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ANNEX A

STATEMENT OF WORKS

CARILLON CANAL NHSC LOCK

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL
SYSTEMS OF THE CARILLON CANAL NHSC LOCK**

PROJECT N° CCRL-MD-2001



Parks Canada

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

Project # CCRL-MD-15-0001

ANNEX A

PARKS CANADA AGENCY

CARILLON LOCK

VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE CARILLON CANAL NHSC LOCK

Project: CCRL-MD-2001

Date: August 2019

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

TABLE OF CONTENTS

1	MANDATE.....	1
2	SCOPE OF WORK.....	1
3	MANDATING METHODS.....	3
4	ASSISTANCE WITH SPRING COMMISSIONING.....	3
5	LIST OF EQUIPMENT.....	3
6	DRAWINGS.....	4
7	LIST OF VERIFICATION AND REGISTRY.....	4
8	FAMILIARIZATION AND REPAIRS AT HOURLY RATE.....	4
9	MATERIALS AND EQUIPMENT.....	4
10	MANPOWER.....	5
11	SERVICE CALLS.....	5
12	WORK SCHEDULE.....	6
13	SAFETY REQUIREMENTS AND PERSONNEL'S CONDUCT.....	6
14	CODES AND STANDARDS.....	7
15	PROTECTION OF PERSONS AND PROPERTY.....	8
16	SYSTEMS MODIFICATIONS.....	8
17	CLEANLINESS OF THE PREMISES.....	8
18	COMMUNICATIONS.....	8
19	REPORTS, CERTIFICATES AND WORK SHEETS.....	8
20	HEALTH & SAFETY FOR MAINTENANCE WORK.....	9
21	INSPECTION AND MAINTENANCE.....	10
APPENDIX A	LIST OF ELECTRICAL AND MECHANICAL DRAWINGS & DOCUMENTS	
APPENDIX B	CONTROL DIAGRAMS	
APPENDIX C	INSPECTION AND VERIFICATION CHECK-LISTS OF EQUIPEMENT	

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

1 MANDATE

1.1 General

- 1.1.1 A control system assisted by programmable logic controllers and computers is currently installed at the Carillon Canal NHSC lock, located on the Ottawa River. The purpose of this contract is to annually preserve and ensure the integrity, efficiency and reliability of all components as well as the electrical and control equipment required for the good operation of the lock. This contract is limited to the control and electrical power aspects; structural and mechanical aspects are carried out by Parks Canada Agency.
- 1.1.2 Work is subject to a very specific schedule and coordinated with the Parks Canada Agency (PCA) project manager. Furthermore, for the whole length of the contract, technical assistance and troubleshooting is required with 24 hours a day availability and a response time of four (4) hours.
- 1.1.3 The present contract covers the following aspects: automation, control, instrumentation, and electrical power distribution.

2 SCOPE OF WORK

2.1 Work Included

The scope of work – relevant to this verification and preventive maintenance contract – includes all control automation systems, electrical power distribution and control as well as instrumentation related to the Carillon lock operation.

Specifically, but not limited to, control systems cover all equipment and materials, such as:

- Main control station and operating panels;
 - Programmable Logic Controllers (PLC) and its panel;
 - Communication networks (cables, connectors, switches, routers);
 - Network link to access and remotely read data from the lock (Internet/Ethernet) and monthly subscription costs;
 - Uninterruptible Power Supply (UPS);
 - Printers;
 - Software and licenses;
 - Input and output modules (I/O), terminal points, fuses;
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- Instrumentation (sensors and probes);
- All other components as part of the lock's control system.

It also includes the software and graphic screens efficiency, assistance on the preparation of measurement reports, management of spare parts inventory, drawings and technical specifications update (min. once a year), cable list update, inspection reports production, and other elements currently in service.

Preventive maintenance also incorporates, but not limited to, all equipment and materials related to the electrical power distribution and control, such as:

- Motor Control Centre (CCM);
- Automatic transfer switch;
- Magnetic starters, switches and variable speed drives;
- Circuit-breakers;
- Junction boxes, control stations and control panels;
- Local switches;
- Conductors and cables;
- Electrical motors;
- Transformers;
- 347/600 V distribution panels only;
- Electrical distribution for lighting;
- Electrical distribution for heating;
- Light-signalling system;
- Sensor system for water level in tunnel;
- Limit and extreme limit switches in mechanical shafts.

2.2 Work Excluded

The following items are not part of the present maintenance contract:

- Structural and mechanical;
 - Electrical entry on Hydro-Québec's side (Carillon powerhouse), including Hydro-Québec's measuring equipment.
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

3 MANDATING METHODS

- 3.1. The mandate is divided into two distinct sections. Section A includes the requirements for technical specifications updates, inspections, maintenance as well as assistance during spring commissioning. At each inspection, all equipment shall be verified and adjusted (calibrated) according to the inspection check-lists presented in Appendix C, which shall be included in inspection reports.
- 3.2. Section B covers all service or repair calls approved by the PCA representative, following an equipment failure or a recommendation in an inspection report. Work executed in section B shall be paid on an hourly basis including material costs in accordance with the terms of bill. A Task authorization (see Annex G) shall be emitted before the on demand works are to be executed.
- 3.3. In all cases, Sections A and B include all round trip expenses for transportation, travelling time and mileage.

4 ASSISTANCE WITH SPRING COMMISSIONING

- 4.1. The Contractor's responsibilities in Section A also comprise assisting the PCA representative during spring commissioning. Delicate manoeuvres in the bypassing of several safety systems or protection systems shall be carried out and in the presence of a Contractor's qualified representative. These manoeuvres are carried out during three to four (3-4) days and as previously mentioned, the schedule is established by the lock superintendent in line with ice conditions and opening of seasonal navigation. As stated in the contract, the Contractor shall be available for spring commissioning at the PCA representative's request.
- 4.2. Inspection and maintenance work are closely tied to spring commissioning. In order to perform all actions/movements required for this commissioning, it is preferable that all inspection and maintenance work is terminated, except adjustments and calibration, which shall be carried out at the end of commissioning. The Contractor shall coordinate the work schedule with the lock superintendent.
- 4.3. At the end of the inspection and commissioning activities, the Contractor shall demonstrate to PCA representative that all manoeuvres and movements of all lock's components are functioning properly. The Contractor shall also demonstrate that all protections are operational and certify in writing that the lock is now ready to safely operate.

5 LIST OF EQUIPMENT

- 5.1. Appendix A presents the drawings list and the main electrical and control equipment of the Carillon Canal NHSC lock.
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

6 DRAWINGS

- 6.1. In order to easily understand and to facilitate the repairs during service calls to the current systems, detailed drawings of the facility as well as distribution diagrams are presented in Appendix B "Control Diagrams". These drawings are available in AutoCAD for eventual modifications and updates.
- 6.2. As mentioned in Section 2.1 "Work Included", the Contractor has the responsibility to update diagrams/drawings, lists and technical documents when a modification is made in the systems. These updates also include the software aspect such as PLC programming (configuration and control logic) as well as the configuration and/or modification of graphics pages of interfaces. All related technical documents shall be updated and issued to the PCA representative, every time a modification is made in the systems. It should be mentioned that if a component is replaced by an identical model, the document does not have to be updated. The intervention report shall describe the work performed.
- 6.3. All documents should be revised at least once a year, in the fall, in order to ensure the accuracy of the technical data. In the event no modification was carried out during the year, drawings, diagrams, manuals, and lists shall be reissued with the increment to their revision number and the mention "Annual General Review". For screen pages and PLC programming (configurations and logics), an updated copy shall be printed and handed to the PCA representative with a reissuance of the revised Operation Manual.
- 6.4. At each modification or review, a paper copy as well as a computer-data storage copy (source file) shall be submitted to the PCA representative.

7 LIST OF VERIFICATION AND REGISTRY

- 7.1. The Contractor can use the check-lists in Appendix C before beginning the inspection and maintenance work. The Contractor shall develop and obtain the approval for these lists, which shall include the equipment verification according to Section 23. See Appendix C "Inspection Check-lists and Equipment Verification".

8 FAMILIARIZATION AND REPAIRS AT HOURLY RATE

- 8.1. Before beginning the work, the Contractor and all employees assigned to this contract shall be familiar with the facility, operations and equipment of the Carillon Canal NHSC lock.

9 MATERIALS AND EQUIPMENT

- 9.1. The Contractor is required to repair or, when necessary, replace worn pieces by new ones. Parts and replacement work shall be paid according to Section B (Task authorization).
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 9.2. The Contractor shall provide instructions, notifications and signs to warn the administrator and building's occupants that work is in progress.
- 9.3. The Contractor shall supply the instruments, tools and all materials or pieces necessary for maintenance, repair or replacement of pieces covered by this contract. If required, it should also provide scaffolding, lifting devices, measuring devices, and specialized machinery required to carry out work and complete its task.
- 9.4. Spare parts shall be identical and come from the same manufacturer as the original ones. If it is impossible to get identical spare parts or materials, the Contractor must use equivalent ones; quality shall be at least equal or superior to the original one.
- 9.5. All equipment shall be approved by the PCA representative.
- 9.6. All changes to parts shall previously be approved by the PCA representative.
- 9.7. Parks Canada Agency reserves the right to decide the spare parts quality; this decision shall be final.
- 9.8. The Contractor is required to supply all information and technical documents, as well as provide training, if necessary, to PCA representatives pertaining to the operation and configuration of control systems, including specific points in the safety interlocks that could affect operation.

10 MANPOWER

- 10.1. Manpower shall be supplied by the Contractor and shall be fully qualified to maintain the equipment in good operating condition according to manufacturers' original specifications.
- 10.2. A Parks Canada Agency employee shall be available to guide the Contractor during the verification period. The presence of a PCA representative, assigned by the foreman, is mandatory. To be valid and approved, every inspection visit shall be subject to an appointment request at least 48 hours in advance and carried out jointly with Parks Canada Agency.

11 SERVICE CALLS – TASK AUTHORIZATION

- 11.1. Work in Section B encloses two categories: 1) service calls following a defect or equipment malfunction; 2) work modifications requested by a PCA representative.
 - 11.2. Service calls cover the automation, control, instrumentation, and electrical power distribution and control. The Contractor shall be qualified and able to solve and repair an electrical or control issue.
 - 11.3. The Contractor shall provide at all times an emergency service to repair eventual failures. The Contractor shall also ensure that the required staff shall be on site in less than four (4) hours.
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 11.4. The Contractor shall supply the necessary parts for the maintenance or repair work in its area of responsibility. During the repairs, the Contractor shall leave on premises all defective parts that were replaced and enter this information in a report.
- 11.5. Upon completion of each major work, an inspection shall be performed by the PCA representative to assess if the work is satisfactory or not.
- 11.6. All service calls and/or work shall be approved by the PCA representative or its assigned representative.
- 11.7. For all system interventions on site or by remote access, the Contractor is responsible to inform safety centers that monitor the alarm systems. The name of a contact person shall be provided by PCA upon contract award.
- 11.8. The Contractor shall have at all times an updated duplicate of the software in case it has to be reinstalled should a problem occur with the lock's computer or server.

12 WORK SCHEDULE

- 12.1. Work shall be performed as to not interfere with normal lock operations and follow a schedule that is likely to disturb the operations as little as possible. To establish a schedule and ensure that arrangements are accepted by Parks Canada Agency, work shall be planned two (2) weeks in advance with the PCA representative.
- 12.2. The Contractor shall answer all emergency service calls, 24 hours a day, 7 days a week.
- 12.3. A maximum of four (4) hours shall be allowed between an emergency service call and the arrival of the Contractor's personnel on site.
- 12.4. For normal repairs and unless otherwise specified or if the PCA representative judges the repairs urgent, work has to be carried out between 7:30 and 15:00 from Monday to Friday, no interruptions until work completion, while respecting the schedule planned with the general foreman, who shall assign a PCA representative on site.

13 SAFETY REQUIREMENTS AND PERSONNEL'S CONDUCT

- 13.1. The Contractor and its representatives shall adhere to all facility and building safety regulations, in particular the wear of a helmet and safety boots as well as electrical protection equipment for the minimum level of protection of arc flashes defects related to distribution systems.
 - 13.2. The Contractor shall supply to his employees an identification card in agreement with current safety regulations. These cards shall be in sight and displayed on the uniform at all times when on duty.
 - 13.3. The Contractor and its representatives shall adhere to the dam and lock traffic regulation.
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 13.4. To prevent accidents with users and employees on site, the Contractor shall comply with the premises' speed limit of **maximum 10 km/h**. The Contractor shall come to a stop at pedestrian or cyclist's crossings.
- 13.5. Without a written authorization and instructions of the PCA representative, the Contractor cannot circulate on roads and engineering structures with vehicles, machines or equipment heavier or larger than the legal limit.
- 13.6. If the PCA representative deems that transportation can damage a section of the road or structure, he/she can require load reduction and even the complete or temporary suspension of transportation on the roads or engineering structures.
- 13.7. **Every Contractor's employee shall have impeccable manners towards the public. No misconduct shall be tolerated.** All misconducts shall be subject to penalties up to permanent withdrawal from site of the offending employee. The PCA representative shall provide a telephone number to the Contractor so that he/she or one of its employees communicates it to the public for communications or complaints.

14 CODES AND STANDARDS

- 14.1. All work shall be performed according to the latest version of the National Fire Code of Canada, National Building Code, Chapter V – Electricity of Quebec Construction Code, Electrical Safety Standards at Work, CNESST safety regulations, part II of the Canadian Labour Code, Parks Canada Agency instructions from the dam safety and retaining structures program, and all other applicable codes or standards.
- 14.2. Materials, implementation and work methods shall be in compliance with the most recent version of the codes, standards and regulations mentioned below. Codes and standards in effect from current and proper authorities related to all stipulated work in this document shall also be respected.

ANSI	American National Standards Institute
ASTM	American Society for Testing of Material
CSA	Canadian Standards Association
EEMAC	Electrical and Electronic Manufacturer's Association of Canada
EIA	Electronic Industries Association
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
ISA	Instrument Society of America
NEC	National Electrical Council
NEMA	National Electrical Manufacturers Association
SAMA	Scientific Apparatus Makers Association

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

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15 PROTECTION OF PERSONS AND PROPERTY

- 15.1. Take all safety and precautionary measures necessary to protect people and property against an accident or damage during maintenance or repair services.
- 15.2. The Contractor shall be unequivocally and solely responsible for accidents or damages caused to people or the property as a result of its activities on the premises.
- 15.3. The Contractor shall manage its activities so that the health and safety of the public and site personnel, as well as the protection of the environment has always precedence over costs or work schedule.
- 15.4. If the Contractor does not comply with safety instructions mentioned in Section 20, the Contractor shall entirely assume its legal responsibility (material damage, on site personnel's unproductivity and/or human loss).

16 SYSTEMS MODIFICATIONS

- 16.1. Parks Canada Agency reserves the right to modify lock's facilities when necessary.

17 CLEANLINESS OF THE PREMISES

- 17.1. Debris build up will not be tolerated. After every work shift, the Contractor shall remove from the premises all trash derived from its work. The Contractor shall leave the premises clean and to the PCA representative satisfaction.

18 COMMUNICATIONS

- 18.1. The area of the calls, including addresses and telephone numbers where the Contractor, superintendent or manager can be reached at all hours, shall be included in a list which shall be given to the PCA representative. This list shall be revised by the Contractor if necessary.
- 18.2. The Contractor shall at all times direct his inquiries to the PCA representative. The name and contact information of a person in authority shall be provided once the contract is awarded.

19 REPORTS, CERTIFICATES AND WORK SHEETS

- 19.1. At the end of the lock's control system inspection and the electrical distribution associated with control, the Contractor shall submit a typed report of the verifications including a list and check-lists duly completed certifying the equipment's efficiency.
 - 19.2. Paper reports shall be submitted to the PCA representative as well as an electronic copy for archiving and follow-up.
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 19.3. The format and information to be included in each report shall be presented before the contract execution for the PCA representative approval. Inspection check-lists presented in Appendix C can be used as such and duly completed. The PCA representative has the right to modify these reports or require additional ones.
- 19.4. Every report shall be verified and countersigned by the PCA representative or another designated person.
- 19.5. As stated in Section B of the contract, after each repair or service, two copies of the work sheets and a detailed certificate including a description of the issue, work executed, hours worked (maintenance and repairs separately), as well as replacement parts shall be submitted. Regardless the nature of the work or operations performed, a paper and electronic copy shall be submitted to Parks Canada Agency for verification and archive. For emergency calls, the date and exact hour that the call was received by Parks Canada, the time of arrival on the premises as well as the number of hours worked shall be registered on the certificates or sheets.

20 HEALTH & SAFETY FOR MAINTENANCE WORK

20.1 General Clauses

- 20.1.1 The Contractor shall manage its activities so that the health and safety of the public and site personnel, as well as the protection of the environment has always precedence over costs or work schedule.
 - 20.1.2 The Contractor shall respect at all times the provisions in the Occupational Health and Safety Act, Safety Code for the construction industry, second part of the Canada Labour Code, and Health and Safety Works Regulations, when applicable.
 - 20.1.3 Regardless the number of workers assigned, the Contractor shall assign a head of health and safety on the premises and grant him/her the authority to cease and restart the work when deemed necessary for health and safety reasons.
 - 20.1.4 The Contractor shall apply the First Aid Standards according to applicable policies and regulations as well as all other clauses stated in this document.
 - 20.1.5 The Contractor shall ensure that its workers received the training and information necessary to work safely, that all tools and protection equipment are available in compliance with standards, laws and regulations and that they are used.
 - 20.1.6 The Contractor shall be aware of the building or facility's emergency plan and provide training and information to its workers.
 - 20.1.7 The Contractor shall notify its workers that they have the right to refuse to
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

perform work that can put their health and safety in danger.

- 20.1.8 The Contractor shall define its work area, control the access and barricade it, if required.
- 20.1.9 When a worker is working alone in an isolated place, where it is impossible to ask for assistance, the Contractor shall identify the risks related to this situation and provide the PCA representative a procedure on preventing these risks and rapidly get help in case of an emergency.
- 20.1.10 If an unforeseen incident occurs, the Contractor shall take the necessary measures, including stop the work, protect workers and public's health and safety and communicate without delay with the PCA representative.
- 20.1.11 Sub-contracting is forbidden without a special authorization from the PCA representative; the decision shall take into account the sub-contractor's capability to meet the requirements.

20.2 Specific Clauses

- 20.2.1 Foresee protective measures against falls.
- 20.2.2 Foresee pad-lock measures in compliance with Parks Canada Agency's standards and requirements.
- 20.2.3 For work in confined spaces, the Contractor shall obtain the PCA representative's authorization confirming that safety procedures are well adapted. All works in confined spaces must comply with the Parks Canada Agency's standards and requirements. Access to certain confined spaces is limited, the Contractor must adjust his work method accordingly. The Contractor must supply to his employees the required safety equipment to work in confined spaces.
- 20.2.4 Foresee electrical safety measures and the wear of individual protective equipment against arc flashes.

21 INSPECTION AND MAINTENANCE

- 21.1 Work in Section A of this mandate comprises four categories which are under the Contractor's responsibility: inspection and maintenance of instrumentation and controls, inspection and maintenance of electrical power distribution and control, technical documentation update, management of the spare parts inventory, and assistance with spring commissioning.

21.2 Instrumentation and Controls

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 21.2.1 Inspection check-lists and equipment verification in Appendix C must be used as such and duly completed. The Contractor is responsible to update and improve them during inspections and recommendations.
- 21.2.2 Inspection and maintenance work for instrumentation and controls include the inspection, verification, adjustment, and calibration of all control system components ensuring the lock's efficiency.
- 21.2.3 The Contractor shall verify the communication between the components and control centers and ensure the logic integrity and efficiency of control software, and verify each component to ensure their proper functionality.
- 21.2.4 At the end of its inspection, the Contractor shall demonstrate to the PCA representative that all manoeuvres and movements of the lock's different components work correctly.
- 21.2.5 For each inspection, the Contractor shall submit a complete inspection report to the PCA representative.
- 21.2.6 The Contractor shall perform all adjustments and calibrations according to the PCA representative's recommendations. All adjustments and calibrations as well as control points shall be written in the inspection report.
- 21.2.7 The Contractor shall validate each driver software instruction, verify the parameters and review the adjustments and calibrations with the PCA representative.
- 21.2.8 The Contractor shall inspect and ensure that all protections, interlocks and external safety elements or mechanical overloads of the automated system (Hardware components) are in good operating condition, well adjusted/calibrated and secure and protect the operations and equipment for which they were installed.
- 21.2.9 The Contractor shall update the system software and specialized software as well as suggest the purchase of other software, if required.
- 21.2.10 The Contractor shall notify the PCA representative if there are license renewal fees to ensure the systems operation.
- 21.2.11 The Contractor shall provide to Parks Canada Agency an updated version of the PLC's program after each modification.

21.3 Electrical Power

- 21.3.1 Inspection and maintenance work of the electrical power part of this contract includes the inspection, verification, adjustment and calibration of all electrical
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

power system components and electrical components ensuring the lock's efficiency.

21.3.2 Work includes, but is not limited to, motor control centers, circuit-breakers or isolating switches, magnetic starters, wiring and electrical motors, variable speed drives, distribution panels, transformers, light-signalling system as well as other electrical components required for the lock's proper function.

21.3.3 Thermal Imaging - Thermography

21,3,3,1 An inspection by thermal imagery shall be carried out to detect hot spots as well as malfunctions in the electrical equipment (automatic transfer switch, transformers, circuit-breaker/fuse panels, motor control center, electrical cabinets, motors).

21.3.4 Molded Case Circuit Breakers

21.3.4.1 The Contractor shall visually inspect the general condition of the circuit-breaker case, inspect for cracks or creases, clean the circuit-breaker and ensure that all components are reliable.

21.3.4.2 The Contractor shall verify the terminations in order to ensure they are reliable and inspect for discoloration or overheating. Retighten according to the recommended tightening torques indicated by the manufacturer, if required.

21.3.4.3 The Contractor shall verify the mechanism of the device. It must handle the circuit-breaker by opening and closing the handle several times, preferably with an electrical load, in order to verify that the mechanism works freely and smoothly.

21.3.4.4 Circuit-breakers equipped with an electronic triggering device may be equipped with ground fault detection. All maintenance work performed on the electronic circuit shall comply with the manufacturer's guidelines. Verify the connections and cleanliness of the ground fault detection system.

21.3.5 Disconnects With or Without Fuses

21.3.5.1 The Contractor shall verify if the device is working properly, smoothly and that it does not stick. Adjust if needed.

21.3.5.2 The Contractor shall verify the electrical connections and search for signs of damage, overheating and improper use. Verify the tightness of the bolts and terminal connections.

21.3.5.3 The Contractor shall verify the grounding;

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

- 21.3.5.4 The Contractor shall visually verify the general condition of the fuse connections for signs of discoloration, overheating or improper use and must clean fuse ends and fuse holders, if applicable.
- 21.3.5.5 The Contractor shall verify and ensure that the type of fuses and fuse size installed are compliant with the drawings and the type of equipment.
- 21.3.5.6 The Contractor shall open and remove all dust and dirt with a vacuum cleaner.
- 21.3.5.7 The Contractor shall clean the cover and the surrounding area.

21.3.6 Distribution Transformers

- 21.3.6.1 The Contractor shall carry out a peripheral visual inspection of the equipment's general condition.
- 21.3.6.2 The Contractor shall clean all external dirt, do paint touch-ups if necessary in case of rust and corrosion; verify if they are excessive.
- 21.3.6.3 The Contractor shall remove all excessive dirt build-up from the windings or the transformer's insulator to allow free air circulation and to protect against insulator breaks. The top and bottom of the windings shall be cleaned with a vacuum cleaner.
- 21.3.6.4 The Contractor shall carry out a ventilation louver clean-up.
- 21.3.6.5 The Contractor shall verify the alignment and tightening of the electrical connections and verify if there is discoloration or oxidation of the current-carrying parts and that there are no hot spots.
- 21.3.6.6 The Contractor shall verify the hardware condition.
- 21.3.6.7 The Contractor shall verify the connectors and search for signs of overheating; if this is the case, redo and isolate the new joint.
- 21.3.6.8 The Contractor shall assure that the transformer does not generate vibrations or unusual noises and it does not overheat.

21.3.7 Automatic Transfer Switch (ATS)

- 21.3.7.1 The Contractor shall carry out a peripheral visual inspection of the equipment's general condition. The Automatic transfer switch is fitted with a Hydro Québec seal.
 - 21.3.7.2 The Contractor shall clean the dirt from the enclosure with a vacuum
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**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

cleaner and remove all humidity with a rag.

21.3.7.3 The Contractor shall verify the transfer contacts of the switch. Barriers must be removed and the status of the contacts verified. The Contractor shall replace contacts when they are excessively worn and reinstall the barriers carefully.

21.3.7.4 The Contractor shall maintain the transfer switch lubrication. If the Contractor notices that the switch is in a very dusty environment, he must lubricate all links in movement; do not use oil.

21.3.7.5 The Contractor shall verify the alignment and tightening of the electrical connections and verify if there is discoloration or oxidation of the current-carrying parts and that there are no hot spots.

21.3.8 Motor Control Center (MCC)

21.3.8.1 The Contractor shall carry out a peripheral visual inspection of the equipment's general condition.

21.3.8.2 The Contractor shall clean the power element exposed surfaces and its enclosure with a vacuum cleaner.

21.3.8.3 The Contractor shall verify the tightness of the electrical connectors and verify if there is discoloration or oxidation of the current-carrying parts and that there are no hot spots. Retighten bolts according to the recommended torque values by the manufacturer, if required.

21.3.8.4 The Contractor shall verify the wires and cables to eliminate friction against the metals rims caused by the vibration, which could progress to an insulation failure.

21.3.8.5 The Contractor shall verify the mechanical parts movements, such as the electromechanical contacts and mechanical latching to ensure a proper operation.

21.3.8.6 The Contractor shall verify and ensure that the type of fuses and size installed are compliant with the drawings and the type of equipment.

21.3.8.7 The Contractor shall verify and replace the signal lamps, if required.

21.3.9 Starter and Contactor

21.3.9.1 The Contractor shall clean all dirt, rust or corrosion; verify if it is excessive.

21.3.9.2 The Contractor shall verify the tightness of the electrical connectors

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

and verify if there is discoloration or oxidation of the current-carrying parts and that there are no hot spots.

- 21.3.9.3 The Contractor shall verify the mechanical connectors.
- 21.3.9.4 The Contractor shall verify the fuses spring leaves' pressure.
- 21.3.9.5 The Contractor shall verify the presence of frayed strands on soft wires.
- 21.3.9.6 The Contractor shall verify if there are overheating signs or mechanical damages to the coils.
- 21.3.9.7 The Contractor shall clean and verify the push-buttons, selector switches or pilot devices.
- 21.3.9.8 The Contractor shall verify if the contactors arc; if this is the case, align to eliminate the bounce of the contacts.
- 21.3.9.9 The Contractor shall verify if there are noises and verify the coils.
- 21.3.9.10 The Contractor shall replace the contact terminals if they are burnt. Do not file silver terminals.
- 21.3.9.11 The Contractor shall verify the contacts' pressure so they are equal on all studs.
- 21.3.9.12 The Contractor shall activate the overload relays by hand to ensure they are working properly. Clean, verify the heating coil and tighten the fitting.
- 21.3.9.13 The Contractor shall verify and adjust the overload and overheating devices to the right values.

21.3.10 Variable Speed Drive

- 21.3.10.1 The Contractor shall clean the dirt and dust and check for humidity. Verify if they are excessive and mitigate the infiltration source.
 - 21.3.10.2 The Contractor shall verify the ventilators, if applicable, and the cooling. Replace all damaged parts. Apply power temporarily to verify if it is operational. If the device does not respond, verify and replace, if required, cables, fuse, ventilator or the ventilator's motor, if applicable.
 - 21.3.10.3 The Contractor shall clean the radiators.
-

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

21.3.10.4 The Contractor shall verify if the variable speed drive is in proper working condition.

21.3.10.5 The Contractor shall clean or change the air filters.

21.3.10.6 The Contractor shall verify the terminals' connections.

21.3.11 Electrical Motor

21.3.11.1 The Contractor shall ensure that the motor does not generate vibrations or unusual noises and does not overheat.

21.3.11.2 The Contractor shall verify that all connections are reliable.

21.3.11.3 The Contractor shall ensure that the windings are not grounded.

21.3.11.4 The Contractor shall note the motor running current in each phase.

21.3.11.5 The Contractor shall verify and tighten all connections.

21.4 Management of the Spare Parts Inventory

21.4.1. The Contractor shall assist and make recommendations to the PCA representative on how to keep a critical or essential spare parts inventory for the proper operation of lock.

21.4.2. The Contractor shall ensure the follow-up and keep a spare parts registry. The Contractor shall also assist the PCA representative with the purchase of new spare parts as needed.

21.5 Annual Update of Technical Documents

21.5.1. The Contractor shall be responsible to keep all technical documents updated following all inspections or repair work, modifications or part replacements during the entire length of the contract.

21.5.2. Management of the documents review shall be carried out pertaining to requirements in "Drawings" Section.

21.5.3. Technical documents comprise of operational and maintenance manuals, sketches and drawings in AutoCAD, inspection report list, spare parts inventory list, cable list and all other documents required for the proper lock's operation, such as data sheets of new installed parts.

21.5.4. The Contractor shall keep in its project report/specifications, a copy of all inspection reports including the date, comments and recommendations.

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

APPENDIX A

LIST OF ELECTRICAL AND MECHANICAL DRAWINGS & DOCUMENTS

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK****DRAWINGS AND DOCUMENT LIST**

Title	Document Number
600 V SINGLE LINE DIAGRAM	OCAR-20-143
NETWORK ARCHITECTURE	CCRL-E01-R00
INTERCONNECTION DIAGRAM - WIRING	CCRL-E02-R00
GENERATOR PLUG INSTALLATION	CCRL-E03-R00
LOCATION OF EQUIPMENT – PLAN VIEW	CCRL-E04-R00
PANEL LAYOUT	CCRL-E05-R00
PAN. BJ-RIO-01 CONTROL POWER SCHEMATIC	CCRL0E06-R00
PAN. BJ-RIO-01 DIGITAL INPUT CARD 1734-IB8 – SLOT 0	CCRL-E07-R00
PAN. BJ-RIO-01 DIGITAL INPUT CARD 1734-IB8 – SLOT 1	CCRL-E08-R00
PAN. BJ-RIO-01 RELAY OUTPUT CARD 1734-OW4 – SLOT 2	CCRL-E09-R00
PAN. BJ-RIO-01 ANALOG INPUT CARD 1734-IE2C – SLOT 3	CCRL-E10-R00
PANEL LAYOUT LUBRICATION SYSTEM – INTERCONNECTION DIAGRAM AND PLAN VIEW	CCRL-E11-R00
WIRING LUBRICATION SYSTEM	CCRL-E12-R00
GREASE SYSTEM - SCHEMATIC	CCRL-M20-R00
VERTICAL GATE MACHINERY SECTION AND DETAILS	CCRL-M52-R00
SUMP PUMPS - DETAILS	CCRL-M54-R00
SCHÉMA D'IMPLANTATION	P019-15-01PCL-01 p.1 de 37
ALIMENTATION 120 VAC	P019-15-01PCL-01 p.2 de 37
DISTRIBUTION 120 VAC ET 24 VDC	P019-15-01PCL-01 p.3 de 37

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

Project # CCRL-MD-2001

Page A3

Title	Document Number
COMMUNICATION DEVICE NET	P019-15-01PCL-01 p.4 de 37
SCHÉMA DE CONTRÔLE DES FEUX DE SIGNALISATION	P019-15-01PCL-01 p.5 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.6 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.7 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.8 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.9 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.10 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.11 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p.12 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – COMMANDE	P019-15-01PCL-01 p. 13 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – PORTE SECTEUR SG3	P019-15-01PCL-01 p.14 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – PORTE SECTEUR SG4	P019-15-01PCL-01 p.15 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – VANNE D'ADMISSION IV	P019-15-01PCL-01 p.16 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – VANNE D'ADMISSION IV	P019-15-01PCL-01 p.17 de 37

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

Project # CCRL-MD-2001

Page A4

Title	Document Number
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – VANNE D'ÉVACUATION DV	P019-15-01PCL-01 p.18 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – VANNE D'ÉVACUATION DV	P019-15-01PCL-01 p.19 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – PORTE LEVANTE LG	P019-15-01PCL-01 p.20 de 37
SCHÉMA DE CONTRÔLE DE L'ÉCLUSE – PORTE LEVANTE DV	P019-15-01PCL-01 p.21 de 37
SCHÉMA DE BRANCHEMENT – MODULE D'ENTRÉES DIGITALES DI-1	P019-15-01PCL-01 p.22 de 37
SCHÉMA DE BRANCHEMENT – MODULE D'ENTRÉES DIGITALES DI-2	P019-15-01PCL-01 p.23 de 37
SCHÉMA DE BRANCHEMENT – MODULE D'ENTRÉES DIGITALES DI-3	P019-15-01PCL-01 p.24 de 37
SCHÉMA DE BRANCHEMENT – MODULE DE SORTIES DIGITALES DO-1	P019-15-01PCL-01 p.25 de 37
SCHÉMA DE BRANCHEMENT – MODULE DE SORTIES DIGITALES DO-2	P019-15-01PCL-01 p.26 de 37
SCHÉMA DE BRANCHEMENT – MODULE D'ENTRÉES ANALOGIQUES AI-1	P019-15-01PCL-01 p.27 de 37
SCHÉMA DE BRANCHEMENT – MODULE D'ENTRÉES ANALOGIQUES AI-1	P019-15-01PCL-01 p.28 de 37
TERMINAL STRIP : TB00, TB01	P019-15-01PCL-01 p.29 de 37
TERMINAL STRIP : TBC1, TBDV	P019-15-01PCL-01 p.30 de 37
TERMINAL STRIP : TBF1, TBI1	P019-15-01PCL-01 p.31 de 37
TERMINAL STRIP : TBI2, TBI3	P019-15-01PCL-01 p.32 de 37

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

Project # CCRL-MD-2001

Page A5

Title	Document Number
TERMINAL STRIP : TBI4, TBK1	P019-15-01PCL-01 p.34 de 37
TERMINAL STRIP : TBLG, TBSG3	P019-15-01PCL-01 p.35 de 37
TERMINAL STRIP : TBSG4, TBU1, TBU2	P019-15-01PCL-01 p.36 de 37
LISTE DES ÉQUIPEMENTS	P019-15-01PCL-01 p.37 de 37
ROCKWELL AUTOMATION CENTERLINE 2100 MOTOR CONTROL CENTER	
CONCRETE RESURFACING (PROJECT 2)_ ELECTRICAL PLAN VIEW	R_072225_001_PN_C01
CONCRETE RESURFACING – TRENCH AND CABLE REPLACEMENT – CABLE LIST INSTALLED IN TRENCH	
ÉCLUSE CARILLON – PARC CANADA SYSTÈME DE CONTRÔLE ET AUTOMATISATION PROJET T017-01-01 MANUEL D'OPÉRATION – DERNIÈRE MISE À JOUR JUIN 2015	

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

APPENDIX B
CONTROL DIAGRAMS

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

APPENDIX C

INSPECTION AND VERIFICATION CHECK-LISTS OF EQUIPEMENT

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

Legend

IVO:	Inlet Valve « OPENING »
IVF:	Inlet Valve « CLOSING »
SG3O :	Sector Gate 3 « OPENING »
SG3F	Sector Gate 3 « CLOSING »
SG4O :	Sector Gate 4 « OPENING »
SG4F :	Sector Gate 4 « CLOSING »
DVO :	Discharge Gate « OPENING »
DVF :	Discharge Gate « CLOSING »
LGO :	Lifting Gate « OPENING »
LGF :	Lifting Gate « CLOSING »
STOP :	Stop Button for the Gates
ES :	Emergency Stop

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

EQUIPMENT VERIFICATION REPORT									
EQUIPMENT	OOSS	COSS	OLS	ENCODEURS	ES LOCAL	BJ DEVICE	BJ LOCALE	LGEPIX	LGEPIY
CHANGED									
LIFTING GATE (LG)									
VISUAL									
« HARD »									
« SOFT »									
REPAIRED									
CHANGED									

ANTICIPATED ADJUSTMENTS AND ENCODERS MEASUREMENTS					
	IV	DV	SG3	SG4	LG
ANTICIPATED DURING CLOSURE					
MEASUREMENT DURING CLOSURE					
ANTICIPATED DURING OPENING					
MEASUREMENT DURING OPENING					

Legend

- OOSS : Opening Overstrength Switch
- COSS : Closing Overstrength Switch
- OLS : Opening Limit Switch
- ES : Emergency Stop
- Encoder : Digital Position Detector
- Device JB : DeviceNet Junction Box for Encoder
- Local JB: Local Connection Junction Box

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

LGEBIX : Emergency Brake Proximity Sensor of the Lifting Gate
 LGEBIY : Safety Catch Proximity Sensor

EQUIPMENT VERIFICATION REPORT													
EQUIPMENT	DRIVE	CC	OC	OL	CA	BC	EBC	SM	FUSIBLE	C-À-C	LGCMO	600 V FILTRE	600 V DRIVE
INLET VALVE													
DISCHARGE VALVE													
SECTOR GATE No. 3													
SECTOR GATE No. 4													
LIFTING GATE													
CONTROL FUSE													
TRAFFIC LIGHT FUSE													
ENGINE BLOCK HEATER FUSE													
TXFO. PRIMARY FUSE													
REPAIRED													
CHANGED													

Legend

DRIVE : ABB Variable Speed Drive
 CC : Closing Contactor « CLOSING »
 OC: Closing Contactor « OPENING »
 OL : Overload
 CA : Auxiliary Contact
 BC : Break Magnetic Starter
 EBC : Emergency Brake Magnetic Starter – Lifting Gate
 LGCMO : Speed Selector Magnetic Starter
 SM : Manual Disconnect (CCM)
 C-à-C : Bypass Selector

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

EQUIPMENT VERIFICATION REPORT									
EQUIPMENT	INDAM	INDAV	TXNDAM	TXNDAV	TXPAV	DMALT	BJ DEVICE	CNAM	CNAV
VISUAL									
MATERIAL									
OPERATION									
NOTE #									

Legend

- INDAM : Upstream Differential Level Switch
- INDAV : Downstream Differential Level Switch
- TXDNAM: Upstream Differential Level Transmitter
- TXDNAV : Downstream Differential Level Transmitter
- TXPAV : Air Pressure Differential Transmitter
- DMALT : Grounding Detector
- BJ DEVICE : DeviceNet Main Junction Box
- CNAM : Upstream Bypass
- CNAV : Downstream Bypass

**VERIFICATION AND MAINTENANCE OF THE ELECTRICAL AND CONTROL SYSTEMS OF THE
CARILLON CANAL NHSC LOCK**

EQUIPMENT VERIFICATION REPORT							
EQUIPMENT DRAINAGE PUMP	LIT-001	LSHH-1	LSLL-1	CTDN	BJ DEVICE	BP	BJ-RIO-01
VISUAL							
MATERIAL							
OPERATION							
NOTE #							

Legend

- LIT-001 : Radar Level Sensor
- LSHH-1 Float Sensor – Extreme High Level
- LSLL-1 Float Sensor – Extreme Low Level
- CTDN Level Transmitter Controller
- BJ DEVICE Float Junction Box
- BP Push Buttons Station
- BJ-RIO-01 : Pumps Control Panel

