

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 35 20 16.51 *Overhaul Vertical Lift Gates*

1.2 REQUIREMENTS

- .1 **Portage Dam.**—May be dewatered using sealed maintenance stoplogs only, supplemented with additional dewatering materials on the upstream side if Contractor so chooses. The area downstream of the dam will dewater naturally.
- .2 **Little Chaudière Dam.**—This dam has a tailwater elevation, hence will require cofferdam materials on the downstream side and pumping between dewatering structures both for initial dewatering and for dewatering maintenance. As for the Portage Dam, the Little Chaudière dam may be dewatered either one sluice at a time or all sluices at the same time, to suit Contractor's schedule and equipment, so long as overall schedule requirements are met.

1.3 SUBMITTALS

- .1 **Shopdrawings of cofferdam.**—To be installed downstream of sluices on the Little Chaudière Dam. Shopdrawings to be signed and sealed by a Professional Engineer licensed to practice in Ontario. Note that no drilling into existing concrete is allowed, but elements of cofferdam may bear against piers and sluices with hydrostatic pressure, so long as this does not damage concrete

1.4 REQUIREMENT

- .1 All the work described in this specification is to be done "in the dry."

1.5 REGULATORY REQUIREMENTS

- .1 Installation of cofferdams must be approved by Department of Fisheries and Oceans in accordance with the Fisheries Act.
- .2 Pumping water out of cofferdam enclosure: to Section 01 35 43 *Environmental Procedures*.
- .3 Obtain, and pay the costs of, all required permits.
- .4 Submit detail drawings to Regulatory Agencies as required to satisfy the conditions for granting of permits.

Part 2 Products**2.1 MATERIALS FOR COFFERDAMS**

- .1 Use materials in good condition and suitable for purpose.
- .2 Do not use materials that would cause environmental damage to waterway or to nearby land. This includes materials which would cause turbidity in excess of the limits specified herein.
- .3 Materials and methods proposed for use in cofferdams, are to be approved by the Ontario Ministry of Natural Resources, the Ontario Ministry of the Environment, and the federal Department of Fisheries & Oceans.
- .4 Earth or granular materials with fines are not acceptable. If using sandbags, sand must be washed of fines before placing in the water.

- .5 Note that Fisheries & Oceans prefers bolted pre-engineered frame-type structures, rubber dams, sheet piling, stoplogs, or other types of cofferdams which do not generate turbidity.

2.2 EQUIPMENT

- .1 Provide and maintain in safe operating condition for entire period of use and/or standby.
- .2 Provide skilled operators for equipment.
- .3 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform the essential functions of Work.
- .4 Provide standby replacement for pumps and other essential dewatering equipment which may breakdown during Work.
- .5 Keep replacement equipment available at site for immediate use.

Part 3 Execution

3.1 GENERAL

- .1 Evaluate, plan, and execute Work in an expert and prudent manner, implementing dewatering according to Professional Engineer's design.
- .2 Repeat the entire dewatering procedure as often as may be necessary if flooding or other damage occurs before completion of Work.

3.2 DESIGN

- .1 Engage a Professional Engineer licensed to practice in Ontario to design and to certify installation of:
 - .1 methods to improve water-tightness of the stoplogs if using existing stoplogs as part of the dewatering structure;
 - .2 temporary dewatering structures (cofferdams) which will be required downstream of Little Chaudière Dam;
 - .3 systems used to remove the water from Work spaces (pumping);
 - .4 method for maintaining the Work spaces in the dry state (ongoing pumping); and,
 - .5 method for safely installing and removing these items.
- .2 Designer of dewatering structures and systems must be a Professional Engineer with considerable expertise and experience in design of similar structures and systems.
- .3 Designer must make, check, and sign all calculations; check, seal and sign all drawings; inspect the dewatering structures and systems at the site and verify their adequacy and safety.

3.3 DESIGN CRITERIA

- .1 Ensure maintenance of work spaces in dry state for duration of Work.
- .2 Maintain quality of the water to within turbidity limits given herein.
- .3 Ensure that no phase of the Work threatens safe performance of dewatering system; ensure no phase of dewatering threatens safe performance of Work.
- .4 **Stoplogs.**—Under the following conditions, Contractor may use existing stoplogs and dam's concrete structures as part of the dewatering system: Canada does not guarantee water tightness of any structures; Contractor is responsible for placing and removing stoplogs; and Contractor

must repair or replace damaged stoplogs and components of structure when damage is caused by Contractor, at no cost to the Crown.

- .1 Pick up and return stoplogs to storage location at Portage Dam.
- .2 Install stoplogs in upstream and downstream dewatering gains.
- .3 Seal stoplogs at gains and between logs to reduce leakage and remove of this sealing material at end of dewatering period.
- .5 Design dewatering systems to be capable of removing water from work spaces without causing instability of excavated slopes or foundation soils due to seepage pressure of infiltrating water.
- .6 Provide a minimum of one metre freeboard to prevent overtopping of cofferdams by waves.

3.4 FISH AND CRUSTACEAN HANDLING

- .1 **Portage Dam.**—Area drains naturally; no special procedures required.
- .2 **Little Chaudière Dam**
 - .1 After dewatering system is installed, pump out work area to within 400mm of dry.
 - .2 Enter the remaining water with nets and capture all remaining live fish and crustaceans trapped in dewatered area. Gently transfer these alive back into watercourse.
 - .3 When all fish and crustaceans have been removed, proceed to remove remaining water.

3.5 DEWATERING MAINTENANCE - LITTLE CHAUDIÈRE DAM

- .1 Remove all water which does leak into workspace and maintain workspace in the dry for the duration of Work.
- .2 Contain leakage flow through stoplogs to an area immediately downstream of the stoplogs by means of a sump area created with sandbags and plastic sheeting.
- .3 Pumping of leakage flow through the logs, and all other water on site must meet turbidity criteria.
- .4 Provide pumping equipment in safe operating condition and maintain it in a safe operating condition for entire period of use and/or standby for use on Work.
- .5 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform essential functions of Work.
- .6 Provide standby replacement for pumps and other essential dewatering equipment which may break down during Work.
- .7 Keep backup equipment available on site for immediate use.

3.6 TURBIDITY CONTROL - LITTLE CHAUDIÈRE DAM

- .1 Provide drainage and temporary pumping necessary to keep the site dry.
- .2 Control turbidity of all water released to watercourse during Work.
- .3 Unless water already meets turbidity requirements, do not pump directly into the waterway; send to a settling pond or filtration area before releasing into waterway.
- .4 If necessary to control turbidity at discharge into waterway, provide a silt curtain. Anchor silt curtain along its length to form a continuous seal on river bed with adequate flotation at water surface to prevent over-spills of turbid water.

- .5 Total suspended solids in any and all water discharged to waterway: to Ministry of Natural Resources (MNR) regulations, Department of Fisheries and Oceans (DFO) regulations, or maximum 80 mg/L whichever is the strictest. Note that MNR and DFO regulations vary with the circumstances and cannot be described ahead of time.
- .6 In case of significant silting or turbidity caused by construction activities, take appropriate measures to confine work and install additional silt curtains. Stop work which is causing turbidity until proper controls have been effected.
- .7 Control disposal or runoff of water containing other harmful substances in accordance with local authority requirements.
- .8 Obtain "*Permit to Take Water*" from Ontario Ministry of the Environment if more than 50,000 litres of water per day is taken from waterway, or if waterway is restricted during construction.

3.7**WATCHKEEPER - LITTLE CHAUDIÈRE DAM**

- .1 Provide watchkeeping staff on 24 hour standby to attend to pumps.
- .2 Watchkeeper must be on site at all times during hours of work and must visit site at regular intervals during non-work periods to ensure everything is functioning adequately.
- .3 Contractor is responsible for making good all damage as a result of failure of dewatering system.
- .4 Watchkeeper must be able to perform, on dewatering equipment, such duties as:
 - .1 Preventive maintenance and refuelling.
 - .2 Emergency repairs of minor complexity.
 - .3 Place standby items in service.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 *Common Work Results for Electrical*
- .2 Section 35 01 51 *Dewatering*

1.2 REFERENCES

- .1 **American Society of Mechanical Engineers (ASME)**
 - .1 ASME B30.9-2014 *Slings*
 - .2 ASME B46.1-2009 *Surface Texture, Surface Roughness, Waviness and Lay*
 - .3 ASME Y14.5-2009 *Geometric Dimensioning and Tolerancing*
- .2 **American Society for Testing Materials (ASTM)**
 - .1 ASTM B584-14 *Standard Specification for Copper Alloy Sand Castings for General Applications*
- .3 **International Organization for Standardization (ISO)**
 - .1 ISO 1302:2002 *Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation*
- .4 **U.S. General Services Administration, Federal Specifications**
 - .1 RR-W-410G (24-Jun-2010) *Wire Rope and Strand*
 - .2 RR-S-550E (10-Oct-2012) *Sockets, Wire Rope*
- .5 A copy of the existing Operating and Maintenance Manual for Portage Dam will be provided by the Departmental Representative to the Contractor.
- .6 Selected original shop drawings for hoisting equipment at Portage Dam.

1.3 PROGRAM OF WORK

- .1 **Portage Dam.**—The work at this dam includes but is not necessarily limited to:
 - .1 remove gates to shop for overhaul;
 - .2 check gains and sill;
 - .3 electrical removals and replacement with new components;
 - .4 clean and inspect hoists;
 - .5 reinstall gates in dam; and,
 - .6 commission gates.
- .2 **Little Chaudière Dam.**—The work at this dam includes but is not necessarily limited to:
 - .1 remove gates to shop for overhaul;
 - .2 check gains and sill;
 - .3 clean and inspect hoists
 - .4 reinstall gates in dam; and,
 - .5 commission gates.
- .3 Dewatering, environmental protection, health and safety requirements, quality control, and waste

disposal are integral tasks with the above-noted work.

1.4 SUBMITTALS

- .1 Before starting any work on site, submit:
 - .1 **Gate handling plan.**—Showing how gates will be transported from and to dam sites.
 - .1 **Little Chaudière Dam.**—Plan must include stability information on crane barges and indicate crane capacities at various angles of heel of barge and confirm that barge stability is adequate for load handling. Stability information to be signed and sealed by a Naval Architect licensed to practice in Canada.
- .2 Minimum three (3) weeks before first gate is due to be re-installed in dam, submit:
 - .1 **Wire rope installation plan.**—Describing how new wire rope slings will be installed on hoists and connected to gates. Include in description of tension will be measured and ensured to be equal on all four legs of each gate arrangement.
- .3 Before purchasing products or equipment, submit:
 - .1 **Proof of conformance.**—Being all product data, shop drawings, purchase orders, invoices, supplier's bench test certificates, and all other quality control documents required to prove that items to be supplied under this contract meet specification requirements.
- .4 At logical points in Work, submit:
 - .1 **Third party inspection reports.**—Showing that installation of equipment meets requirements of Contract.

1.5 QUALITY CONTROL

- .1 To Section 01 45 00 *Quality Control*.
- .2 Allow Departmental Representative free access to plants where equipment is being built and provide all required personnel and equipment to move, test and inspect parts requiring handling and trial runs for proper inspection.
- .3 Tolerances not specified here must be established by manufacturer and be consistent with industry practices in this type of work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 In presence of Departmental Representative, inspect gates for damage upon delivery to dam site and before re-installation. Be responsible for rectifying damage caused in transportation, handling, and installation.

Part 2 Products

2.1 MATERIALS

- .1 **Bushings for gate wheels.**—Manganese bronze C86300 to ASTM B584-14 *Standard Specification for Copper Alloy Sand Castings for General Applications*, self-lubricated type, graphite-free, suitable for extreme pressures and for year-round freshwater immersion use. Provide grease tubes leading from each wheel (see drawing 5190-H1) up to top of gate so that Damkeeper standing on deck can lubricate bushings with grease annually.

- .1 **Dimensions for Portage Dam.**—Dimensions as shown on original shop drawing 5190-H1 detail 204, but confirm against actual as-found items before ordering.
- .2 **Dimensions for Little Chaudière Dam.**—Shop drawings not available. For bidding purposes, use dimensions as shown on original Portage Dam shop drawing 5190-H1 detail 204 as actual dimensions will likely not be grossly different. During Contract, however, remove bushings and measure these for accuracy. Discuss with Departmental Representative before ordering or PWGSC will not be responsible for inaccurate dimensions.
- .2 **Gate hoisting slings (wire rope and fittings).**—Either of two alternative systems is acceptable:
 - .1 **Alternative A - Galvanized system**
 - .1 **Wire rope.**—Preformed, galvanized, size $\frac{3}{4}$, to RR-W-410G *Wire Rope and Strand*, Type I (General purpose wire ropes), Class 2 (6 by 19 Seale), IWRC, right regular lay, minimum breaking strength 236 kN. Lubricate internally and externally during fabrication.
 - .2 **End terminations**
 - .1 **Gate end.**—Hot dipped galvanized steel open spelter socket, (Type A), to RR-S-550D *Sockets, Wire Rope*, with either poured zinc filler or with epoxy resin filler of a type recommended by socket manufacturer for use in freshwater immersion environment.
 - .1 Design factor: to ASME B30.9.
 - .2 After attachment, manufacturer to proof-test assembly to requirements of ASME B30.9; submit test report and certification.
 - .3 Re-lubricate where lubrication has been disturbed by socket installation process.
 - .2 **Drum end.**—Salvage, clean, and re-install existing rope clamps. If these are too damaged to re-use, then fabricate new using dimensions as per existing parts supplemented with information from original Portage Dam shop drawing 5190-H10 Detail 214 and supply all new fasteners. For the purposes of bidding, assume zero (0) wire rope clamps require replacement. Allow minimum $2\frac{1}{2}$ dead wraps of wire rope on drum at full pay-out.
 - .3 **All other fittings.**—Hot-dipped galvanized.
 - .2 **Alternative B - Stainless steel system**
 - .1 **Wire rope.**—Preformed, stainless steel (type 302 or 304 both acceptable), size $\frac{3}{4}$, to RR-W-410G *Wire Rope and Strand*, Type I (general purpose wire ropes), Class 2 (6 x 19 Seale), IWRC, right regular lay, minimum breaking strength 236 kN. Lubricate internally and externally during fabrication.
 - .2 **End terminations**
 - .1 **Gate end.**—Stainless steel open spelter socket, (Type A), to RR-S-550D *Sockets, Wire Rope*, with epoxy resin filler of a type recommended by socket manufacturer for use in freshwater immersion environment.
 - .1 Design factor: to ASME B30.9.
 - .2 After attachment, manufacturer to proof-test assembly to requirements of ASME B30.9; submit test report and certification.

- .3 Re-lubricate where lubrication has been disturbed by socket installation process.
 - .2 **Drum end.**—Salvage, clean, and re-install existing rope clamps. If these are too damaged to re-use, then fabricate new using dimensions as per existing parts supplemented with information from original Portage Dam shop drawing 5190-H10 Detail 214 and supply all new fasteners. For the purposes of bidding, assume zero (0) wire rope clamps require replacement. Allow minimum 2½ dead wraps of wire rope on drum at full pay-out.
 - .3 **All other fittings.**—Type 302 or type 304 stainless steel.
- .3 **Lubricants for wire rope.**—As recommended by sling manufacturer for use in freshwater immersion service. Lubricate wire ropes at manufacturing facility with equipment capable of forcing lubricant between rope wires, including centre strand.

Part 3 Execution

3.1 REMOVAL OF GATES FROM DAM

- .1 **Scheduling.**—Note that there are only enough stoplogs to dewater one (1) sluice at a time. Provide means of dewatering other sluices if electing to work on more than one sluice at a time.
- .2 **Preparation and removals**
 - .1 Dewatering to Section 31 23 19 *Dewatering*.
 - .2 Play out maximum length of wire rope from hoist and detach from hoist drum. Detach wire rope from gate. Take care not to damage either hoist or gate; if something needs to be sacrificed, destroy a wire rope fitting as these items are to be disposed-of anyway.
 - .3 Lift gate free from gains.
 - .4 Transport gates to shop.
- .3 **Protection of gates during transportation between dam and shop**
 - .1 Ensure safe transportation between dam and shop; provide all required blocking, supports, and braces to ensure stability at all times. Until final Acceptance Testing has been completed, be responsible to repair damage caused by shipping and handling at no additional cost to Crown.

3.2 OVERHAUL GATE LIP - IN SHOP

- .1 **Clean.**—Degrease surface. Employ power wire brush to mechanical clean off surface accretions and corrosion; do not grind.
- .2 **Measure.**—At minimum 100mm intervals, measure roughness of gate lip, record results, and submit to Departmental Representative.
 - .1 **Acceptance criteria.**—As indicated on Portage Dam shopdrawing 5190-G1(1).
- .3 **Repair work - Gate lip.**—For all cases where gate lip is outside original tolerances, machine to re-establish tolerances within acceptance criteria limits. For the purposes of bidding, assume 3 gate lips require machining.

3.3 OVERHAUL GATE SEAL TUBE SYSTEM - IN SHOP

- .1 Clean stainless steel seal tube and its chain of accumulated scum. Coat cleaned tube with same

lubricant as used for wire rope.

3.4 OVERHAUL GATE WHEELS - IN SHOP

- .1 **Measure.**—Measure, record, and submit existing alignment of wheel contact surfaces before starting dis-assembly:
 - .1 Check that centres of wheel shafts are all points along a straight line.
 - .2 For each wheel, measure distance between downstream running surface of wheel and centreline of its wheel shaft.
- .2 **Overhaul.**—Disassemble and remove wheels from gate: remove keeper bar, eccentric axles, wheels, bushings, washers and grease tubes. Dispose of old grease fitting, tubing, and connector. Clean all other parts paying particular attention to prove all grease ways are clear. Examine removed items and report findings to Departmental Representative.
 - .1 **Repair work - Wheels**
 - .1 Upon written authorization from Departmental Representative, build-up flat spots by welding then turn wheels on lathe to re-establish roundness and original profile.
 - .2 This repair work will be paid on actual quantities measured on site and the unit prices stated in the Bid and Acceptance Form.
- .3 **Re-install**
 - .1 Re-install wheels on gate with new bushings, re-using existing shafts and washers.
 - .2 Provide new grease tube leading from wheel bearing to top of gate so that Damkeepers can grease wheel bearings when standing on dam deck. Provide lubricant suitable for underwater operation (must be both environmentally-friendly and have suitable lubricating properties) as recommended by bearing manufacturer.
 - .3 Support gate in horizontal position for adjusting wheel assemblies so that wheels are free to rotate and adjustment to wheel position can be made easily. Using eccentricity of wheel axles, adjust gate wheels to ensure alignment of wheel contact surfaces is within range of Acceptance Criteria. Make adjustments to position of keeper bars if required.
 - .1 **Acceptance Criteria**
 - .1 Each wheel must be free to rotate by hand.
 - .2 Wheels' running surfaces must be within 0.2mm of pre-dismantling distance from shaft centreline.
 - .3 Wheels' running surfaces taken together must be within 0.5mm from true straight.
 - .4 After wheel assemblies have been adjusted, lock them into position by drilling and screwing-in the keeper plates.

3.5 INSPECT & MAINTAIN GATE HOISTS - ON SITE

- .1 **Cleaning.**—After wire rope is removed from drums, steam-clean drum assembly of grease and dirt. Ensure no removed material enters watercourse.
- .2 **Inspect drums.**—Check grooves for wear and verify their condition is suitable for new wire rope. Immediately inform Departmental Representative of problems found.
- .3 **Inspect hoists.**—Check motor brakes and replace liners with new. Adjust brake shoes. Ensure brake drum and liner are free of oil and grease. Check solenoid's magnetic coil for proper

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functioning. Check oil level in reducers and top-up as required

- .4 **Electrical work.**—Change limit switches for new as described in Section 26 05 00 *Common Work Results for Electrical*. Check electrical connections and tighten as required for: hoist motor, brake, starter, and those limit switches which are not being replaced.

3.6 CHECK RUNNING & SEALING SURFACES OF GAINS & SILL - ON SITE

- .1 **Clean.**—Degrease surfaces. Employ power wire brush to mechanical clean surface accretions and corrosion; do not grind.
- .2 **Measure.**—Measure horizontality of sill and verticality of gain running surfaces (upstream and downstream side of gains) and record. Measure at 100mm intervals to an accuracy of ± 0.5 mm.
 - .1 **Acceptance criteria**
 - .1 Gain wheel path verticality: maximum 3 mm deviation over full length.
 - .2 Sill beam horizontality: maximum 3 mm across opening.
- .3 **Repair work - Running & sealing surfaces.**—For all cases where running or sealing surfaces are outside original tolerances, machine *in situ* as required to bring item into acceptance range. For the purposes of bidding, assume three (3) sills and three (3) pairs of gains require machining.

3.7 RE-INSTALL GATES

- .1 Re-install gates with new wire rope and appurtenant fittings.
- .2 **Acceptance criterion.**—With gate in closed position, gap between sill and gate lip must reject a 0.2mm feeler gauge.

3.8 INSTALL NEW WIRE ROPE

- .1 Remove existing wire rope slings from gate and from hoist drum.
- .2 Salvage existing lifting plates. Clean and inspect for wear, cracks, or other defects that would render it impossible to re-use.
 - .1 **Repair work - Lifting plates.**—For all cases where lifting plates are too damaged to use, fabricate new lifting plates using material and dimensions given in original Portage Dam shop drawing 5190-H21 detail 119 supplemented with measurements taken from existing parts. Finish with a coat of same lubricant as used for wire rope. For purposes of bidding, assume one (1) new lifting plate requires fabrication.
- .3 Measure existing wire rope slings and provide new ones of same length or longer as required to ensure minimum number of turns on hoist drum.
- .4 After measurement, dispose of existing wire rope and fittings to federal, provincial, and local laws and regulations.
- .5 Install new rope. Measure and record deflections of all legs of hoist arrangement to ensure equal tension. Submit this information to Departmental Representative.
 - .1 **Acceptance criterion.**—Rope deflections are within 5% of each other.

3.9 ACCEPTANCE TESTING & COMMISSIONING

- .1 **General**
 - .1 Implement commissioning procedures described in approved Inspection and Test Plan described in Section 01 45 00.

- .2 Provide staff required to effect demonstrations, measurements, and adjustments.
 - .3 Adjust operation and control apparatus until all components function as required.
 - .4 Effect repairs and adjustments and correct defects as required to meet acceptance criteria at no additional cost to Crown.
 - .5 Repeat trial operation and testing after correction of defects until acceptance criteria are achieved.
- .2 **Pre-Commissioning - Minimum Requirements.**—Inspection and Test Plan must include at least the following:
- .1 Perform lubrication of all components requiring lubrication. In particular, check proper level of lubricant in speed reducer. Refer to Operating and Maintenance Manual for products required for existing components. For new components, use products recommended by manufacturer suitable for use in a freshwater environment.
 - .2 Inspect dogging devices and other appurtenances to assure proper operation.
 - .3 Manually actuate limit switches and adjust if necessary.
 - .4 When all pre-commissioning tests runs are complete, check that all bolts and keys on hoist parts are sufficiently tight.
- .3 **Commissioning-in-the-Dry - Minimum Requirements.**—Inspection and Test Plan must include at least the following:
- .1 Operate gates from *Fully Closed* to *Fully Open* position and record time for raising and lowering. Do this at least twice, with stops and starts at three points to demonstrate that hoisting equipment operates normally. Demonstrate this from all control centres.
 - .2 Measure motor current and voltage during all gate movements and submit information to Departmental Representative.
 - .3 Check function and accuracy of Position Indicator on Main Panel.
 - .4 Check for proper operation of gate travel limit switches as actuated by gate motion.
 - .5 Check for proper operation of gain heating system.
 - .6 Check for proper operation the manual opening system (electric drill system).
- .4 **Commissioning-in-the-Wet - Minimum Requirements.**—Inspection and Test Plan must include at least the following:
- .1 Repeat tests from Commissioning-in-the-Dry with dewatering stoplogs and cofferdam removed from the sluice and gate at normal operating hydrostatic pressures.

3.10 SUPPLY SPARE PARTS

- .1 Provide at minimum following: (manufacturers may suggest others, propose these to Departmental Representative for consideration).
 - .1 Two complete wire rope assemblies, one for each of Portage Dam and Little Chaudière Dams.

3.11 OPERATING & MAINTENANCE MANUALS

- .1 **Portage Dam.**—Departmental Representative will provide Contractor with a copy of the existing Operating and Maintenance Manual. Update this manual with information on new materials and products installed during Work. Do this by hand in red ink on a hardcopy printed version of Manual. Provide PDF copies of manufacturer's product information and certifications were required. Departmental Representative will make changes and assemble final manual based on

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this raw information.

END OF SECTION