Part 1 General

1.1 SCOPE OF WORKS

.1 The list of works listed in this section is indicative and non-limitative. It does not exclude works described in other sections of the specifications, shown on drawings or necessary for a complete execution of the works in the spirit of the plans.

.2 The works described in the present section address the restoration of historical metal ornaments of the Armoury such as the two pinnacles of the square towers, the grilles of the windows of East Wing (1913-1914), the two small secondary crests and the two start ups on the turrets of North façade.

1.2 RELATED REQUIREMENTS

.1 Section 07 61 00 - Sheet Metal Roofing.

.2 Section 07 62 00 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

.1 CSA International

- .1 CSA W59-03, Welded Steel Construction (Metal Arc Welding) .
- .2 CAN3-S157-FM83(C2000), Cast iron units mechanical strength calculations
- .3 CSA W47.2-FM1987(C1998) : Certification of companies of fusion welding.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

.3 The Master Painters Institute (MPI)

- .1 Architectural Painting Specification Manual - 2004. (Named « MPI manual» in the present section.)
- .2 Master Painters Institute (MPI)
  - .1 MPI Architectural Painting Specifications Manual, 2007.
  - .2 MPI - Maintenance Repainting Manual, 2004.

1.4 DÉFINITION

.1 Wrought Iron: a two component metal consisting of high purity iron and iron silicate, a particular type of glass-like slag, both in physical association

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Clearly indicate materials, finishes, connections, and joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.

.3 Submit two copies of WHMIS MSDS Material Safety Data Sheets in accordance with Section 01 35 29 - Health and Safety Requirements for abrasive media, oil, grease, paint stripper, primers, paints and coatings.

.4 Submit mock-ups of each Repair Type to the Departmental Representative for approval before starting work. Upon acceptance, these mock-ups become the quality standard against which the rest of the work is compared.

.5 Provide mock-up demonstration of each Repair Type in this Section and newly forged item for review, prior to completion of similar repairs on other components of metal ornaments.

.6 Provide to Departmental Representative at end of Work all patterns and moulds used for reproduction of metal ornaments

.7 Provide to Departmental Representative at end of Work all moulds made by the blacksmith for the reproductions of the Armoury.

.8 Provide Departmental Representative with Project Record Drawings required in paragraph 3.4.1.

.9 Maintain accurate and up to date records, on drawings provided by Departmental Representative, of any unseen conditions or necessary repair work above and beyond that already noted on drawings. Submit a copy of these drawings to the Departmental Representative at the completion of the Work.

1.6 COORDINATION

.1 Coordinate work before and during the project to ensure that any required modifications to the iron work are understood, approved by the Departmental Representative and executed, before painting and reinstallation. No cutting shall be done on site.

.2 Any potential or actual conflict between the accurate reinstallation of the restored iron work and the masonry and roofing must be brought to the attention of the Departmental Representative within 30 days of the iron work being removed from the building.

.3 Provide wood structure framers, masons and roofers with accurate templates of the restored iron work so that anchoring and attachment points in the masonry or roof surface can be accurately located and prepared.

1.7 QUALITY ASSURANCE

.1 It is formally forbidden to undertake the following stages without approval of Departmental Representative:

.1 Photographic documentation of existing conditions of ornaments.

.2 Labeling and documenting all pieces;

.3 Protection of ornaments and transport to shop.

.4 Preparation of surface of metal ornaments.

.5 Dismantling of components, repair and replacement of missing or deteriorated elements.

.6 Application of paint.

.7 The Departmental Representative must obligatorily inspect each of the metal ornaments, the pinnacles, the start ups and each module of secondary crests, all BEFORE transporting them to the site.

.8 Protection of ornaments and transport to site.

.9 Reinstallation of restored metal ornaments.

.2 Adjust techniques as directed by Departmental Representative until desired results are achieved. Steps or processes approved by Departmental Representative serve as the standard for subsequent work.

.3 The iron components that make up the pinnacles and start ups are made of wrought iron and the secondary crests of cast iron and must be reproduced in the same materials. The collars are of cast lead (collars) and must be reproduced in the same materials.

.4 Do welding work in accordance with CSA-W59, unless otherwise specified.

.5 Workers must possess all the knowledge and experience required for the execution of the works of historic ornamental metal works restoration according to the 3 categories of works stated below:

.1 Restoration of cast iron ornamental elements of the end of the XIXth century (cast iron crests)

.2 Restoration of cast iron ornamental elements of the end of the XIXth century (finials, ridges, onsets)

.3 Historic reconstitution of ornamental metals to the identical with steel and/or cast aluminum.

.6 They must have all licenses, permits and/or competency cards required for the execution of works in the province of Québec.

.7 At the request of Departmental Representative, historic ornamental metals contractor will have to present a document showing achievements of all his workers assigned to the project in work categories 1.1 to 1.3. In the event where achievements of one or several of the workers do not demonstrate that he or they have the necessary knowledge and/or experience for the execution of the works, Departmental Representative may order the contractor to replace the worker or workers.

At the request of Departmental Representative, the worker whose achievements demonstrates that he has the necessary experience and knowledge for the execution of the works, must make a work sample in one or several of the categories of the works stated at point .1.1 to .1.3 and this, in presence of Departmental Representative, in a manner to demonstrate that work processes and techniques are well controlled while meeting drawings and specifications requirements. In the event where performed samples do not demonstrate that he controls work processes and techniques necessary for the execution of the works, Departmental Representative may order the contractor to replace the worker or workers.

.8 At any moment before or during the execution of the works, in case of unsatisfactory performance from a worker assigned to execution of the works, Departmental Representative may order contractor to replace the worker or workers who do not demonstrate a level of adequate competency for the execution of the works.

1.8 SHOP DRAWINGS

.1 Submit required shop drawings, including shaping and mounting documents, that is conception and assembling details, shaping, mounting diagrams and instructions as well lists of equipment and materials in accordance with section 01 33 00 - submittals

.2 Contractor must furnish shop drawings made digitally (no hand sketches) of all components and elements of metal ornaments.

.1 Indicate clearly materials, finishes, connections, joints, and anchor methods, number of anchors, supports, reinforcements, ornaments, profiles, details and accessories of metal ornaments on the shop drawings.

.3 Contractor must furnish shop drawings made digitally (no hand sketches) of all details for anchoring and reinstallation of metal ornaments at the roof.

.4 Submitted drawings must indicate the sections, assembling, piercings, threaded fastening devices, rivets, weldings and other required elements.

.5 Submit documents describing work methods, sequence of mounting of elements and type equipment type which will be used.

1.9 SAMPLES AND MOCK UPS

.1 Contractor must make the following work mock up for approval by Departmental Representative:

.1 Produce a new module (1 section) of the secondary cast iron crest;

.2 Make a sample of affixing a new cast iron piece on an existing module of secondary ridge;

.3 Furnish 1 sample of EACH copper component which are part of the pinnacles and start ups as described in plans;

.4 Preparation of surfaces and removal of paint on a pinnacle, 1 start up and 1 module of the cast iron of secondary crest;

.5 Carry out the dismantling of components of a pinnacle;

.6 Do a casting of 1 lead collar;

.7 Do paint work on 1 pinnacle, 1 start up and 1 module of cast iron secondary crest.

.8 Submit a sample of all fastenings, anchors, screws, draw strings and other fastening devices.

.2 Accepted samples and mock-ups will become the standard of acceptation for the works present section.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Identify hazardous and related materials which are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from the Provincial Ministries of Environment and Regional Levels of Government.

.2 Safely store materials defined as hazardous or toxic waste, including emptied containers and application apparatus, in containers or areas designated for hazardous waste and dispose of contaminants in an approved legal manner.

1.11 PHOTOGRAPHIC DOCUMENTATION OF EXISTING CONDITIONS

.1 Do a photographic survey of all surfaces and of all sides of each metal ornament (2 start-ups, 2 pinnacles, 2 secondary crests) in order to document their existing conditions. These photos must be of professional quality and high resolution. Submit the photographic survey to Departmental Representative for approval before transporting the metal ornaments. Document by numerical photography and with measured and annotated drawings, the interface and configuration between steel components and roof covering systems and adjacent masonry.

1.12 METHODOLOGY OF LABELING OF COMPONENTS

.1 Install two labels for components (one at each end) on each dismantled component with stainless steel wire fastenings. Do not use aluminium.

.2 Use the same designation for the components as the one indicated on the drawings with sufficient additional information to ensure that the orientation and configuration will be well understood at the time of reassembling. Refer to drawings for the nomenclature of assembling. Include the information of the labels on the drawings. Modify the labeling system as required by Departmental Representative.

.3 Submit a labeling plan of pieces and components of metal ornaments.

.4 Each component replaced must be previously photographed and given to the Departmental Representative.

1.13 PROTECTION AND TRANSPORT OF METAL ORNEMENTS

.1 Construct 19mm plywood boxes big enough to contain the ornaments individually. The ornaments must be padded and the plywood boxes must be covered with rigid insulation inside on all sides. Put the ornaments in the boxes and fill all voids in the box with balls of expanded rigid insulation. Mark the number of the ornament on the box.

.2 Do not pile components in the boxes.

.3 Never slide or drag sections if metal touches metal.

.4 Tie up sections in place by tightening with nylon straps where elements are supported by spacers.

.5 Construct a test box for approval of Departmental Representative before producing all the plywood transport boxes. The Departmental Representative must inspect all the ornaments in the plywood boxes before their closure and transport. This requirement applies also for the transport from the shop to the site.

.6 The metal ornaments of the armoury are dated of 1885 and are relatively fragile. Handling and transport must be delicate and meticulous.

.7 The use of the same plywood protection boxes is permitted for the transport of metal ornaments from the shop to the site. However Departmental Representative must validate the state of the boxes beforehand and approve their use.

.8 All damages caused to metal ornaments due to handling and/or transport, must be repaired at the expense of the contractor and to satisfaction of Departmental Representative.

1.14 EVALUATION OF EXTENT OF REPAIR WORKS

.1 Once metal ornaments are delivered to workshop, contractor must do a review of interventions of restoration and replacement of damaged components with the Departmental Representative. No work must be done on the metal ornaments before this inspection at the workshop. Notify Departmental Representative 10 working days in advance.

.2 On the drawings provided by Departmental Representative, hold a precise an updated record of all conditions which have not been seen or necessary repair works additional to those already indicated on the drawings. Bring these drawings at each site meeting for the purposes of reviewing, adjusting and updating them according to the instructions of Departmental Representative.

.3 Stamp the current year on each new wrought iron element in a discreet location as indicated by Departmental Representative. Each number must have about 3 mm of height and 2 mm of depth.

1.15 REINSTALLATION PLAN OF ORNAMENTS

.1 Prepare and submit for approval to Departmental Representative a plan of reassembling which describes the methodology and sequence of reinstallation of metal ornaments. No reinstallation works must be undertaken before approval of the contractor’s reassembling plan.

1.16 COORDINATION MEETINGS WITH CONTRACTOR AND SPECIALIZED SUBCONTRACTORS

.1 The following meetings with the Departmental Representative, the Contractor and his specialized Subcontractor are obligatory:

.1 Start off meeting before the beginning of the works described in this section;

.2 Meetings and inspection visits to workshop of specialized Subcontractor.

.3 Coordination meeting before reinstallation of metal ornaments.

1.17 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 Materials to be used in conservation process shall be intact and unaltered by previous work. Refer to article 2.2 for Departmental Representative supplied materials.

.2 All wrought iron shall be best quality forged iron, tough, ductile and fibrous in character, and of even texture.

.3 Supply sheet wrought iron from which to form the missing rosettes and other floral decorations as indicate

.4 Penetrating oil.

.5 All new machine screws are to be stainless steel slot heads, round or flat as appropriate.

.6 White lithium grease.

.7 Nylon head sleeve.

.8 Cast iron. Type GS (Graphite Sphéroïdal, also named Ductile Cast iron according to standard ASTM A-897-92/A987M-90;

.9 Stainless steel bolts: according to standard ASTM F 593.

.10 Screws, bolts, nuts etc. Stainless steel type 304.

.11 Welding materials: according to CSA-W59.2 for cast iron welded construction.

.12 Filling putty for metal: Polyester resin with fiberglass and kevlar compound.

.1 Acceptable product :

.1 Fiber-Tech byEvercoat Corp.

.2 Replacement material: approved by addenda in conformance to Instructions to tenderers.

.13 Touch-up putty for metal: Metal putty (glazing putty)

.1 Acceptable product :

.1 Bondo Corp.

.2 Replacement material: approved by addenda in conformance to Instructions to tenderers

.14 Ultra High Molecular Weight polyethylene pads

.15 Air abrasive media: aluminum oxide, grain of 70-120 microns

.16 Methylene-chloride based paint stripper.

.17 Paint Systems (the informations in this paragraph have precedence – for the metal ornaments - on the other sections of the specifications concerning paint). The general Contractor is responsible to transmit the following information to his appropriate subcontractor:

.1 EXT 5.1G, pigmented polyurethane based product (on primer based on epoxy resin with high zinc content and epoxy resin with high garnishing power), of superior quality, including :

.1 1 coat of MPI no 20, primer; epoxy resin rich in zinc.

.2 2 coats of MPI no 108, epoxy covering with high garnishing power, low gloss finish.

.3 2 coats of MPI no 72, 2 components polyurethanne, and pigmented black, high gloss finish.

.2 Paint materials for the paint system must be the products of only one same manufacturer.

.18 Welding bar :

.1 Wrought iron welding bars for repair works on wrought iron..

2.2 FABRICATION

.1 At places where repair or replacement sections must be combined to original components:

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Unless otherwise indicated or prescribed, make the elements with metal compatible with the material to restore or preserve.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.5 Elements must be shaped in conformity to standard CAN3-S157 and according to indications of the shop drawings.

.6 Apparent surfaces of elements of cast iron must be finished as the existing finishes of the original elements of the cast iron ridge.

2.3 EQUIPMENT AND FACILITIES

.1 Provide indoor facilities off-site (workshops) for all aspects of this work including but not limited to layout, surface preparation and all blacksmithing work.

.2 Provide machine shops, paint booths, and all other facilities required to perform the work, off-site.

.3 Equip the workshop with the following tools and equipment:

.1 An electrolytic reduction system for removal of paint and corrosion products:

.1 Steel tanks shall be of sufficient size and number to hold the roof cresting components

.2 The steel tank(s) shall serve as the anode (+)

.3 The objects being treated form the cathode

.4 An electrolyte consisting of a saturated solution of sodium hydroxide (NaOH)

.5 A direct current (DC) power supply of 100 amps at 6 volts.

.2 Screwdrivers accurately sized for the fastener.

.1 Gunsmith screwdrivers with hollow-ground blades and fixed or interchangeable bits.

.3 Component labels: sheet brass tag with hole at one end, punched with required information and secured with 300 Series stainless steel wire.

.4 Cable pulls: nylon, various lengths.

.5 Straps/slings: nylon, nominal 75 mm wide.

.6 Padding: ethafoam sheet, mover's blankets.

.7 A power hammer: sufficient to draw out sections of wrought iron that may be as large as 50 mm in diameter.

.8 A coal-fired forge sized to heat sections of wrought iron that may be as large as 50 mm in diameter to working temperatures.

Part 3 Execution

3.1 PREPARATION PRE-DISASSEMBLY OPERATIONS

.1 Install two component labels (one at each end) with stainless steel tie wires on each component being disassembled. Do not use aluminium.

.2 Use the same component designation as indicated on drawings with sufficient additional information to ensure configuration and orientation will be understood during reassembly. Refer to drawings for assembly nomenclature. Include label information on drawings. Modify labelling system as directed by Departmental Representative.

.3 Record with digital photography and annotated measured drawings how the iron components fit and relate to adjacent masonry and roofing systems.

.4 Apply liberal quantities of penetrating oil to screw heads, junction of the frame members and other attachment points. If required, build dams with a putty-like modelling material made from calcium salts, petroleum jelly and aliphatic acids, to contain pools of oil over fasteners and joints. Allow oil to penetrate for a minimum of 48 hours before beginning disassembly.

.5 Mark any condition problems on the drawing set that are not already noted and report immediately to Departmental Representative.

3.2 REMOVAL

.1 Throughout the process of removing the iron work exercise extreme care. Only undo existing connections. Cutting patrimonial works will not be tolerated.

.2 Exercise extreme caution when dismantling the iron to prevent breakage and damage to stone work. Any elements broken or damaged during the dismantling must be brought to the attention of the Departmental Representative.

.3 Original screw heads are slotted. Remove screws with screwdrivers of appropriate width and thickness.

.4 If screw heads shear off, drill the shanks out and extract. Coordinate with General Contractor to have a conservation mason cut out the joints around stone settings, (window grills), with hand tools. Provide General Contractor with 5 days prior notice.

.5 Remove sufficient fasteners that components are reduced to manageable sized pieces at the discretion of the Departmental Representative.

.6 Brace, pad and protect components.

3.3 DAMAGE

.1 Make good all damage to the iron work that occurs while they are with the contractor at no cost to and as directed by the Departmental Representative.

3.4 SHOP WORK DISASSEMBLY

.1 All grills, crests, star-ups and pinnacles are to be fully disassembled in the wokshop.

.2 All machine screws are to be removed and all rivets holding rails within the slots of the balusters are to be drilled out so that all assemblies are broken down into their individual pieces.

.3 Add additional tags and key to drawings as this work proceeds.

3.5 PAINT AND CORROSION PRODUCT REMOVAL AND REPAINTING (EXCEPT FOR THE SECONDARY CAST IRON CREST)

.1 Wash loose dirt, paint, etc., from surfaces using a pressure washer and potable water.

.2 Paint shall be removed with methylene chloride based paint stripper to speed up the process. The softened paint shall be removed with wood or plastic scrapers not metal. Follow manufacturer's printed instructions for process and safety.

.3 Then remove all paint and corrosion products by electrolytic reduction.

.4 Load the iron components into the tank with small wires to ensure good current supply to each piece of iron and the negative lead. Connect the positive lead to the tank.

.5 Ensure that the iron components are not in direct contact with the tank (anode).

.6 Fill the tank with hydroxide solution, (ph 13 or more), until all parts are submerged.

.7 Turn on the power supply and check with a voltage metre that there is a voltage difference between the anode (tank) and the cathode (iron components). If there is no voltage then there is a short to be corrected.

.8 Shut off power and remove parts from the tank and pressure wash. If the surfaces are reduced to a dull grey with some black or brown mottling they are sufficiently clean.

.9 Wash with a pressure washer and water only to remove all salts and dry immediately with compressed air.

.10 Any components still showing corrosion products are to be treated again as described above.

.11 Immediately prior to painting all surfaces are to be given a dusting off with air abrasive to remove any light corrosion that may have occurred in the mean time. The metal should be clean and grey with some brown and black mottled stains with no accumulation of corrosion products at all. Do not blast "white" as this is overly aggressive and will result in the loss of surface detail and edge sharpness.

3.6 WELD REPAIRS

.1 Where weld repairs to original wrought iron components are called for, gas or electric welding shall be used to join on the new part or repair the break. Mild steel electrodes, nickel or MIG wire are not acceptable. Use only wrought iron filler rod on wrought iron repairs, as specified. Care must be taken in preparation however, as wrought iron is a laminar material, and welding must be carried out through the full depth of the section.

3.7 FASTENERS

.1 All existing rivets, peened over tenons, and machine screws shall be replaced with stainless steel, flat head slotted machine screws in the same diameter as the fasteners they are replacing. This includes instances where the historic fastening has been previously replaced with weld.

.2 In the case of peened over tenons, cut the tenon off, fill the mortise with weld and then drill and tap for the new stainless steel flat head slotted machine screw.

.3 Carefully drill out existing fasteners and re-tap for the new stainless ones.

.4 Sandblast the stainless heads to give a physical profile to the surface to increase paint adhesion.

.5 Use a nylon headed sleeve on each fastener to provide electrical insulation; seal the joint; reduce fastener vibration; eliminate electrolytic action.

.6 Coat the threads with white lithium grease immediately prior to installing the new fasteners, taking extreme care not to contaminate with grease any exposed surface that will be painted in the future.

.7 Take care not to over tighten.

.8 Prime and paint the screw heads after installation.

3.8 NEW CAST IRON COLLARS

.1 Design new 2-piece collars to replace those missing at origin. The collar is to be 2 halves joined by stainless nuts and bolts at half lap intersections on the castings.

.2 Drawings of the proposed replacement will be submitted for approval. Once the pattern is made and a collar is cast, it too will be submitted for approval.

.3 Machine, fettle and dress the new castings as required to produce clean castings.

.4 Because of the possibility of delays at the foundry, the Contractor shall arrange to have this portion of work done as one of the first items of work attempted, in order that the components shall be ready on time for painting and re-assembly.

.5 The Departmental Representative shall examine for casting defects (porosities, cold-shuts, etc.), as well as accuracy of machining and accuracy of casting. The components must fit neatly together. If the parts do not fit properly, they must be made to do so, either by adjusting the pattern or by machining of the finished castings, as directed by the Departmental Representative.

.6 On acceptance by Departmental Representative, the prototypes become the quality standard against which the rest of the castings shall be measured.

.7 Proceed with casting and machining the balance of required units as directed by Departmental Representative.

.8 Have Departmental Representative make final inspection of entire lot of castings before applying the primer. Any castings not to the satisfaction of Departmental Representative must be re-cast and re-machined.

.9 Assume 24 lead castings to produce 12 collars.

3.9 NEW WROUGHT IRON COMPONENTS

.1 In working the wrought iron all welding is to be done in the fire. The use of electric welding or gas welding will be limited to repairs where indicated.

.2 Unless indicated otherwise, all wrought iron work in shall use the traditional techniques of drawing out, upsetting, forge welding, riveting and collaring etc.

.3 In addition, the reproduction of leaf and floral components may require the use of stakes and jumping hammers and therefore a high degree of blacksmithing skill is required.

.4 The quality of work will be judged by the finish texture of the work, which is the absence of hammer marks, the structural integrity of structural connections such as forge welds, peened over tenons, rivets, etc., as well as the physical match of the new work compared to the old.

.5 The reproduction of missing decoration may require the blacksmith to make custom stakes; these are to be given to the Departmental Representative at job end.

3.10 STRAIGHTENING OF BENT WROUGHT IRON

.1 Do not begin the straightening of bent or deformed wrought iron components until all have been disassembled.

.2 Bring the component to the appropriate heat at the forge and remove the deformation to match the configuration and overall finish of components identified by the Departmental Representative.

.3 Finished work to be free of any hammer marks.

.4 Refer to Drawings for quantities and locations. Coordinate bends to conform to roofing with site measurements after roof has been installed.

3.11 REMOVAL OF OLD REPAIRS

.1 Remove any previous weld/braze repairs by grinding, cutting and melting out.

.2 Build up pitted or wasted areas that are still structurally sound by gas welding and puddling in.

.3 Weld breaks.

.4 Use wrought iron for wrought iron components.

3.12 MODIFICATIONS TO DORMER CRESTING RAIL ENDS TO MEET ROOF SLOPE

.1 Grind off all traces of existing weld with grinder and file smooth.

.2 Cut back existing rail to original material.

.3 Extend material by welding with wrought iron filler rod.

.4 Match slope of end piece with slope of roof. This work is to be coordinated with roofer to ensure lengths and angles.

.5 Install with Ultra High Molecular Weight polyethylene pads between iron and copper and nylon sleeve around all S.S. lag bolts. See detail on drawing.

3.13 RE-INSTALLATION

.1 Reinstall the restored iron work in their adjusted locations such that all bearing and support points make contact.

.2 Coordinate and cooperate with masons, carpenters and other trades as required during the reinstallation process.

.3 Apply Ultra High Molecular Weight polyethylene, 1.6 mm, pads between all iron to copper contact points.

.4 Lag bolt holes should have a bead of thermoplastic caulk applied around them on the copper roof before the plastic pads, ironwork and lag bolts are installed. The lag bolts are to be driven tight before this caulk cures.

.5 Stainless steel lag bolts into the roof structure are to have nylon headed sleeves installed on them.

.6 Touch up paint as required or as directed by Departmental Representative

3.14 WORKS ON WINDOW GRILLES EAST WING (1913-1914)

.1 Remove the steel grilles from window openings as details on drawings. Transport the grilles to the workshop in conformity with requirements of Part 1 of present section.

.2 Scrape the grilles and strip the paint up to sound steel with a micro-abrasion technique and with the help of a piccolo. Use aluminium oxyde of 70-120 microns. Use a low pressure micro abrasive system to strip surfaces of existing paint. The system must be capable of spraying 120 microns granulate through a nozzle with a pencil spout having an opening of 1 mm **creating a vortex**, at sustained pressures between 70 and 275 kPa.

.3 Test all stripping methods by micro-abrasion of steel surfaces. Do the test at low pressures, starting at 158 kPa, to determine methods and procedures to use. Under the direction of Departmental Representative, do other tests at diverse pressures different types of mediums, impregnation periods, concentrations, types of nozzles and projection distances from wall surface until satisfactory results are obtained and approved by Departmental Representative.

.4 Once stripping completed, plan an inspection of required repairs on all the grilles.

.5 Contractor must include 3 reconstruction repairs of surface by grille by area of 50mmx50mm. Reconstructions must be done with polyester resin compound with fiberglass and Kevlar. Allow to dry and sand repairs.

.6 In addition of what is indicated on typical details on drawings concerning the grilles, Contractor must include 2 replacements by grille according to the following:

.1 1 Partial replacement of steel bar (diam 19mm and length of 200mm). Replacement steel for the grilles is in stainless steel 304 welded to existing steel (grind down the welded joints).

.2 1 Partial replacement of transversal bar (38mm width x 12mm thick and length of 200mm). Replacement steel for the grilles is in stainless steel 304 welded to existing steel (grind down the welded joints).

.7 Refer to drawings for reinstallation details of the grilles.

.8 Do preparation and paint works according to paragraph 2.1.17 and 3.17

3.15 WORKS ON CAST IRON SECONDARY CRESTS - RESTORATION OF EXISTING SECTIONS WORKS

.1 Transport the sections of secondary crests to the workshop in conformity with requirements of Part 1 of present section.

.2 Strip the paint up to bare metal with a micro-abrasion technique and with the help of a piccolo. Use aluminum oxide of 70-120 microns. Use a low pressure micro abrasive system to strip surfaces of existing paint. The system must be capable of spraying 120 microns granulate through a nozzle with a pencil spout having an opening of 1 mm **creating a vortex**, at sustained pressures between 70 and 275 kPa.

.3 Test all stripping methods by micro-abrasion of cast iron surfaces. Do the test at low pressures, starting at 158 kPa, to determine methods and procedures to use. Under the direction of Departmental Representative, do other tests at diverse pressures different types of mediums, impregnation periods, concentrations, types of nozzles and projection distances from wall surface until satisfactory results are obtained and approved by Departmental Representative.

.4 Once stripping completed, plan an inspection of required repairs with Departmental Representative at all sections of the two secondary crests.

.5 Reconstruct missing elements and reinforcements of existing elements.

.6 File down and do grinding down necessary to make surfaces smooth and non obstructive.

.7 Do preparation and paint works according to paragraph 2.1.17 and 3.17

.8 Do reinstallation according to details on drawings.

3.16 WORKS ON CAST IRON SECONDARY CRESTS - REPLACEMENT OF MISSING OR DETERIORATED ELEMENTS

.1 Departmental Representative will choose modules and pieces which will serve as models to moldings (matrix) for replacement pieces. Cast iron. used for replacement pieces is to be grey cast iron. The model serving to make the mould will be made of wood, metal, plastic material or wax, having to each set back more or less, the same shape as the pieces to mould and destined to the realization of the molds of foundry.

.2 Provide the furnishings and labor necessary to the molding of cast iron pieces necessary to replace missing elements identical to the existing elements.

.3 Do the shaping of the molds with sand or other methods approved by Departmental Representative.

.4 Do pouring of cast iron of molds of sand, or other methods approved by Departmental Representative. Molds must be made of black sand bonded with bentonite, or sand with chemical self-hardening bond according to model to reproduce. Stages of inoculation and conversion of the metal must conform to current standards during the pouring of the cast iron.

.5 Once the predetermined period of solidification and cooling are completed, the piece must be carefully removed of it's sand mold. The piece must be thereafter freed of it's feed heads, abrasive blasted and trimmed.

.6 Do the necessary filing and grinding to make the pieces exempt of spallings and do closing of holes and other openings with metal putty and sand until obtaining of a smooth and uniform surface.

.7 Sand lightly the new cast iron elements with an aluminum oxide sandpaper no.180. Clean the new cast iron pieces of all residues, grease, dust or dirt before proceeding to paint works in workshop.

.8 Prepare the threaded holes and bolts before installation.

.9 Do assembling and fixation in workshop of new cast iron pieces by welding them.

.10 Do cleaning of surfaces application of paint on bare metal.

.11 Protection, transport, furnishing and installation of the crest on the site as described in paragraph 1.12.

.12 Repairs must be imperceptible through paint coats at a distance of 2 meters.

3.17 PAINT WORKS- PRODUCTS

.1 Paint System (the information in this paragraph has precedence – for the metal ornaments - on other sections of the specification concerning paint). The general contractor is responsible to transmit the following information to his appropriate sub-contractor:

.1 EXT 5.1G, pigmented polyurethane based product (on primer based on epoxy resin with high zinc content and epoxy resin with high garnishing power), of superior quality, including :

.1 1 coat of MPI no 20, primer; epoxy resin rich in zinc.

.2 2 coats of MPI no 108, epoxy covering with high garnishing power, low gloss finish.

.3 2 coats of MPI no 72, 2 components polyurethane, and pigmented black, high gloss finish.

.2 Paint materials for the paint system must be the products of only one same manufacturer.

.2 Only products appearing on MPI Approved Products List (APL) may be used for the present works.

.3 All paint materials for the paint system must be the products of only one same manufacturer.

.4 Only products officially recognized having obtained the mention Environmental choice E3 can be used for the present works.

.5 Conform to current requirements of MPI relating to paint coverings, including those regarding surface preparation and application of primers or impression paint.

.6 Products used inside the building, namely primers or impression products, paints, coatings, varnishes, tinting, lacquers, filling products, thinners, solvents and others, must

be in conformity to the « Approved Product Listing » (APL) of MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual.

.7 For the interior of the building, provide paint products having the mention « Environmental choice E3 » founded on VOC content (according to EPA 24 method).

3.18 PAINT WORKS- PREPARATORY WORK

.1 Protection

.1 Protect the surfaces of the building and neighboring structures which must not be covered with paint or coating against speckles, marks and other damages with non dirtying coverage or masking elements. If surfaces involved are damaged, clean them and restore them according to instructions of Departmental Representative.

.2 Protect materials and components covered by a factory finish.

.2 Preparation of surfaces

.1 The surfaces to paint must be exempt of oil, dust, dirt and must be dry.

.3 Clean and prepare surfaces in conformity with requirements listed in MPI Architectural Painting Specification Manual and MPI Maintenance Repainting Manual and to recommendations of paint manufacturer.

.4 Before application of primer or impression coat and between subsequent coats, prevent cleaned surfaces from being contaminated by salts, acids, alkalis, corrosive chemical products, grease, oil and solvents. Apply primer or impression product, paint or any other prerequisite treatment product as soon as possible after cleaning, before surface is contaminated again.

.5 As possible, apply a coat on concealed surfaces of new wood works before putting them in place. Use to do this, the products prescribed for the apparent surfaces.

.6 Clean metallic elements (surfaces) to paint by removing from them rust traces, laminated scaling, welding stains, dirt, oil, grease and other alien material in conformity with MPI requirements.

.7 Touch-up surfaces covered with a factory applied primer, according to indications.

.8 Do not apply paint on prepared surfaces before their acceptance by Departmental representative.

3.19 PAINT WORKS- APPLICATION

.1 The application method used must be approved by Departmental Representative. Unless otherwise indicated, apply the product according to manufacturer’s instructions.

.2 Apply each coat of paint in a manner to obtain a continuous coat, of uniform thickness. Rework bare or with a too thin coat surfaces before applying the following coat.

.3 Allow surfaces to dry and harden adequately après after cleaning and between each successive coat, by waiting the minimum time recommended by the manufacturer.

.4 Sand and clean dust of surfaces between each coat to eliminate apparent defects.

.5 Finish surfaces which are located over and under lines of sight in conformity with applicable prescriptions to neighboring surfaces, including tops of cupboards and interior cabinets and projecting edges.

END OF SECTION