended with a highly absorbent, inert, dry material to form a thick, wet paste.

Applied to a dry surface at a thickness of 1/8 – 3/8 inches (3 -10 mm), liquid is absorbed from the wet poultice paste into the masonry surface where it slowly dissolves the target stain or salt. As the surface of the paste begins to dry, evaporation reabsorbs the liquid and mobilized staining into the applied poultice paste

The type of soiling, stain or salts being removed – and the sensitivity of the surface being cleaned - will determine the nature of the liquid component. For instance, to remove water-soluble salts, poultices consisting of fresh water blended with inert clay are commonly used. Conversely, to remove staining which is not soluble in water, a solvent or chemical detergent will be required. Certain poultice formulations may require surface neutralization.

When selecting the most suitable absorbent material the application method, surface texture and overall project conditions must be considered. Common absorbents used in poultice cleaning include proprietary poultice blends, Attapulgite clay, Fuller's Earth, talc, clay-based kitty litter, shredded paper, cotton wool, and methyl cellulose. A small trowel or taping knife may be used for spot applications. Plasterer's trowels and power sprayers are commonly used for larger, general applications.

To improve cleaning efficiency, and to extract more deeply set or severe staining, wet poultices are commonly covered with polyethylene or a specialized protective sheet. This protective cover controls evaporation and prevents contact with passersby. Allowed to remain in place for 4 – 24 hours, the protective sheet is removed and the poultice allowed to dry before removing the mobilized staining with the dried poultice. A wet sponge or gentle water rinse is then used to remove all traces of absorbent media from the cleaned surface.

Advantages of Poultices

1. Ideal for removing deep-seated stains
2. Preferred method for removing salts from historic masonry
3. Can be conveniently mixed at the job-site
4. Poultices are ideal for the controlled cleaning of sensitive or vulnerable substrates
5. Can be selectively used as spot cleaning in combination with other cleaning methods
6. The absorbent poultice material can be mixed with specialized cleaning compounds to target specific stains.
7. The extended contact time produces dramatic cleaning results with low chemical concentrations.
8. Very little risk of mechanical damage to the masonry surface when used properly
9. Ideal for use on complex facades where a high level of cleaning control is desired
10. Minimizes the volume of rinse waters required.

Limitations of Poultices

1. May not be practical for large-scale cleaning
2. Multiple applications may be required when removing heavy salt contamination or deep-seated stains.
3. Dry poultice powders should be used with proper personal protection equipment to prevent inhalation of fine particles
4. Incorrect use of chemical poultices can damage sensitive surfaces and may require neutralization.
5. Not a quick method; to maximize cleaning efficiency, the poultice must dry thoroughly before removal.

D. THERMAL CLEANING

Heat

Electric heat guns are primarily used for paint stripping. The heat gun pulls air into the body of the tool and drives it across an electric heating element and out through a nozzle. The heated air is directed onto the painted surface, causing it to soften so the paint can easily be stripped off, using either a stripping knife or hook. It is best to use the heat gun above the stripping tool, softening the paint just before the stripping tool reaches it.

Advantages of Heat Gun

1. The heat is almost instantaneous so the heat gun can be switched off during pauses in the work.
2. Effective in removing many types of paint coatings.
3. Easy to control. Able to direct the heat to a particular spot.
4. Effective for removing paint from detail work.

Limitations of Heat Guns

1. Extreme heat can cause highly flammable items to catch fire.
2. Can cause cracks in glass or spalling of wet masonry.
3. A heat gun has an electrical resistance coil that typically heats between 500 - 750° Fahrenheit. Caution must be taken to prevent injury.
4. Not applicable for the removal of lead-based paints because of the danger of lead paint vapors.
5. Too time consuming for large jobs.
6. Heat guns are not suitable for removing water-based paints, some primers and undercoats or for removing paint from metal or plaster.

Cold – Dry Ice Blasting

This system uses small rice size pellets of dry ice propelled through a jet nozzle by compressed air. The frigid temperature (-109.3° F / -78.5° C) of the dry ice "blasting" against the soiling causes it to shrink and lose adhesion

from its subsurface. Additionally some of the dry ice penetrates through the soiling and comes into contact with the underlying surface. The warmer subsurface causes the dry ice to convert back into carbon dioxide gas. The gas has 800 times greater volume and expands behind the soiling to help lift it from the surface. Paint, oil, grease, asphalt, tar, chewing gum, soot, dirt and adhesives are some of the materials removed by this procedure.

Advantages of Dry Ice Blasting

1. The dry ice converts quickly into gas form and only the removed material must be cleaned up.

Limitations of Dry Ice Blasting

1. Effective cleaning can only occur in a straight line of sight from the dry ice jet nozzle.
2. Dry ice may pit or damage the underlying surface.
3. Large amounts of carbon dioxide are released which can be harmful if not ventilated out of the space.
4. Thermal shock may cause rapid freezing and spalling of wet masonry.

Cold – Liquid Nitrogen Blasting

Liquid nitrogen blasting involves chilling the substrate with liquid nitrogen to embrittle or crack the surface coating or staining before subjecting it to impaction with a plastic media. After chilling the coating to approximately -320° F (-195° C), the liquid nitrogen warms to ambient temperatures and evaporates into a gaseous form.

Advantages of Liquid Nitrogen Blasting

1. Minimizes pollution generation. Avoids generation of wastewater and volatile organic compounds because the process is dry; no water is used.
2. If the correct plastic medium is selected, they can be recycled numerous times.
3. Can be effective at a removing multiple layers of coatings.

Limitations of Liquid Nitrogen Blasting

1. Not appropriate for thin coatings.
2. Less effective on epoxies and urethanes.
3. Capital and start up costs can be high.
4. Extreme temperature may damage substrate.

E. LASER CLEANING

The laser is a unique source of light, providing energy in the form of a very intense, monochromatic (single color or wavelength), well-collimated beam. A typical laser beam spreads out only a few millimeters after traveling several meters. When a laser beam contacts the surface, part of the energy is reflected and the remainder is absorbed, assuming no transmission. The fraction of energy absorbed depends on the wavelength of the laser and the physical and chemical properties of the surface. Unless it is at least partially absorbed, a laser beam can have no effect on a surface.

The most important cleaning parameter is the energy density, or fluence, of the laser beam. The laser beam's fluence is defined as the energy per unit area incident on the surface (energy per pulse/ beam size at the surface) and is usually measured in joules per square centimeter (J/cm^2). When working, the fluence should be high enough to remove the dirt layers but low enough to avoid damage to the surface. There is a safe working window within which this can be achieved for a wide range of materials. This is the self-limiting nature of laser cleaning. If the fluence must be raised above the damage threshold, the operator must stop the process as soon as the soiling has been removed, but before damage has been done to the masonry surface.

Advantages of Laser Cleaning

1. Removal of layers of dirt without removing any of the underlying surface. Such control allows the operator to select exactly what is removed from the surface. Surfaces which have already been generally cleaned can be selectively re-cleaned to remove any remaining contaminants without fear of over cleaning.
2. Useful on extremely fragile surfaces because there is no mechanical contact with the surface. Energy is delivered in the form of light.
3. The laser cleans only where directed.
4. The cleaning action is instantly halted once the laser is switched off. Therefore the operator can stop whenever necessary or appropriate. The condition of the surface can be continuously monitored by the operator during cleaning, allowing decisions to be made at the earliest possible stage.
5. Laser cleaning generates very small quantities of waste material. The only waste generated is the dirt ejected from the surface. Collection and disposal can be as easy as using efficient dust extraction systems.
6. The only protective clothing necessary is safety glasses and a face mask.
7. Laser cleaning is clean and quiet, causing minimum disruption to building occupants or passers-by.

Limitations of Laser Cleaning

1. Slow, very time consuming process. Not suitable for cleaning entire façades.
2. Not effective on subsurface staining.
3. Laser cleaning is an expensive process.

CONSIDERATIONS

There are some things to consider to stay on the straight and narrow path to successful restoration cleaning. Proper identification of the masonry substrate is of paramount concern in the selection of appropriate cleaning products or processes. When surfaces are covered with 80 years of atmospheric soiling or paint, even the trained eye may have difficulty distinguishing between a light-colored sandstone and a fine-grained limestone. Terra cotta is frequently mistaken for natural stone, and masonries casually referred to as "marble" or "granite" may actually be any one of a number of very different natural or man-made "stones."

It is not necessary for those involved with restorative cleaning to have extensive geological training. If you are not confident in your ability to properly identify substrates, however, get help.

Once the decision has been made to clean a building, it is the responsibility of the persons in charge of the cleaning project to conduct a series of job site tests aimed at determining the most effective and practical cleaning process.

The need for thorough pretesting of all proposed cleaning systems cannot be overemphasized. The fact that specific cleaning agents and techniques worked effectively on similar projects is no reason to assume the same procedures will prove effective on the present project. While previous experience is valuable in scheduling and implementing a cleaning program, as well as determining which cleaning system is appropriate for evaluation, that experience is not a replacement for testing.

Testing programs should be designed to arrive at the gentlest (lowest rinsing pressures), mildest (lowest chemical concentrations) practical cleaning procedures capable of producing the desired degree of cleaning. Typically, when cleaning, avoid over-cleaning. Aim for achieving 85percent clean. Most damage occurs when attempting to clean the last 15percent. Tests should always be performed in inconspicuous areas where the effects of unacceptable tests can be hidden if necessary.

Once the testing program is completed and the job is ready to begin, make sure to protect all surfaces not intended to be cleaned from contact with dust, cleaner, wind drift, fumes, residue, and rinse water. Take necessary measures to ensure people and passers-by are protected from incidental contact with the cleaner or cleaning operations. Do not clean in high winds. Shut down and cover air-handling equipment that could circulate fumes into or through the building, and inform building management and occupants about the cleaning operations before starting.

If cleaning with water or chemicals, determine the local requirements for handling the wastewater. The local public works department is a good place to start. Ask about the local area's industrial pretreatment program. The test panel stage is the time to make these calls.

CONCLUSIONS

Cities throughout the United States take great pride in the revitalization of their downtown districts, river fronts and historic landmarks. Recognizing the public appeal of "restored" properties, many developers and investors have sought to capitalize on this popularity by purchasing wholly or partially vacant downtown buildings for renovation into new office, retail and housing space.

Because the cleaning of a building's façade is one of the most visible means of generating interest in the buying/leasing public, new owners are frequently pressured into implementing the quickest, easiest cleaning method available to "restore" the buildings' appearance. As a result, improper and often destructive cleaning procedures are often employed on important and not-so-important historical buildings – detracting from the beauty of the building fabrics, shortening their remaining life and stimulating the need for extensive and repeated repairs.

Cleaning a building's façade is by far one of the least expensive capital expenditures involved in a total building renovation program. Yet the completed, cleaned appearance of a renovated building is one of the most attractive and charismatic features. Therefore, it should be of the utmost importance that the cleaning be done properly by providing adequate time, consideration and funding, and by employing the best available people, materials and techniques.

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