

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 04 03 07 –Historic works – masonry repointing and repair.
- .2        Section 04 05 00 – Common work results for masonry.

**1.2                REFERENCES**

- .1        Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).
- .2        Federal legislation
  - .1        Canadian Environmental Assessment Act (CEAA), 1995 ch. 37,
  - .2        Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .3        Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).
- .3        Mine Safety and Health Administration/National Institute for Occupational Safety and Health (MSHA/NIOSH) Standards

**1.3                PERFORMANCE REQUIREMENTS**

- .1        Clean all brick /stone masonry surfaces in the areas included in the contract, to remove surface soiling after completion of repointing, to restore the stone/brick as much as is feasible to its original appearance.
- .2        Clean the stones/bricks to remove stains and black soiling without damaging the stone surface physically or chemically.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Provide submittals in accordance with Section 04 05 00, Common work results for masonry.
- .2        Submit two copies of WHMIS MSDS - Material Safety Data Sheets documentation in accordance with Section 01 35 29- Health and Safety Requirements for cleaning materials. Indicate VOC content.
- .3        Submit details of proposed protection methods.
- .4        Submit the cleaning works schedule. Include interfacing of schedule with cleaning of masonry required in other sections.
- .5        Test results: submit two copies of test results describing cleaning methods used for each tested surface.

**1.5                SAMPLES**

- .1        Demonstrate machinery, tools, nozzles and materials to be used for the cleaning works for approval by Departmental Representative.

- .2 Provide samples of all cleaning materials for approval of Departmental Representative.

## 1.6 QUALITY ASSURANCE

- .1 Refer to section 04 05 00 – Common work results for masonry.
- .2 Regulatory Requirements: ensure work is performed in compliance with CEPA, CEAA, TDGA, and all applicable Provincial regulations.
- .3 Submit test results in accordance with section 01 33 00 Submittal procedures.
- .4 Submit 2 copies of report describing test results, describing cleaning method used, water pressure at compressor, tools, dimension of nozzles, impregnation time, pressure, angle of projection of nozzle during cleaning, media type, media size (aggregate), distance of projection from masonry surface, used for each test surface.
- .5 Proceed with cleaning upon receiving written approval by Departmental Representative concerning tested cleaning methods
- .6 Tests must be repeated at no additional cost until satisfactory results are achieved. Assume each test must be repeated minimum 4 times.
- .7 Record existing conditions, using photographs or video recording, before and after cleaning. Inform Departmental Representative of potential cleaning problems.

## 1.7 MOCK-UPS

- .1 General:
  - .1 Do mock-ups tests in accordance with Section 01 45 00 - Quality Control and section 04 05 00 – Common work results for masonry.
  - .2 The location of test surfaces will be determined by Departmental Representative once scaffolding system is in place.
  - .3 Allow for 4 samples of works for the following cleaning:  
EXTERIOR
    - .1 for cleaning of copper oxidation stains on wing east
    - .2 for cleaning of corrosion stains
    - .3 for cleaning of paint and old sealant stains
    - .4 for cleaning of black deposits from atmospheric pollution on central building.
    - .5 for cleaning of black deposits from atmospheric pollution on east wing
    - .6 for cleaning of brick in old Multifunctional Room of Central Building.
    - .7 for cleaning and finishing of concrete surface of the saut-de-loup on north façade of East Wing.INTERIOR
    - .8 for cleaning of soot on the two turrets of north façade.
    - .9 for cleaning of efflorescence on interior walls of East Wing.
    - .10 for cleaning of paint and old sealant stains inside

- .4 The objectives of samples of cleaning works for micro-abrasion systems are to determine:
  - .1 Type of nozzle to use;
  - .2 Water pressure at compressor;
  - .3 Distance and angle of projection of nozzle in relation to surface to clean;
  - .4 Time lapse of passage of nozzle on zone to clean;
  - .5 Pressure to use;
  - .6 Validate media to use – Departmental Representative may replace type or granularity of media (at no extra cost) for optimum cleaning results.
- .5 Allow for 4 test surfaces for each other type of cleaning prescribed in the presents and for each type of stone. The tests must compulsorily be done in the presence of the Departmental Representative.
- .6 Allow test surfaces of 1,5 m<sup>2</sup> for each type of cleaning prescribed in the presents and of 2 m<sup>2</sup> for cleaning of black deposits from atmospheric pollution.
- .7 Notify Departmental Representative 2 weeks before starting to clean each test patch. Obtain approval from Departmental Representative before starting tests.
- .8 Conduct tests on building to determine effectiveness of low pressure wash cleaning methods.
- .9 Determine impact of cleaning operations on nearby historic materials and plants.
- .10 Stop the works when there are harmful effects on nearby historic materials and plants.
- .11 Start cleaning works after receiving Departmental Representative's instructions.
- .12 Protect masonry opening against water or chemical products during the cleaning works.
- .13 Recuperate, neutralize and eliminate water and chemical products in conformance to contract requirements, to applicable regulations and to the Canadian environmental protection act (CEPA).
- .2 Conduct tests to determine effectiveness of 158, 6 kPa, water pressures, during 4 hours. Under the direction of Departmental Representative do other tests with different water pressures and different impregnation time periods, types of nozzles and spraying distances from wall surface until obtaining satisfactory results approved by Departmental Representative.
- .3 Test pressure at each storey height of scaffolding and floor levels to determine effect of "line drop" on effectiveness of water jets.
- .4 Test brushing and spraying as alternative to pressure washing. Consult Departmental Representative to review test results. Use method approved by Departmental Representative.
- .5 Test methods to remove rust in order to establish a formulation of effective poultice and determine impregnation time delay.

- .6 Test micro abrasives cleaning methods. Test at low pressure, starting at 158 kPa, in order to determine methods and procedures to use. Under the direction of Departmental Representative do other tests at diverse water pressures and different types of media and with different impregnation time periods, concentrations, types of nozzles and spraying distances from wall surface until obtaining satisfactory results approved by Departmental Representative.
- .7 Test a variety of methods to remove black deposits from atmospheric pollution in order to establish effective methods and determine cleaning degree to perform.
- .8 Test a variety of methods to remove pigeon faeces as prescribed in PART 3 – EXECUTION, in order to determine the most effective method.
- .9 For the other cleaning methods prepare work samples in conformance to prescriptions of PART 3 – EXECUTION.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with section 04 05 00 Common work results for masonry.

## **1.9 AMBIENT CONDITIONS**

- .1 Do not use wet cleaning methods when there is threat of frost.
- .2 Do not use chemical cleaners when ambient or surface temperature is below 15 degrees C (unless otherwise stated in the present section of the specifications). Provide and maintain heating in the scaffoldings at a minimum of 15 °C for masonry cleaning operations (unless otherwise stated in the present section of the specifications).
- .3 Provide shading to wall to avoid cleaning in full, hot sunlight.
- .4 Do not clean if there is risk of chemical spray being blown onto surrounding historic material, publicly accessible areas or if other materials are at risk of being damaged by the cleaning process.
- .5 Recuperate and eliminate used cleaning materials and products which accumulate in the work area. Prevent runoff and absorption of water, chemical products and abrasives in the masonry or the soil under the cleaning area. Recuperate all cleaning water of interior cleaning works.
- .6 The recuperation and elimination systems must be approved by Departmental Representative.
- .7 Conform to requirements featured in the Workplace Hazardous Materials Information System (WHMIS) relating to use, handling, storage and elimination of hazardous materials; and relating to labeling and furnishing of material safety data sheets.
- .8 Protect masonry, stone and brick against dirt, rain and the other elements after cleaning by humid means.

## **1.10 SEQUENCE OF WORKS**

- .1 Complete the works according to schedule approved delay. Do not modify schedule without written approval of Departmental Representative
- .2 Coordinate cleaning works schedule with other works on the construction site.
- .3 Perform the cleaning works **after** the reassembly works, the replacement and the repointing in depth of stone/brick are finished and **before** the realization of repairs to the restoration mortar, repairs of deep and surface fissures with CHD and the final surface repointing. The sequence of subsequent applications must be approved by Departmental Representative.
- .4 Allow drying periods prescribed in the applicable sections of the specifications before performing cleaning operations.
- .5 Ensure that the pH of stones located inside setbacks is neutral after the post-chemical water cleaning. Contractor must submit the pH verification method to Departmental Representative for approval before the beginning of the works.
- .6 The masonry cleaning must compulsorily be done once the stones have been reassembled in the wall and that the reassembling is finished. No cleaning by unit of disassembled stone will be authorized.

## **1.11 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sort and recycle waste in conformance to section 01 74 21 – Construction/demolition waste management and disposal, and section 04 05 00 – Common work results for masonry.

## **1.12 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Use clean potable water free from contaminants. Treat water which has high metal content before use in cleaning.
- .2 Use air free from oil or other contaminants.
- .3 Use masking material to approval of Departmental Representative.
- .4 Use non-ionic surfactant (detergent) of appropriate type for masonry.
- .5 Solvents: toluene, xylene, acetone, methyl ethyl ketone
- .6 Asphalt and tar remover:

- .7 Paint strippers
  - .1 Gel form, with active ingredient Methylene Dichloride.
  - .2 Stripper Systems.
- .8 Ethylene diamine tetra-acetic acid (EDTA) formulated for use as a ferric oxide (rust) removal agent
- .9 Attapulgite or Diatomaceous Earth (Fullers Earth): as poultice medium.
- .10 Abrasive classified for micro abrasive cleaning.
- .11 Acid base cleaning product: acceptable product must be approved by Departmental Representative.
- .12 Cleaning product based on alkaline hydroxide sodium solution: acceptable product must be approved by Departmental Representative.
- .13 Aluminum Oxide 70-120 microns.
- .14 Glass micro-balls 70-120 microns.
- .15 Sodium Bicarbonate based cleaner
- .16 Waterproof Protection / ecological copolymer acrylic based sealant in liquid form, colorless and odorless. Permeance rate to water vapor must be 20 perms or more with a pH rate of 8.
  - .1 Acceptable Material:
    - .1 Faceal Oloe HD by PSS
    - .2 Replacement material approved by addendum in conformance with Instructions to bidders.

## 2.2 TOOLS AND EQUIPMENT

- .1 Use brushes with natural or soft plastic bristles.
- .2 Use scrapers of wood or plastic.
- .3 Use water pumps fitted with accurate pressure regulators and gauges capable of being preset and locked at maximum specified levels. Water pumps to have rating of 0.3 kPa.
- .4 Use air compressors equipped with on-line oil filters to avoid spraying oil onto masonry.
- .5 Use gun equipped with pressure gauge at nozzle end.
- .6 Use equipment with plastic or non-ferrous metal piping and fittings.
- .7 Use nozzles that give nebulized droplet spray. Use nozzles with 12 mm opening.
- .8 Buckets.
- .9 Solid color sponges resistant to solvents and to chemical products.
- .10 Polyethylene sheets of 4 mils.

- .11 Micro abrasive cleaning of general wall surfaces: low pressure Micro abrasive cleaning system, capable of pulverizing a dry abrasive of 30 to 100 microns in a nozzle of 2 mm **creating a whirlwind**, at pressures maintained between 140 and 160 kPa.
  - .1 Acceptable equipment:
    - .1 J.O.S. Rotec systems.
    - .2 Replacement equipment: approved by addendum in conformance with Instructions to bidders.
- .12 Micro abrasive cleaning of bas-reliefs, cornices, capitals, coat of arms, pediments and sculpted elements of wall : low pressure Micro abrasive cleaning system, capable of pulverizing a granulate of 100 microns through a nozzle with pencil beak having an opening of 1 mm **creating a whirlwind**, at pressures maintained between 70 and 275 kPa.
  - .1 Acceptable equipment:
    - .1 COMCO Micro abrasive system.
    - .2 Replacement equipment: approved by addendum in conformance with Instructions to bidders.
- .13 Pressurized hot-water cleaning of 3,500 psi.capacity.
  - .1 Acceptable equipment:
    - .1 Dyna-blast series DGF model H4035DGF
    - .2 Replacement equipment: approved by addendum in conformance with Instructions to bidders.
- .14 Heavy duty electric hot-air gun: heat generated by electric coil with no flame.
- .15 Vacuum cleaner for industrial use, HEPA filter type.

### **Part 3 Execution**

#### **3.1 SITE VERIFICATION OF CONDITIONS**

- .1 Report to Departmental Representative conditions of deteriorated masonry or pointing not noted on Contract Drawings found before and during cleaning.
- .2 Obtain written approval of Departmental Representative before cleaning areas of deteriorated masonry.

#### **3.2 PREPARATION**

- .1 Place safety devices and signs near work areas as indicated and directed.
- .2 Seal or repair openings and joints where there is potential risk of water/chemical infiltration.
- .3 Cover surfaces which must not be cleaned.
- .4 Remove with brush or scrape accumulations on the walls, edges and cornices.
- .5 Cover and protect surfaces and finishes which are not of masonry in the areas to clean.

- .6 Cleaning operations with chemical products must be performed before beginning repointing works.

### 3.3 PROTECTION

- .1 Protect vents, windows, and other openings, to prevent water entry or entry of air contaminated by chemical fumes.
- .2 Protect wood, glass, and metal (ex. Copper) adjacent to surfaces to be treated.
- .3 Protect plants, gardens, shrubs from watering and chemicals.
- .4 Ensure that workers wear protective glasses, hard hats, masks, gloves and protective clothing, as well as boots and respiratory protection devices conforming to requirements of applicable standards MSHA/NIOSH.
- .5 Protect cleaned surfaces to be painted from contact with rain and snow.
- .6 Protect rainwater leaders, eaves troughs and gutters from being blocked by residue.
- .7 Protect finished work against damages until delivery of works.
- .8 Protect adjacent Work from spread of dust and dirt beyond work areas.
- .9 Ensure protection workers and worksite personnel against dangers.
- .10 Maintain the scaffolding protection system and the heating in place during a period of 15 days after a cleaning by humid means to permit the stone/brick to dry sufficiently before being exposed.

### 3.4 TYPE 1A: Cleaning of black deposits from atmospheric pollution at the surface of stone/brick facings

- .1 The general intention of the masonry cleaning works is to remove only the necessary dirt, without damaging the stones to stop deterioration.
- .2 A micro abrasion system will be used for this type of cleaning. Micro abrasive cleaning of general surfaces of masonry facings (brick and stone): low pressure Micro abrasive cleaning system, capable of pulverizing a dry abrasive of 30 to 100 microns in a nozzle of 2 mm **creating a whirlwind**, at pressures maintained between 140 and 160 kPa.s. See 2.2.11.
- .3 Cleaning Media no.1: glass micro-balls 70-120 microns for Château-Richer limestone and clay brick.
- .4 Cleaning Media no.2: aluminum oxide 70-120 microns for Deschambeault limestone.
- .5 Methods, procedures and materials to use will be established early in the schedule of project after a period of works samples execution in the presence of Departmental Representative. The level and intensity of cleaning of surface of stones with micro abrasives systems will be determined by Departmental Representative.
- .6 STEP no.1: Procedure for cleaning of black deposits from atmospheric pollution:
  - .1 Make an air-waterproof separation of zones to clean with air-waterproof canvas;
  - .2 Perform a pre-cleaning of masonry surfaces with pressurized hot water;

- .3 Use a sufficient pressure from the compressor for an adequate cleaning by the micro-abrasive system.
- .4 Install a humidity separator in the forced air supply.
- .5 Empty periodically used water in a 45 gallons barrel which will be transported off site.
- .7 Procedure for recuperation of cleaning water and removal of residual media
  - .1 Residual water will be removed by a type "wet-vac" vacuum cleaner.
  - .2 Recuperated cleaning water will be drained in 45 gallons plastic barrels at soil level;
  - .3 Barrels will rest on site for 24 hours to leave media particles drop down in the bottom of barrel.
  - .4 Water in the barrel will be thereafter pumped at 600mm from the bottom of the barrel and poured in a drainage basin .
  - .5 The residual media in the bottom of the barrel must be thereafter packed into transparent plastic bags and removed off site.
  - .6 Equip workers with respiratory protection devices to protect them from dust particles and dangerous pollutants in the air all along cleaning operations.

### 3.5 **TYPE 1B: Cleaning of black deposits from atmospheric pollution on sculpted and molded stone elements.**

- .1 Use a micro abrasive cleaning system for bas-reliefs, cornices, capitals, coat of arms, pediments and sculpted elements of wall : low pressure Micro abrasive cleaning system, capable of pulverizing a granulate of 100 microns through a nozzle with pencil beak having an opening of 1 mm **creating a whirlwind**, at pressures maintained between 70 and 275 kPa. See 2.2.12.
- .2 Methods, procedures and materials to use will be established early in the schedule of project after a period of works samples execution in the presence of Departmental Representative. The level and intensity of cleaning of surface of stones with micro abrasives systems will be determined by Departmental Representative.
- .3 STEP no.1: Use carefully small silk brushes and wood scrapers in addition to steam cleaning to remove most of the dirt sediment **before** proceeding to micro-abrasive cleaning.
- .4 STEP no.2: Procedure for cleaning of black deposits from atmospheric pollution:
  - .1 Make an air-waterproof separation of zones to clean with air-waterproof canvas;
  - .2 Perform a pre-cleaning of masonry surfaces with hot steam and with soft brushing and scraping;
  - .3 Proceed to micro-abrasive cleaning and use a sufficient pressure from the compressor for an adequate cleaning by the micro-abrasive system.
  - .4 Install a humidity separator in the forced air supply.
  - .5 Empty periodically used water in a 45 gallons barrel which will be transported off site.

- .6 Complete the cleaning system with a poultice cleaning as prescribed, for located areas containing des soluble salts.
- .5 Procedure for recuperation of cleaning water and removal of residual media
  - .1 Residual water will be removed by a type "wet-vac" vacuum cleaner.
  - .2 Recuperated cleaning water will be drained in 45 gallons plastic barrels at soil level;
  - .3 Barrels will rest on site for 24 hours to leave media particles drop down in the bottom of barrel.
  - .4 Water in the barrel will be thereafter pumped at 600mm from the bottom of the barrel and poured in a drainage basin.
  - .5 The residual media in the bottom of the barrel must be thereafter packed into transparent plastic bags and removed off site.
  - .6 Equip workers with respiratory protection devices to protect them from dust particles and dangerous pollutants in the air all along cleaning operations.

### 3.6 **TYPE 1C : Concrete finishing of the saut-de-loup on north façade of the East square tower .**

- .1 The general intention of the concrete finishing works is to clean off stains and also to give a mineral texture similar to a light bush hammer.
- .2 A micro abrasion system will be used for this type of cleaning and surface finishing. Micro abrasive cleaning of general surfaces of all concrete surfaces of the saut-de-loup (exterior surfaces and those in the saut-de-loup: low pressure Micro abrasive cleaning system, capable of pulverizing a dry abrasive of 30 to 100 microns in a nozzle of 2 mm **creating a whirlwind**, at pressures maintained between 140 and 160 kPa.s
  - .1 Acceptable Material:
    - .1 J.O.S. Rotec system.
    - .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .3 Cleaning Media no.1: Glass micro-balls 70-120 microns
- .4 Methods, procedures and materials to use will be established early in the schedule of project after a period of works samples execution in the presence of Departmental Representative. The level and intensity of cleaning of surface of stones with micro abrasives systems will be determined by Departmental Representative.

### 3.7 **TYPE 2: Removal of asphalt and tar**

- .1 STEP no.1: Scrape and remove the exceeding deposits of thick asphalt and tar with high density plastic scraper. Facilitate this dry method by freezing the surface with dry ice and in conformance with Departmental Representative's instructions.
- .2 STEP no.2: Apply poultice with the remover product for tar.
  - .1 Acceptable Product:
    - .1 Asphalt and Tar Remover by Prosoco

- .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .3 Take required precautions to maintain strictly the tar in the affected area. Do not leave the stain transfer elsewhere or leak on other masonry surface.
- .4 STEP no.3: Once the chemical cleaning is completed, proceed with a micro-abrasive cleaning of Type 1A as described at paragraph 3.4 in order to remove residues on the stones.
  - .1 Neutralize all cleaned surfaces with a water rinsing.
  - .2 When surface is completely dry, approximatively 4 days after rinsing, remove paint marks and stains by a low pressure micro abrasive cleaning of type 1A as described in paragraph 3.4.
  - .3 Confine all dust resulting from micro abrasive cleaning works in the work area, then finally clean with vacuum cleaner and eliminate from work site as described in paragraph 3.4.

### **3.8 TYPE 3: Removal of paint and/or sealant products**

- .1 STEP no.1: Remove mechanically exceeding paint or sealant products before undertaking cleaning with chemical products.
- .2 Scrape surfaces with high density plastic scrapers to remove excess paint.
- .3 STEP no.2: In addition to scraping the paint, perform cleaning by using paint removal systems by chemical cleaning as first stage of cleaning;
  - .1 Acceptable Product :
    - .1 Heavy Paint Stripper by Prosoco
    - .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .4 STEP no.3: Once chemical cleaning done, proceed with a micro-abrasive cleaning of Type 1A as described in paragraph 3.4 to remove residues on the stones.
  - .1 Neutralize all cleaned surfaces with a water rinsing.
  - .2 When surface is completely dry, approximatively 4 days after rinsing, remove paint marks and stains by a low pressure micro abrasive cleaning of type 1A as described in paragraph 3.4.
  - .3 Confine all dust resulting from micro abrasive cleaning works in the work area, then finally clean with vacuum cleaner and eliminate from work site as described in paragraph 3.4
- .5 Install an air extraction system with filter for all procedures including chemical products described above when fumes are emitted ; maintain this system in place for the duration of the works, as soon as the method prescribed to remove the paint or sealant products is determined by Departmental Representative.
  - .1 The fumes emanating from procedures to remove paint must absolutely be extracted and filtered in the confined area of the works.

- .2 Contractor must provide proof of efficiency of extraction system by doing daily testings on air quality.
- .3 The fact of not providing an appropriate extraction and filtration system will lead immediately to a requirement to stop the works from the Departmental Representative until the problem is resolved, and this, without extra charges to the Government of Canada for delays or for the improvement of the equipment.

**3.9 TYPE 4: Removal of ferrous oxide stains (rust) and d'oxidation of copper (green stains).**

- .1 The level and intensity of cleaning targeted for ferrous oxide stains and copper oxidation will be established and approved by Departmental Representative following the works samples of cleaning.
- .2 STEP no.1: Effect cleaning with a removal of rust stains and copper oxidation system by chemical cleaning as first stage of cleaning.
  - .1 Acceptable Product :
    - .1 Ferrous Stain Remover by Prosoco
    - .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .3 STEP no.2: Once chemical cleaning performed, proceed to micro-abrasion cleaning of Type 1A as described at paragraph 3.4 in order to remove dirt rings and stain residues on the stone.
  - .1 Neutralize all cleaned surfaces with a water rinsing.
  - .2 When surface is completely dry, approximatively 4 days after rinsing, remove paint marks and stains by a low pressure micro abrasive cleaning of type 1A as described in paragraph 3.4.
  - .3 Confine all dust resulting from micro abrasive cleaning works in the work area, then finally clean with vacuum cleaner and eliminate from work site as described in paragraph 3.4

**3.10 TYPE 5A: Cleaning of interior side of all brick walls of the Multifunctional Room (Central Building) and exterior side of south wall.**

- .1 Type no.5A cleaning applies to the totality of surfaces of walls of all interior elevations of the Multifunctional Room and on the exterior side on the totality of the surface of south wall.
- .2 STEP no.1: Effect a pressurized hot water cleaning with a pressure of 1,500 à 2,500 psi to remove flaking paint residues and unsound surface elements.
- .3 STEP no.2: Remove loose residues and excess paint with high density plastic scrapers. Perform a brushing of all surfaces with a brush with soft nylon bristle.
- .4 STEP no.3: Effect cleaning with a chemical detergent and a brushing of surfaces:
  - .1 Acceptable Product :
    - .1 Restoration Cleaner by Prosoco

- .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .5 STEP no.4: Perform a pressurized hot water rinsing at a pressure of 1,500 psi and let dry surfaces during 7 days.
- .6 STEP no.5: Effect a forced air cleaning to remove all surface residues and a last dry brushing of surfaces. Notify Departmental Representative to inspect surfaces before passing to step no. 6.
- .7 STEP no.6: Apply a Waterproof Protection / ecological copolymer acrylic based sealant having a permeance rate to water vapor of 20 perms or more on the totality of surfaces of the walls. Surfaces must be dry, clean and free of dust with a surface temperature of more than 10 degrees Celsius.
  - .1 Acceptable Material:
    - .1 Faceal Oloe HD by PSS
    - .2 Replacement material approved by addendum in conformance with Instructions to bidders.

**3.11 TYPE 5B: Cleaning of soot of brick walls interior side of the two turrets of the north wall (Central Building)**

- .1 Type no.5B cleaning applies to the totality of surfaces of interior brick walls of the two turrets of the north façade of the Multifunctional Room.
- .2 STEP no.1: Effect a hot water cleaning under a pressure of 1,500 à 2,500 psi to remove residues of flaking paint and loose surface elements.
- .3 STEP no.2: Remove loose residues and excess paint with high density plastic scrapers. Effect a brushing of all surfaces with a brush with soft nylon bristle .
- .4 STEP no.3: Effect cleaning with a chemical detergent and with a brushing of surfaces:
  - .1 Acceptable Product :
    - .1 Restoration Cleaner by Prosoco
    - .2 Replacement material: approved by addendum in conformance with Instructions to bidders.
- .5 STEP no.4: Effect a hot water rinsing under pressure of 1,500 psi and let dry surfaces during 7 days"
- .6 STEP no.5: Effect a forced air cleaning to remove all surface residues and a last dry brushing of surfaces

**3.12 TYPE no.6: Removal of efflorescence from stone walls and brick walls by using clay poultices**

- .1 STEP no.1: Brush and vacuum to remove all loose salt efflorescences on surfaces of affected stone.
- .2 STEP no.2: Soak affected stone elements by wetting them by intermittent spraying.

- .1 Complete soaking of the stone elements is necessary to remove damaging salts with a poultice.
- .2 Intermittent spraying to ensure a complete and efficient soaking must be done on a period of 12 hours before applying the clay poultice.
- .3 Recuperate all run-off water coming from this intervention in trays to ensure that soaking and rinsing water is confined to the work surface.
- .3 STEP no.3: Mix diatomaceous clay in a pail with a sufficient quantity of potable water to produce a wet but cohesive consistency. The Departmental Representative will determine what the adequate consistency for the clay poultice mix is.
- .4 STEP no.4: Apply the clay poultice on affected surfaces of the wall in a thickness of 6 mm.
- .5 STEP no.5: Cover the poultice with polyethylene during 24 hours, then remove the polyethylene and let the poultice dry at a controlled air temperature between 18 °C and 24 °C and a relative humidity of 65 %.
- .6 STEP no.6: When the poultice has completely dried, after about 7 days, remove the poultice by scraping with a wood scraper directly in disposable bags and eliminate them from the work site.
- .7 STEP no.7: Properly brush the surface and pass the vacuum cleaner.
- .8 STEP no.8: Rinse with water at low pressure.
- .9 STEP no.9: Let rest the surface of the wall during 3 days before repeating the procedures while maintaining temperatures between 18 °C and 24 °C and humidity of 65 % during this waiting period.
- .10 STEP no.10: Repeat the above procedure at least 3 times, or as required by Departmental Representative.

### **3.13 TYPE no.7: Removal of organic substances and lichen**

- .1 STEP no.1: Apply the solution of registered trademark of ammonium quaternary based biocide in conformance to written instructions of the manufacturer, with a manual sprayer.
  - .1 Acceptable Product :
    - .1 Enviro Klean BioWash by Prosoco
    - .2 Replacement material: approved by addendum in conformance with Instructions to bidders
- .2 STEP no.2: Saturate the surface with the solution and let it penetrate in the masonry.
- .3 STEP no.3: Mask and protect adjacent masonry during application.
- .4 STEP no.4: Repeat removal procedures as needed.

**3.14 TYPE no.8: Cleaning of dirt and bird faeces stains**

- .1 STEP no.1: Remove thick deposits with a non ferrous trowel and remove them immediately from the site.
- .2 STEP no.2: Effect cleaning tests with poultices moistened with solvent mixed with diatomeous earth and/or to a methylene dichloride stripper. Leave the poultice in place for 2 hours and cover it so that it does not dry. Remove it and then brush vigorously the masonry surface with a hard bristle brush while dabbing softened dirt with cotton rags moistened with chemical product. If the method works, continue in this manner for the rest of affected surfaces.
- .3 STEP no.3: If removal of dirt caused by pigeon faeces with chemical products does not work sufficiently well, do a cleaning test with the low pressure micro-abrasion cleaning system. If this method works, continue the cleaning of affected areas to obtain an approved cleaning level. Avoid cleaning too hard and damaging the stone.

**3.15 TYPE no.9: Cleaning with surfactant**

- .1 STEP no.1: Use the following method to clean light and not well bonded to surface stains.
- .2 STEP no.2: Dry brush all surfaces with a hard bristle brush to remove accumulated loose soiling while vacuuming dirt with a vacuum cleaner as it breaks of.
- .3 STEP no.3: Provide protection means such as trays and all required installations to ensure that cleaning solution does not discharge, run off or make contact in any way with wall surfaces or adjacent floors which are not included in the present cleaning.
- .4 STEP no.4: Apply freely the surfactant and a hot water solution having a temperature of 37 °C to 43 °C on surfaces of stones to clean. The concentrations of surfactant and water solution will be determined by Departmental Representative.
- .5 STEP no.5: Brush vigorously the surface manually with a hard bristle brush. Do not let the surface dry. Work on surfaces having maximum dimensions that can be managed in a single operation. Brushes must have different forms and dimensions to allow easy access and a sound contact with all surface forms of stones to clean.
- .6 STEP no.6: Discharge all surfactant solution as soon as it becomes soiled and replace it by a new solution.
- .7 STEP no.7: Once the surface is clean to satisfaction of Departmental Representative, rinse the surface of cleaned stones by applying freely hot water and ensuring to collect all run off rinsing water.
- .8 Any damage on surfaces of adjacent walls, such as mortar, glass, plaster or wood must be repaired or elements replaced to satisfaction of Departmental Representative and costs assumed by the contractor.

**3.16 TYPE no.10: Waterproof / sealant protection (shoulders of buttresses and passing window sills)**

- .1 STEP no.1: Clean light and lightly adhered stains of surface.

- .2 STEP no.2: Dry brush all surfaces with a hard bristle brush to remove accumulated loose soiling while vacuuming dirt with a vacuum cleaner as it breaks of and proceed with a light water rinse.
- .3 STEP no.3: Allow stone to dry for 48 hours and apply a waterproof protection / ecological copolymer acrylic based sealant having a permeance rate to water vapor of 20 perms or more on the totality of the following stone surfaces:
  - all passing windowsills of North façade (including new stones )
  - all shoulder stones (4 by buttress) of buttresses of North façade.
  - all interior and exterior surfaces of the cast concrete saut-de-loup in north façade of East Wing.Surfaces must be dry, clean and free of dust with a surface temperature of more than 10 degrees Celsius.
  - .1 Acceptable Material:
    - .1 Faceal Oloe HD by PSS
    - .2 Replacement material approved by addendum in conformance with Instructions to bidders.

**3.17 OPERATIONS AFTER TECHNICAL CLEANING AND FINAL CLEANING (APPLICABLE FOR ALL TYPES OF CLEANING DESCRIBED IN THE SPECIFICATIONS).**

- .1 Do the final rinsing of masonry to satisfaction of Departmental Representative on all masonry surfaces (brick and stone) exterior and interior of the whole Armoury.
  - .1 Pre-wet masonry surface when necessary. Work from bottom of wall upwards.
  - .2 Avoid prolonged wetting and excessive water penetration.
  - .3 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by Departmental Representative at tests.
- .2 At completion of works, verify the pH value of stone at places where chemical products have been used in the cleaning process. If pH value is not neutral, rinse with water. Continue rinsing until surface pH of wall reaches a neutral pH value of 7 to 8,5.
- .3 Collect and eliminate cleaning materials and clean work zone as cleaning progresses.
- .4 Collect and eliminate chemical and hazardous waste in conformance to applicable regulations on hazardous waste.
- .5 Scrape carefully the last residues in plastic bags and remove them from the site.
- .6 Make sure masonry is cleaned after removal of scaffoldings to eliminate masonry soiling caused by the fastening devices.
- .7 Make sure that surface finishing joint mortar is sufficiently dry before doing the final cleaning. Damaged mortar joints during final cleaning will have to be scooped out and final.
- .8 At completion of works, clean the site and restore the work zones to a state equivalent to their initial state.

**END OF SECTION**