Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00.02 – Concrete Forming and Accessories

.2 Section 04 03 07.02 – Historic Masonry Repointing.

.3 Section 04 03 42.02 – Historic Replacing Stone.

.4 Section 04 03 43.02 – Historic Dismantling Stone Masonry.

.5 Section 04 05 10.02 – Common Work Results for Masonry.

.6 Section 09 97 19.02 – Painting Exterior Metal.

1.2 REFERENCES

.1 Definitions:

.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.

.2 Ductile iron, also known as ductile cast iron, nodular cast iron or spheroidal graphite iron for all replacement collars.

.2 References:

.1 Canadian Standards Association (CSA):

.1 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding

.2 CSA W59-M1989 (r2001), Welded Steel Construction (Metal Arc Welding).

1.3 SUBMITTALS

.1 Provide submittals for review in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings

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

1.4 CLOSEOUT SUBMITTALS

.1 Project record

.1 Provide documents in accordance with Section 01 78 00 – Closeout Submittals.

.1 All patterns for the reproduction wrought and cast iron components.

.2 Photograph record of all iron surfaces: before; during; and after conservation.

.3 Project Record Drawings, include location of replacement and interventions indicating their type.

1.5 PRICE AND PAYMENT PROCEDURES

.1 Sequencing: sequence with other work in accordance Construction Progress Schedule. Comply with manufacturer's written recommendations for sequencing construction operations.

.2 Scheduling: schedule with other work in accordance with Construction Progress Schedule.

.3 Ironwork restoration and rehabilitation is included in the bid price.

1.6 COORDINATION

.1 Coordinate work before and during the project to ensure that required modifications to the iron work are understood, and approved by the Departmental Representative before execution, 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 must be brought to the attention of the Departmental Representative within 30 days of the iron work being removed from the masonry.

.3 Coordinate removals and re-assembly with masons so that any damage to the pier and coping stones is minimal and so that anchoring and attachment points in the stone can be accurately located and prepared.

.4 Undertake each initial step of iron conservation from tagging, disassembly, and surface preparation through repair and painting under direct review of Departmental Representative.

.5 Coordinate the preparation of full-size plywood templates representing the pier stones and the capstones, using the restored iron fence with Div 03 and Div 04, as a priority to allow Div 03 and Div 04 to prepare their shop drawings and work. Coordinate to ensure correct radii of wall are built. Allow for inspection by Departmental Representative, giving 72 hours notice.

.6 Coordinate with Div 03 and Div 04 for laying out of wall to correct location, length and radii.

.7 Coordinate installation with Div 04 for laying out and cutting of holes in stone to receive spear posts.

1.7 QUALITY ASSURANCE

.1 Allow Departmental Representative access to the workshop(s) for inspection of current work-in-progress.

.2 Qualifications

.1 Ironwork Contractor:

.1 Ironwork contractor to have experience in historic architectural ironwork on project of similar size and complexity to Work of this Contract.

.2 Perform work in accordance with established procedures for historic masonry conservation and The Standards and Guidelines for the

Conservation of Historic Places in Canada, 2nd Edition, published by Parks Canada.

.3 To have on staff metal conservator with demonstrable applicable education/training, in conserving architectural metals as primary occupation, including projects involving wrought iron and cast iron restoration. Conservator to oversee all aspects of the wrought iron restoration.

.2 Workers:

.1 Provide demonstrated, specialized, skilled and competent trades persons who shall have extensive experience in all types of specified work. The skills of individuals will be subject to review and acceptance by the Departmental Representative. Review will include production of basic mock-ups for al types of work specified.

.2 Provide a list of the proposed workers a minimum one week after contract is signed.

.3 No workers shall be changed during the progress of the work without written acceptance by the Departmental Representative.

.4 All workers shall be required to demonstrate competence levels to satisfaction of the Departmental Representative, before being permitted to work on the fence.

.5 Individuals undertaking ironwork shall be fully experienced in working large cross sections of wrought iron and well versed in all traditional blacksmithing techniques such as drawing out, upsetting and forge welding, as well as in the repair of wrought iron using gas welding and wrought iron filler rod.

.6 Workers employed on this project must demonstrate ability to reproduce mock-up standards.

.7 Departmental Representative has right to reject individuals who do not demonstrate appropriate abilities or experience

.8 Workers employed on this project throughout the course of project must meet above requirements. Where, during course of project, workers leave work force, replacement workers must also meet requirements.

.9 Obtain approval from Departmental Representative for changes to qualified personnel.

.3 Mock-ups:

.1 Construct mock-ups in accordance with Section 01 45 00 – Quality Control.

.2 Perform mock-ups, including demonstration procedures for each type of repair and each type of newly forged item and newly cast items for review in location designated by Departmental Representative.

.1 Perform mock-ups under supervision of Departmental Representative to demonstrate a full understanding of specified procedures, techniques and formulations are achieved before work commences.

.2 Provide mock-ups of:

.1 Repair Type A.

.2 Repair Type B.

.3 Repair Type C – for lengthening spear post.

.4 Repair Type C – For lengthening of rails.

.5 Repair Type D.
.6 Weld repair.
.7 Replacement collar 2 – ends open.
.8 Replacement collar 1 – end open.
.9 Panel with all stages of surface preparation and painting.
.10 Panel installed with spear posts.
.11 Demonstration of lead post setting.

.3 Notify Departmental Representative minimum 72 hours prior to construction of mock-up. Provide mock-ups for review at one time.

.4 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application

.5 Perform mock-ups where directed by Departmental Representative.

.6 Work not to proceed prior to approval of mock-up. Allow 72 hours for inspection of mock-up by Departmental Representative before proceeding with work.

.7 Repeat mock-up until results are to satisfaction of Departmental Representative.

.8 When accepted by Departmental Representative in writing, mock-up will demonstration minimum standard for this work. Mock-up may remain as part of finished work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Deliver, store, handle and protect materials in accordance with 01 61 00 – Common Product Requirements.

.2 Carefully lift each sections onto an flatbed truck and lay flat on 38 x 92 mm spacers set at 600 mm on centre.

.3 Do not stack components. At no time slide or drag sections if metal touches metal.

.4 Secure sections in place by ratchetting with nylon straps where supported by spacers. Do not over tighten.

.2 Storage and Protection:

.1 Separate dismantled ironwork to approval of Departmental Representative to prevent contact between elements before shipping to shop.

.2 Provide temporary storage for removed elements.

.3 Transport and store ironwork at storage location to approval of Departmental Representative.

.4 Wrap restored ironwork in foam or bubble wrap before it leaves the shop and while it is lifted into place and positioned.

.3 Pick-up and deliver all materials supplied by the Departmental Representative and store in off-site location. Pay all associated costs.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused metal materials from landfill to metal recycling facility.

.3 Divert unused paint material from landfill to official hazardous material collections site.

.4 Do no dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Materials to be used in conservation process shall be untainted by previous work.

.2 The iron components that make up the fence are made of wrought iron with cast steel collars, and shall be replicated in wrought iron with ductile cast iron collars. Independent metallurgical testing of new material shall be paid for by Departmental Representative as needed.

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

.1 Composite material consisting of iron silicate (slag) strands in a ferrite matrix.

.2 Slag stands must be fine and evenly distributed.

.3 Composition

.1 98% or more iron.

.2 0.02 to 0.03% carbon

.3 0.02% maximum sulphur

.4 0.15% maximum phosphorus.

.4 Field acceptance tests: Hot hammer 25 mm square bar down to 3 mm thick without splitting along slag stringers.

.4 Forge-welding flux: Anhydrous Borax.

.5 Welding rods: to CSA W48-01.

.1 Wrought iron welding rod for repair of wrought iron.

.6 Cast iron:

.1 Make replacement collars from ductile cast iron.

.2 No recycled iron is to be added to the cast iron mix.

.7 Air abrasive media: aluminium oxide, 100 grit, glass bead, 60/10 grit.

.8 Penetrating oil.

.9 All machine screws are to be stainless steel, 300 series with slot heads.

.10 White lithium grease.

.11 Methylene-chloride based paint stripper.

.12 Lead molten for setting spear posts into mortices within the pier and coping stones. Alloy: 98% lead and 2% tin .

.13 Threaded fasteners and pins: 300 series stainless steel.

.14 Neoprene spacers: Black.

.15 Stainless steel setting pins, 304 alloy.

.16 Bubble wrap.

2.2 FABRICATION

.1 Where remedial or replacement sections are to be combined with original components:

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

.2 Fabricate items from metal matching the original component unless otherwise noted or specified.

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

2.3 FINISHES

.1 Section 09 97 19.02 – Painting Exterior Metal.

2.4 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 fence 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 fastener.

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

.3 Component labels: stainless steel tag with hole at one end, punched with required information and secured with re-bar tie wire.

.4 Cable pulls: nylon, various lengths.

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

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

.7 Auto carrier: flat aluminium deck, with nylon securing straps.

.8 A coal-fired forge sized to heat sections of wrought iron that may be as large as 50 mm square to working temperatures, up to white heat (correct temperature for forge welding). Natural Gas forge not acceptable.

.4 Other traditional blacksmithing equipment and tools sufficient to execute traditional blacksmithing operations such as forge welding, drawing out and upsetting.

2.5 MARKING

.1 Date stamp the current year on each replacement component in an inconspicuous location indicated by the Departmental Representative.

.2 For replacement cast iron collars the date shall be cast into the underside.

.3 For reproduction wrought iron components the date shall be stamped on the underside.

.4 Characters shall be about 3 mm high and 2 mm deep.

Part 3 EXECUTION

3.1 Safety

.1 Follow all regulations and recommendations for handling and disposing of paint containing lead.

.2 Follow all regulations and recommendations for handling lead in its liquid melted and solid states.

3.2 EXAMINATION

.1 Report in writing, to Departmental Representative areas of deteriorated ironwork not previously identified.

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

.2 Obtain Departmental Representative's approval and instructions for repair and replacement of ironwork units before proceeding with repair work.

.3 Assume existing paint contains lead, and follow regulations for lead paint removal and disposal.

.4 Fence spear posts are set in lead, follow regulations for handling lead.

3.3 PREPARATION

.1 Install using rebar wire, two stainless steel labels (one at each end), minimum size of 10mm by 100mm long, stamped with unique identifier number for the part, on each component being disassembled. Do not use aluminium.

.2 Ensure that individual panels, spears and other details are numbered and inventoried to allow re-installation.

.3 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. Each tag shall also carry the notation “Property of the Gov’t of Canada”. Modify labelling system as directed by Departmental Representative.

.4 Record with digital photography and annotated measured drawings how the iron components fit and relate to the stones.

.5 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. Bring these drawings to each site meeting for review and adjust and update as directed by Departmental Representative.

.1 Submit a copy of these drawings to the Departmental Representative at the completion of the Work.

3.4 RECORDING

.1 Before wall and ironwork are dismantled, engage services of licensed surveyor to:

.1 Record the shape of the wall and fence.

.2 Location of piers.

.3 Length of each fence bay from pier to pier.

.4 Elevations to top of capstone sand pier stones.

.5 Other information that would be required in order to rebuild the wall and fence to the same location, with adjustments to fit the restored ironwork.

.6 Set control points to permanent structures that will not change for the duration of the project.

.7 Provide electronic files in Autocad, pdf and hardcopy.

.8 Provide copies to Departmental representative.

.9 Use common surveyor engaged for other work on this project and West Slope Project.

.2 Layout batter boards and other markers to locate the centre of wall location and shape.

.3 Using the information from the survey, the same surveys shall layout the restored fence and create plywood templates for setting out the capstones, locations of spear posts and shape of the wall.

3.5 REMOVAL

.1 Throughout the process of removing the iron work from the masonry, exercise extreme care. Only undo existing connections; cutting historic material will not be

tolerated except for the drilling out of the setting pins near the bottoms of the spear posts and for cutting collars that are already split as approved by Departmental Representative

.2 The removals of the spear posts and rail ends from the stone is to be done under the direction of a mason. Exercise extreme caution when dismantling the iron to prevent breakage and damage to the iron work. The stone may be broken to remove the spear posts on the wall indentified for dismantling. Any elements broken during the dismantling must be brought the attention of the Departmental Representative.

.3 Note that the existing spear posts and railings are set into the pier and coping stones and can be removed without breaking the stone by tipping the spear and coping stone on their sides and using heat to melt and pour the lead out of the socket.

.4 Protect adjacent masonry, pathways and vegetation.

.5 Disassemble the fence to manageable sized pieces at the discretion of the Departmental Representative. Fence panels are not to be disassembled unless it is required for repair – therefore disassembly is limited to separating the spears, collars and panels.

.6 Brace, pad and protect components.

3.6 SHOP WORK - DISASSEMBLY

.1 Larger assemblies are to be fully disassembled in the shop.

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

3.7 PAINT AND CORROSION PRODUCT REMOVAL

.1 Remove all paint and corrosion products by electrolytic reduction.

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

.3 If necessary, 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.

.4 Load the iron components in to 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 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 before painting, give surfaces a dusting with air abrasive to remove any light corrosion that may have occurred in the meantime. The metal should be clean and grey and no 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.

3.8 NEW WROUGHT IRONWORK - GENERAL

.1 In working the wrought iron for the reproduction of replacement elements all welding is to be forge welding done in the fire. The use of gas welding will be limited to repairs where indicated.

.2 Unless indicated otherwise, all wrought iron work in shall use the tradition techniques of drawing out, upsetting, forge welding, tenoning, etc.

.3 The Departmental Representative will reject the black-smithing work if a high level quality work cannot be demonstrated.

.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, etc., as well as the physical match of the new work compared to the old.

3.9 REPLACE SETTING PINS

.1 Replace existing setting pins with stainless steel, 13 mm diameter (confirm after stripping) set into a painted hole in the spear posts. Setting pin to project from spear by 18 mm each side. Pins are friction fit, distort if necessary to achieve tight fit.

.2 Carefully cut off and drill out existing setting pins. Repair spear, if damage occurs, where the existing setting pin is removed.

.3 Lightly sandblast the stainless heads to produce a mottled surface.

.4 Prime and paint the exposed portion after installation.

.5 Refer to drawings for fastener locations.

3.10 WELD REPAIR

.1 Oxy-acetylene gas welding shall be used for the repair of wrought iron components.

.2 Pre-heat surrounding material.

.3 Full depth welding only.

.4 Do deep welds in lifts.

.5 Weld from both sides wherever geometrically possible.

.6 Use wrought iron filler rod only.

.7 For thick or high impurity parent material do weld in multiple lifts. Keep weld liquid until impurities have risen to the surface. Allow metal to freeze and brush off impurities before making another lift of weld material or grinding smooth (final pass).

.8 File smooth.

3.11 REPLACEMENT COLLAR

.1 Make replacement cast iron collars as shown in approved shop drawings. All new cast iron components are to be free from blow holes or other imperfections.

.2 Machine, fettle and dress the replacement castings as required to produce clean castings.

.3 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 all fit together as original. 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.

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

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

.6 Have Departmental Representative make final inspections 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.

.7 Machine bolts shall be 10mm diameter with a flat slot head. Lightly sandblast head and do not paint.

.8 Paint surfaces of collars before installation.

.9 Apply lithium grease to threaded hole immediately before installing bolts.

.10 Note that final tolerances for the size and fit of collars need to be determined based on final thicknesses of paint films and range of spear cross sectional sizes. This shall be reflected in the shop drawings and mock ups. Ideally the hole for the spear would be slightly large so that a discreet piece of sheet lead, on the downhill side of the wall, could be used as a shim when tightening, if necessary. The holes for the railings also need to be slightly oversized to allow for paint film thicknesses and slight deviations in fit and in plan of the wall. The pockets within the collars, for both the spears and rails may be machined to allow for variations in geometry of the wall but the paint films much be restored.

.11 Generally, the collars are the standard design for two or one railings and to allow for changes in direction or curve of the wall plan the shape of the rail ends shall be modified.

.12 Cast collars for Piers 48 and 51 with one closed end and one open end.

3.12 ORIGINAL COLLARS

.1 The 10% of collars that are in the best condition are to be carefully removed, cleaned by electrolytic conduction, and given to Departmental Representative.

.2 At two spear locations identified by Departmental Representative, the original collars may be reused. However, order enough new collars for these two spear locations in case the originals are not reused at this phase. Note that the holes for the spear rail ends will have to be ground larger to accommodate paint film thicknesses.

.3 Touch up damaged paint films after sliding collars into position.

.4 Refer to Drawings for quantities and locations

3.13 REPAIR TYPE A - REMOVE OLD MODIFICATION, FILL AND GRIND SMOOTH

.1 Remove old repair metal and redundant metal by use of die grinder, filing, and as directed.

.2 Fill cavity or wasted area by bringing to welding heat and puddling in wrought iron.

.3 File smooth.

.4 Assume four locations at spear posts 548.01 and 551.01 and elsewhere as indicated.

3.14 REPAIR TYPE B - FILL AND GRIND SMOOTH

.1 This repair is largely limited to filling areas wasted by corrosion. Bring affected area to welding heat and puddle in wrought iron.

.2 File smooth.

.3 For collar locations, rail ends and spear bottoms as indicated.

3.15 REPAIR TYPE C - SPLICE NEW MATERIAL

.1 This is largely limited to the need to building up or extend bottoms of spears and lengthening rail ends.

.2 Cut back to sound material.

.3 Splice and weld new material, of correct size, to parent piece.

.4 File smooth.

.5 Cut to correct length/angle.

.6 For extending bottoms of spears assume two locations at spear posts 548.01 and 551.01 and two additional locations as directed, and rail ends as indicated.

.7 To allow for the idiosyncrasies of the re-built wall the rail ends at the panels that begin and end each run of fencing (a run is defined by the steps up and down in the masonry coping) shall be extended. These pieces shall be fitted last and the rails ends shall be adjusted to fit properly.

.8 Locations as indicated.

3.16 REPAIR TYPE D - STRAIGHTENING RAILS

.1 This is largely limited to the need to straighten rails that have deformed with settling to the wall.

.2 Heat rail with torch moving the torch over the area to be bent.

.3 Keep temperature below 648 degrees Celsius.

.4 Use mechanical equipment or hand tools to move the bent rail back to straight position.

.5 Cool with water, wet rags or compressed air.

.6 Several heats maybe required to arrive at a straight rail.

.7 Locations as indicated.

3.17 SHORTEN RAILS

.1 For all rail ends not being lengthened, assume the need to shorten the rail ends to fit the replacement collars or to clear the pier stone.

3.18 PAINTING

.1 Coordination with painting is a critical aspect of the reassembly process.

.2 Once all components have been restored, reproduce or modified, all surfaces are to be lightly cleaned with air abrasive immediately prior to the application of primer.

.3 Prior to reinstallation, apply the zinc rich primer, two epoxy base coats and two polyurethane top coats to all surfaces of all components except for threaded holes.

.4 All painting to be applied in accordance with manufacturer's printed instructions free of sags, runs, drips or other imperfections.

.5 Apply first polyurethane top coat by spraying.

.6 Apply final coat of polyurethane by brush after iron is reinstalled, to give the appearance of a traditional hand applied finish.

.7 See Section 09 97 19.02 – Painting Exterior Metal for additional information.

3.19 PREPARATION OF PLYWOOD TEMPLATES AND USE

.1 Coordinate with Div 03 and Div 04 for assistance to prepare plywood templates and assist in laying out the wall and ironwork.

.2 Survey wall to map out location length, shape, and pier stones.

.3 Use a metric scale, and capstones/pier stones marked out with identification number and take a photo of each mortar joint on path side of the wall, to record width of joint.

.4 As coping stones and pier stones with piers are removed, move the stone onto a 19mm thick plywood sheet and trace out the shape of the stone. Mark with stone identifier number top side and path side on template, and cut out shape along traced line.

.5 Retain plywood templates for laying out formwork.

.6 After concrete footing is poured, layout plywood templates on footing and adjust, spacing for mortar joint width, until correct radius of wall is found. Confirm centre line length of template from pier to pier with measurements taken of length of ironwork bays taken on survey. Review with Departmental Representative.

.7 Once layout of plywood template is confirmed, mark out location to erect formwork for pouring upper wall to correct radii and location.

3.20 REINSTALLATION

.1 Restore the iron work as a priority to verify lengths of fencing, for coordination with Div 03 and Div 04 work, allowing time for these trades to prepare shop drawings and prepare their work. Use the restored ironwork fence for re-erecting the wall to set final radii of the walls, location of capstones, location of pier stones, and location of holes in capstones to receive spear posts.

.2 Reinstallation of the iron fence shall be closely coordinated with the setting of the pier and coping stones by masons, starting at Pier 48.

.3 Reinstall iron work in tandem with masons setting pier and coping stones.

.4 Wherever it is necessary to modify the cast iron collars or the rail ends by machining, cutting or grinding, the iron work shall be returned to the shop to have all three paint films restored. Anticipate more adjustments to panel lengths along Bays 49 and 50.

.5 Use the restored iron panel as a guide in placing the next spear and repeat process.

.6 Reinstall the restored iron work as indicated in drawings.

.7 Take care not the damage the paint film on the iron work.

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

.9 After completion of work, store remaining unused ironwork in location designated by Departmental Representative for possible re-use.

3.21 LEAD SETTING

.1 Do not undertake this work if the stone copings are damp or if the air temperature is below 10 degrees Celsius.

.2 Where original collars are to be installed, slip these onto the spears and slide to the top temporarily.

.3 Level and plumb the spears and brace temporarily with clamps, wedges and/or wood supports.

.4 Generally, pour lead in lifts not to exceed 50 mm.

.5 For the final lift pour the lead to within 10 mm of the top.

.6 For each poured lift allow the lead to cool until it is set and has shrunk and can be compacted by hand.

.7 All components associated with the spears shall be removed to allow unhindered access to the lead joint around the spear.

.8 Compress each poured lift with a flat-faced punch, or square caulking iron to tighten the joint which may be slightly loose after the lead as cooled and shrunk.

.9 Position a square mould, made of wood or metal, around the hole, and add the final layer of lead, approximately 6 m proud of the surface of the stone. Allow the lead to cool before removing the mould.

.10 Compact this final layer of lead to tighten the joint, taking care not to damage the paint. The surface of this final layer should have a positive slope to shed water away from the iron, off the lead, and onto the flat coping stone. The outer edge of the lead joint should be flush with, or just slightly proud of the stone, so that there is no place for water to pool on the load joint and seep into the joint.

.11 Touch up paint.

.12 The associated panels and collars shall be permanently installed once the lead work is completed.

END OF SECTION