SECTION 04510.01 **MASONRY CLEANING: REMOVAL OF ATMOSPHERIC SOILING,GRAFFITI, STAINS, AND BIOGROWTH**

PART 1 - GENERAL

1.01 DESCRIPTION

A. This specification provides guidance for cleaning historic masonry materials, including the removal of soiling, staining, graffiti, and biogrowth.

B. This specification has been developed for use on historic properties (defined as any district, site, building, structure, or object that is listed in or eligible for listing in the National Register of Historic Places) and provides an overview of accepted practices. Site-specific specifications, when appropriate, will be provided by the Architect.

C. All work described herein and related work must conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.

D. The Contractor shall provide all labor, material, equipment, and operations required to complete the rehabilitation work indicated herein.

E. All work described herein and related work must have the approval of a Cultural Resources Manager, Conservator, Historic Architect, or other professional who meets the standards outlined in the Secretary of the Interior's Standards – Professional Qualifications Standards pursuant to 36 CFR 61. Such person is referred to in this document as the *Architect*.

1.02 SECTION INCLUDES

A. Cleaning of soiling.

B. Cleaning of staining and graffiti.

C. Cleaning of biological growth and bird droppings.

1.03 RELATED SECTIONS

A. Section 03710.01 – Concrete Cleaning: Removal of Atmospheric Soiling, Graffiti, Staining, and Biogrowth.

B. Section 04100.01 – Removal of Mortar Joints and Repointing

C. Section 04110.02 – Repair and Replacement of Historic Stucco

D. Section 04211.01 – Historic Brick Properties and In Kind Replacement

E. Section 04214.02 – Terracotta Patching and Glaze Repair

F. Section 04510.03 – Poulticing and Salt Removal

1.04 DEFINITIONS

A. Atmospheric Soiling: The dust, aerosols, and particulate matter deposited from the air directly on the material surface. Particulates can result from vehicle exhaust, sea salts and other contaminants.

B. Biological soiling: Discolorations that include biological growth (biogrowth) and biological deposits. Biogrowth includes microorganisms, including lichens, bacteria, algae, fungi, and molds that discolor the material surface. Factors influencing biogrowth include exposure, orientation, position, and the material's surface texture. Deposited material, such as bird droppings, aphid "honey dew," and others, are considered biological soiling.

C. Chemical Cleaning: Cleaning methods that involve applying a substance to the material that interacts with the material and any discoloration on the surface. Chemical cleaning methods may include water, organic solvents, and alkaline or acidic chemicals.

D. Cleaning Test Patch: A small unobtrusive area, usually less than 6 inch by 6 inch, in which the Contractor tests a particular cleaning method. Several cleaning test patches are usually performed side by side to directly compare methods.

E. Complexing and Sequestering agent: an organic chemical that acts to grab and bind metals to itself.

F. Detergent: any chemical substance, other than soap, that is an effective cleanser and functions equally well as a surface-active agent in hard or soft water.

G. Graffiti: Usually an unwanted painting or marking in any manner on property.

H. Physical Cleaning: Physical cleaning methods generally involve the removal of material from the surface using abrasive methods. Physical methods include pressure washing at low and medium pressures, and mechanical or manual brushing.

I. Poultice: The term poultice is extended to a wide range of cleaning materials and techniques. In general, it is a cleaning method that involves the application of a mixture of a cleaner and an absorbent substance to a surface to draw out contaminants and stains from the surface of a material.

J. Staining: a penetrating discoloration or soiled spot found on the material.

1.05 REFERENCES

A. Masonry cleaning shall conform to National Park Service's *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, 1992. National Park Service. 28 July 2009. <http://www.nps.gov/history/hps/tps/standards_guidelines.htm>

B. Where applicable, techniques employed for treatment shall be as outlined in the following *Preservation Briefs*, published by the National Park Service:

1. Mack, Robert C. and Grimmer, Anne E. *Preservation Brief No. 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings*. National Park Service. 2000. 30 July 2009. <http://www.nps.gov/history/hps/tps/briefs/brief01.htm>.

2. Grimmer, Anne E. *Preservation Brief No. 6: Dangers of Abrasive Cleaning to Historic Buildings*. National Park Service. 1979. 28 July 2009. <http://www.nps.gov/history/hps/tps/briefs/brief06.htm>.

3. Weaver, Martin E. *Preservation Brief No. 38: Removing Graffiti from Historic Masonry*. National Park Service. 1995. 28 July 2009. <http://www.nps.gov/history/hps/tps/briefs/brief38.htm>

C. See, Historic Preservation Technical Procedures Standards. General Services Administration. 30 July 2009. <http://w3.gsa.gov/__852565c500543eb4.nsf?OpenDatabase>.

D. *Cleaning Techniques in Conservation Practice*. Edited by Kyle C Normandin and Deborah Slaton, Consultant Norman R Weiss, Managing Editor Jill Pearce. A special issue of the Journal of Architectural Conservation. Vol. 11 No. 3. November 2005.

E. *Conservation of Historic Stone Buildings and Monuments:* Report of the Committee on Conservation of Historic Stone Buildings and Monuments. National Material Advisory Board, Commission on Engineering and Technical Systems, National Research Council. Washington, D.C.: National Academy Press, 1982.

F. Grimmer, Anne E. *Keeping it Clean: Removing Exterior Dirt, Paint, Stains and Graffiti from Historic Masonry Buildings*. Darby, Pennsylvania: Diane Publishing Co., 1992.

G. Staehli Alfred M. "Appropriate Water Pressures for Masonry Cleaning: What Do the Numbers Mean?" *APT Bulletin*, Vol. 18, No. 4 (1986), pp. 10-17. Published by: Association for Preservation Technology International (APT).

H. Weaver, Martin E. *Conserving Buildings: A Manual of Techniques and Materials*. Revised edition. New York: John Wiley & Sons and the Preservation Press, 1997.

I. Weiss, Norman R. *Exterior Cleaning of Historic Masonry Buildings*. Washington, D.C.: National Park Service, February 1977.

1.06 SUBMITTALS

The Contractor shall submit to the Architect:

A. A detailed schedule of the areas to be cleaned, including an assessment of the problem surfaces, and proposed masonry procedures, application methods, dwell times, etc., for approval once cleaning test panels are completed and approved.

B. The manufacturer's product literature for all proprietary cleaning products. Product literature shall include specification data, Material Safety Data Sheets, and instructions for storage, handling, and use.

1.07 QUALITY ASSURANCE

A. The Contractor performing the work described in this Section shall have a minimum of seven (7) years experience in masonry cleaning and restoration and shall have successfully completed at least three projects of similar scope within the previous five years. He/she shall demonstrate a working knowledge of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*.

1.08 MOCK-UPS

A. The Contractor, at locations designated by the Architect, shall prepare test panels not to exceed 100 square feet per sample demonstrating the cleaning product on inconspicuous areas, preferably conducted by the operator undertaking the final work.

1. Water Soak Cleaning – Approximately 50 square feet.

2. Chemical Cleaners – Approximately 25 square feet for each specified product.

B. More than one test panel may be required for approval. If necessary the Contractor shall prepare at least four (4) test panels of each type without further compensation. Approved test panels shall become part of the work and shall serve as the quality standard for all similar work.

1.09 DELIVERY, STORAGE, AND HANDLING (as applied to products and materials)

The Contractor shall:

A. Deliver restoration cleaning and testing materials and proprietary products to the project site in manufacturer's or distributor's packaging, undamaged, complete with application instructions and Material Safety Data Sheets

B. Store and transport cleaning agents, chemicals, and solvents within the temperature range recommended by the manufacturer and away from direct sunlight. Handle all materials according to manufacturer's instructions.

C. Collect and dispose of waste material, packaging, debris, and effluent associated with the masonry cleaning work in accordance with local, state, and federal environmental regulations.

1.10 PROJECT / SITE CONDITIONS

A. The work of this Section shall be executed only when the air and surface temperatures are 40 degrees Fahrenheit and rising or less than 90 degrees F and falling. Minimum temperature for masonry cleaning shall be 50 degrees F and above for at least two hours after completion and above freezing for at least 24 hours after completion. Work shall not commence when rain, snow, or below-freezing temperatures are expected within the next 24 hours. All surfaces shall be free of standing water, frost, and ice.

B. The Contractor is responsible for protecting existing adjacent materials during the execution of the work and shall provide all necessary protection and follow all necessary work procedures to avoid damage to existing material assemblies not a part of the work of this Section. At a minimum, the Contractor shall:

1. Protect woodwork, glass, and metal adjacent to masonry areas to be cleaned from overspray and possible chemical or water damage from cleaning operations. Cover all window openings with waterproof plastic to prevent leakage to the building interior.

2. Protect surrounding lawns and vegetation from runoff during cleaning operations.

3. Access work areas from the exterior only. Under no circumstances are hoses to be run or equipment transported through the building during cleaning operations.

C. The Contractor shall erect waterproof enclosures around areas where cleaning operations are in progress to protect nearby property and passers-by from overspray of cleaning chemicals or rinse water.

D. The Contractor shall coordinate masonry cleaning operations with the other trades involved in exterior and interior restoration work, including but not limited to masonry restoration, sealing, and painting. Masonry cleaning is to be completed prior to restoration of windows, doors, and metalwork, and prior to any exterior painting in the affected areas.

E. All Contractor personnel performing masonry cleaning operations shall be provided with gloves, respirators, protective clothing and any other personal protective equipment as recommended by the manufacturer of the masonry cleaning products and required by local, state, and federal regulations.

F. The Contractor shall complete installation of temporary sealants at window and door perimeters prior to starting cleaning operations where required to prevent leakage to interior.

PART 2 - PRODUCTS

2.01 MASONRY CLEANING OF ATMOSPHERIC SOILING

A. Investigations and Method selection:

1. Identification of material types, surface and substrate conditions, previous treatments, and the nature, cause and pattern of the soiling type for each area shall be determined. Testing may require additional technical expertise from a materials scientist, architectural conservator, microbiologist, and/or other technical expert. The Contractor shall choose the gentlest method possible to remove the soiling without damaging the substrate material.

2. The Contractor shall conduct cleaning test patches, usually less than 6 inch by 6 inch, in unobtrusive locations on the masonry to be cleaned. The purpose of the test patch is to determine the gentlest, most effective method to remove soiling from the masonry. Several cleaning methods are generally tested side by side.

3. The method of cleaning and the level of clean shall be approved by the Architect. The Contractor shall protect adjacent materials, installed non masonry materials, and openings.

B. Cleaning methods: Cleaning shall be undertaken through the mildest, least abrasive method.

1. The following methods are gentlest and should be considered first:
   a. Water with soft brushes
   b. Water with mild soap
   c. Water with stronger soap
   d. Water with stronger soap plus ammonia
   e. Water with stronger soap plus vinegar

2. Water washing: Washing the surface with low to medium jet pressure, 200-500 pounds per square inch (psi) at 4-6 gallons per minute (gpm) using a 45degree fan type nozzle, for water soluble dirt and chemical compounds. Optimal water pressure and wand distance are to be determined during preparation of cleaning test patches. Note that most commercial pressure washing systems operate at significantly higher pressures than those recommended. Use of a pressure regulator to reduce pressures may be needed.

3. Nebulous Sprays: Application of intermittent mist spray under low pressure to dampen surface. Dirt is removed through differences in drying rates of the soiling and substrate. Swelling of the soiling generally loosens its attachment to the substrate. Optimal water pressure, time cycles, and duration of the cleaning technique are to be determined during preparation of cleaning test patches.

4. Detergents: Formulations made with dilutions of cleansers, surfactants, and chelating agents in water. Neutral or non-ionic detergents or surfactants are added to water for use on hydrophobic stains.

5. Masonry Cleaners: Proprietary cleaning solutions containing detergents, acidic or alkaline compounds. If this type of product is proposed, great care must be exercised in product selection and preparation of test panels to identify potentially detrimental effects on the masonry. This type of product is not recommended for polished stones or extremely fragile or deteriorated masonry. The use of raw acids and/or alkalis for masonry cleaning is not permitted at any time.

C. Water used for cleaning of historic masonry cleaning shall be potable and free of injurious amounts of oil, soluble salts, alkali, acids, and other impurities that might stain or otherwise damage masonry.

D. Equipment for masonry cleaning:

1. Pipes and hoses used for water cleaning shall be plastic or other similar material that is not subject to corrosion, which can cause discoloration and staining of surfaces being cleaned.

2. Natural bristle brushes shall be used for scrubbing. Metal bristle brushes are not to be used.

3. Hoses, fittings, and equipment to be used for application of proprietary cleaning compounds shall be solvent, acid, or alkali-resistant as recommended by the manufacturer of the cleaning products.

4. Buckets, trowels, and other tools to be used for mixing and application of poultices shall be solvent-resistant plastic. Wood scrapers and trowels are also permitted. No metal tools are to be used.

E. Water/rinsing method: Surfaces shall be rinsed with water after cleaning. Rinse water will be collected and disposed of in accordance with federal state, and local environmental standards. Rates of water pressure shall be no greater than 500 psi at 3-6 gpm with minimal saturation.

2.02 MASONRY CLEANING OF STAINS

A. Investigations and method selection:

1. Types of materials, surface and substrate conditions, previous treatments, and the nature, cause and pattern of the stain, corrosion, or deposits for each area shall be determined. Testing may require additional technical expertise from a materials scientist, architectural conservator, microbiologist, and/or other technical expert. The Contractor shall choose the gentlest method possible to remove the stain without damaging the substrate material.

2. The Contractor shall conduct cleaning test patches, usually less than 6 inch by 6 inches, in unobtrusive locations on the masonry to be cleaned. The purpose of the test patch is to determine the most effective, gentlest method to remove stains from the concrete. Several cleaning methods are generally tested side by side.

3. The method of cleaning and the level of clean shall be approved by the Architect.

B. Cleaning Methods:

1. Poultices (see Section 04510.03)

2. Cleaning solutions to be used in a poultice mixture may include chelating agents such as EDTA (ethylenediaminetetraacetic acid), ammonium citrate, sodium citrate, citric acid, and oxalic acid. Seek additional professional advice if chelating agents are to be used in a poultice.

3. Organic solvents or inorganic chemicals in water, either ready-made or site mixed, can be used to remove some stains. Care must be exercised so that the stain isn't pushed further into the masonry. Also, many cleaners can be toxic to workers and damage adjoining building materials, always follow the manufacturer's recommendations and safety standards.

C. Equipment for Application (see Atmospheric Soiling, Sec 2.01 D above)

D. Water/rinsing Method (see Atmospheric Soiling, , Sec 2.01 E above)

2.03 MASONRY CLEANING OF GRAFFITI.

A. Investigations and Method Selection:

1. Identification of materials types, surface and substrate conditions, previous treatments, and the materials used to create the graffiti for each area shall be determined. Testing may require additional technical expertise from a materials scientist, architectural conservator, microbiologist, and/or other technical expert. The Contractor shall choose the gentlest method possible to remove the graffiti without damaging the substrate material.

2. The Contractor shall conduct cleaning test patches in unobtrusive locations on the concrete to be cleaned. The purpose of the test patch is to determine the gentlest, most effective method to remove stains from the masonry. Several cleaning methods are preferably tested side by side.

3. Incised graffiti cannot be addressed by cleaning, and is therefore not covered under this section. If the damage is deep, removal may be addressed in Sections 04500.02 and 04500.03.

4. Staining and graffiti should be addressed after atmospheric soiling and biogrowth are removed.

5. Graffiti is most easily removed when it has been freshly applied. Therefore, timely removal of graffiti is important.

B. Cleaning Methods:

1. Water and Detergent: Washing the surface with water at low to medium jet pressure, 500 psi or less at 3-6 gpm. Neutral or non-ionic detergents may be introduced. Note that most commercial pressure washing systems operate a significantly higher pressures than those recommended. Use of a pressure regulator to reduce pressures may be needed. Use the lowest possible pressure to achieve the desired results.

2. Poultices: A paste or slurry made with absorbent material or powder-inert clay, such as kaolin or sepiolite, diatomaceous earth (fuller's earth); or Cellulose products such as pulp cellulose, shredded paper that is mixed with a cleaning solution (a liquid reagent such as water, organic solvent, or paint stripper among others).

3. Organic Solvents and Paint Removers: Proprietary graffiti-removal products and/or commercial paint strippers containing organic solvents, sol gels, gel or paste removers, or paper or cloth-backed removers. Do not use "off-the-shelf" aerosol graffiti removers as these can cause additional staining and redistribution of pigments to clean areas.

C. Equipment for Application: See Atmospheric Soiling above

D. Water/rinsing Method: See Atmospheric Soiling above

2.04 CLEANING BIOGROWTH AND BIRD DROPPINGS

A. Investigations and Method selection: Material types, surface and substrate conditions and the nature, cause and pattern of biomaterials for each area shall be determined. The cleaning method shall be approved by the Architect.

B. Cleaning Methods:

1. Water Washing: Cold water applied at 200-500 psi pressure. A commercially available biocide, generally containing a quaternary ammonium treatment, may be introduced for treatment of algae, fungi, molds, and mildew. Use lowest possible pressure to achieve desired results.

2. Acidic Cleaners: Formulations of acids, surfactants, and chelating agents.

3. Poultices: See Section 04510.03.

C. Equipment for Application: See Atmospheric Soiling, Sec 2.01 D above

D. Water/rinsing method: See Atmospheric Soiling, Sec. 2.01 E above

2.05 STONE PROPERTIES AFFECTING CLEANING

A. Calcitic Stone (Limestone, Marble and some Sandstones): Marble, limestone and some sandstones are acid sensitive. Acids can cause etching and dissolution of the stones and should not be used for their cleaning.

B. Silicate Stone (most types of Sandstone): There are many kinds of sandstone, each of which has a different geological composition. For example, sandstones that contain water-soluble minerals can be eroded by water cleaning. Some sandstone can be cleaned with acids; others are sensitive to acid and can be severely etched or dissolved by an acid cleaner.

C. Granite: This extremely hard, dense stone is generally not adversely affected by chemical cleaning. However, the use of strongly acidic cleaners may cause selective etching and/or bleaching of the constituent minerals, resulting in a change in appearance, particularly for polished stones. Additionally, some granites and gneisses contain impurities that may be eroded or chemically converted by inappropriately strong or improperly applied acidic cleaners, resulting in a weakened surface that may deteriorate at an accelerated rate in the future. Where possible, petrographic analysis should be sought when planning a large granite masonry cleaning project if chemical cleaning is proposed.

D. Schist and Gneiss: These are metamorphic rocks derived from clays and silts (schist) or igneous rocks (gneiss) and containing a proportion of platy minerals such as mica and hornblende, often combined with quartz and feldspar. Schists are generally highly micaceous and are distinguished by their foliated or platy texture and easily split along their micaceous layers. Gneisses are formed under higher temperatures, forming distinct mineral bands. They also contain a small proportion of micaceous minerals. The strength and chemical resistance of schists and gneisses varies widely and is best assessed by preparation of cleaning test patches.

E. Shale and Slate: Shale is a fine-grained sedimentary rock composed primarily of clay and silt particles derived from quartz and feldspar minerals. Shale is a very porous rock that will absorb most liquids. Care must be taken with Shale because it may contain water-soluble minerals that can be eroded by water cleaning. Slate is a fine-grained layered metamorphic rock derived from shale under low to moderate heat and pressure. Slate is relatively common as a finish material for floors, walls, and roofs because of its low permeability. As it is composed primarily of quartz and feldspar, slate is relatively unaffected by mild acids.

PART 3 - EXECUTION

3.01 GENERAL

A. The initial cleaning test patches shall be undertaken by Contractor and reviewed by the Architect to determine the mildest cleaning method to be used once cleaning test patches are approved. Cleaning mock-ups will be prepared by the Contractor, and reviewed by the Architect.

B. Contractor shall submit testing schedule and a cleaning schedule, including the methods and materials to be used.

C. The Contractor shall protect all adjacent materials from spray and chemicals.

D. The runoff from the cleaning process will be collected in plywood troughs lined with polyethylene sheeting. Polluted liquid gathered shall be pumped into tanker trucks or drums for properly controlled disposal. Acidic runoff shall be neutralized with lime or soda ash prior to release.

E. Masonry cleaning shall be completed prior to masonry repointing and repairs. The Contractor shall remove and store light fixtures, downspouts, and other appurtenances to ensure full access to wall surfaces, unless otherwise noted by the Architect. Anchor holes and penetrations from appurtenances must be temporarily filled with removable sealant or protected with cover plates.

F. The Contractor shall remove invasive plants and plant debris from the structure prior to cleaning. With the approval of the Architect, invasive vines shall be cut close to the ground and allowed to wither and dry. This method allows the vines to contract and withdraw from the masonry. The process may take up to two weeks. The dry vines shall be carefully removed and the façade surface cleaned with a natural bristle brush prior to other treatments.

G. After removing invasive species, the Contractor shall protect desirable plants surrounding the building from chemicals and cleaning efforts. This may include tying back plants away from the building. Covering plants may be needed as well. Hard pruning may be appropriate with approval of the Architect.

3.02 MASONRY CLEANING

A. Surface Preparation for Cleaning

1. Examine the surfaces to be cleaned prior to commencing cleaning operations. Large cracks (one-eighth inch or larger) and open joints discovered shall be temporarily filled with removable sealant to prevent penetration of cleaning solutions into the core of the wall.

2. Window and door openings shall be protected from leakage and damage from cleaning solutions by plastic sheeting or another waterproof membrane. Open joints around window frames and door frames shall be filled with temporary sealant to prevent leakage.

B. Nebulous Spray Water Mist Cleaning

1. A water misting apparatus will be designed to suit the size of the masonry to be cleaned. Generally, the nebulous spray misting system consists of PVC pipe and fittings, flexible mist-type spray heads spaced evenly based on cleaning needs, and a timed shutoff valve for on/off cycling. The nebulous spray misting system is suspended beneath the overhanging surfaces to be cleaned. Conditions that can be varied and must be controlled include
   a. available water pressure delivered to the system,

b. volume of water delivered from each sprayer,
c. nozzle shape,
d. droplet size,
e. distance from surface, and
f. duration of on/off cycles.

2. Cleaning conditions with the nebulous spray system shall be optimized prior to cleaning the masonry surface. Intervals for wet dry cycles vary widely based on the cleaning action desired. Cycles can be as short as three seconds on and 40 seconds off, to as long as four hours on and four hours off for a period of 24 hours. It is generally recommended to start from the top of the masonry structure and work downward.

3. During misting, the nozzles can be adjusted to apply mist on the most concentrated areas and crevices. Natural bristle brushes can be used to aid in the removal of heavily soiled areas or cleaning of high relief decoration.

4. Final washing of each section shall consist of a low pressure wash, not to exceed 300 psi. Rinse surfaces from top to bottom using a 45 degree fan-tip nozzle. Maintain a minimum distance of 18 inches between the nozzle tip and the masonry surface. Use the lowest possible pressure to achieve desired results.

C. Chemical Cleaning

1. Masonry surfaces shall be saturated with water prior to application of chemical cleaning products to prevent undesirable absorption of cleaning chemicals.

2. Cleaning of masonry walls shall proceed from the bottom of the wall upward to minimize streaking.

3. Apply the masonry cleaning product in accordance with manufacturer's instructions and approved cleaning procedure submittal. The Contractor shall use fiber brushes, rollers or very low-pressure spray (not to exceed 100 psi) for application. The Contractor shall not use high-pressure spray equipment to apply cleaning product.

4. After completion of the appropriate dwell time, loosened soiling shall be removed using a low-pressure water rinse. Do not allow the cleaning products to dry on masonry surfaces. Rinse surfaces from top to bottom using a 45 degree fan-tip nozzle with a nozzle pressure not to exceed 500 psi and a flow of approximately four gpm. A minimum distance of 18 inches between the nozzle tip and the masonry surface shall be maintained.

5. After cleaning is completed, the Contractor shall remove protective coverings from adjacent surfaces and repair any damage or staining caused by the cleaning operation to adjacent surfaces.

D. Removal of Metallic Stains: See Section 04510.03, Poulticing and Salt Removal

E. Removal of Salts: See Section 04510.03, Poulticing and Salt Removal

F. Cleaning Graffiti

1. Apply the specified paint stripper using a brush, roller or low pressure spray apparatus equipped with a nozzle 0.019 inch or larger. Spray equipment must be equipped with chemical resistant packing and hoses. Apply to a minimum thickness of 10 mils.

2. Allow the stripper to remain on the surface in accordance with the dwell time determined during preparation of the approved test panel. Dwell time will increase as temperatures decrease.

3. Following dwell time the Contractor shall remove lifted layers using a squeegee, plastic scraper, or wet vacuum device as required. Collect paint and stripper residue, and dispose in accordance with local, state and federal regulations.

4. Thoroughly rinse surface with clean water. Reapply stripper as required to remove all existing paint layers.

G. Removal of Algal Growth, Moss, and Bird Droppings (Biological Staining)

1. Do not remove living mosses, lichens, and higher order plants without first killing them with a biocide, since roots and other attachments may penetrate deeply into the masonry. Allow time for the plant to detach before attempting removal. The Contractor may apply a biocidal product such as a quaternary ammonium product to colonies of moss, or other biological contaminants. After at least 24 hours, the Contractor may remove colonies of moss, loose growth, and accumulations of bird droppings from masonry surfaces to be cleaned using wooden scrapers.

2. The Contractor shall apply selected cleaning agent in accordance with manufacturer's instructions and approved test panel. Allow product to dwell on soiled surfaces to achieve optimal cleaning.

3. Following required dwell time, agitate with a soft bristle brush to lift and remove embedded growth. The Contractor shall flush surfaces with low to medium-high pressure (not to exceed 500 psi) water rinse as required to remove staining. Repeat application as required to remove stains.

4. Spot clean for heavily soiled areas (biological growth):

    a. Spot cleaning shall be performed only after general cleaning has been completed for approximately two weeks.

    b. Thoroughly wet surfaces to be treated with spot cleaner. Apply the product using a synthetic brush, roller or low-pressure spray and allow it to dwell on the surface. Dwell time to be in accordance with the approved test panel.

    c. After dwell time has elapsed, thoroughly rinse the surface with clean water at moderate pressure (500 psi or less), working from the bottom up.

d. Apply neutralizing rinse (if required) and allow to dwell on the cleaned surface three to five minutes. Following the required dwell time, rinse the surface again with clean water at moderate pressure(500 psi or less), working from the bottom up.

3.03 FINAL REPORT

The Contractor shall:

A. Provide a final report of completed work, including all approved submittals and photographs of the areas cleaned that were taken before, during, and after the work.

B. Provide a written summary of the project and results upon final inspection and approval. The summary shall include a discussion of steps taken or new findings not specified in the initial documentation.

END OF SECTION