



SPECIFICATION OF WORK WATER TREATMENT SYSTEM UPGRADE AT THE ST-ARMAND BORDER CROSSING

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1.0 Background

As a federal employer, the Canada Border Services Agency (CBSA) must ensure that the water intended for human consumption provided to its personnel at border crossings across the country is drinkable and that the water supply is reliable and sufficient.

The CBSA is responsible for about twenty-four (24) border crossings in Quebec with a non-municipal drinking water supply. Many of these crossings are isolated, and most of them rely on local sources like groundwater. Water treatment processes such as filtration, softening and disinfection vary considerably between locations.

The CBSA has been conducting various levels of water quality monitoring at its facilities since 2004, as part of its National Potable Water Monitoring Program. Raw water samples have been collected from most of these sites for a few years.

The analyses carried out show that in several cases, treatment devices must be added to the treatment line in place to guarantee safe water at all times.

The CBSA has directed Public Services and Procurement Canada (PSPC) to retain the services of a firm qualified to work on the water treatment system at the St-Armand (Philipsburg) border crossing in the Montérégie region.

2.0 Site description

The border crossing addressed in this mandate, its characteristics and identified needs are the following:

- Address: 10 Route 133, St-Armand, QC, J0J 1T0
- Buildings: 2 buildings named “international” and “commercial”
- Number of employees: maximum 25 employees per day
- Opening hours: open 7 days a week, 24 hours a day
- Wells:
 - #1 (commonly known as the “Des frères” well) is located along Route 133 South, more than 32 metres deep, was dug in 1989, has a 1/2 HP submersible pump and an estimated capacity of 13,000 litres/day.
 - #2 (commonly known as the “commercial” well) is located at the southern end of the commercial building, more than 92 metres deep, was dug around 1960, has a 1 HP submersible pump and an estimated capacity of 56,000 litres/day.
- Estimated daily water consumption: 20,000 litres/day

- Existing water treatment equipment: 2 paralleled softeners, 1 chlorine metering pump, 6 contact tanks 1.8 m high by 1.2 m in diameter and 2 pressure pumps. Two reverse osmosis systems installed under the sinks in the international and commercial service buildings kitchen.

Objectives of the water treatment system upgrade:

- Control the discharge of chloride and sodium ions when backwashing the softeners
- Increase disinfection capacity by adding UV reactors
- Reduce the hardness in the water supplying a humidifier

Taking into account the current treatment line, problems with water quality and results of the bacteriological and physicochemical analyses for each of the two wells, plans and specifications have been produced to specifically define the work to be carried out. These documents are included in Appendix 1.

An updated analysis of the two wells' physicochemical characteristics was performed, and the results are included in Appendix 2.

3.0 Mandate

The mandate of the contractor selected for the work will involve installing the equipment required to modify and complete the water treatment system while consistently ensuring the bacteriological and physicochemical quality of the drinking water.

The work must take into consideration the site's particularities, which include, but are not limited to, the equipment already in place, the characteristics of the drinking water and the observed problems with water quality.

The objectives of the mandate are the following:

- Provide and install the equipment required in accordance with this work specification and the attached plans.
- Produce a maintenance and operations manual for all of the equipment in the water treatment system.

To do so, the selected firm must carry out all of the required tasks, including:

- List the proposed equipment in accordance with the specifications of the plans and specifications in Appendix 1;
- Propose a schedule of work for written approval;
- Install and commission the equipment and take water samples before (including the two water inlets) and after treatment (conventional or untreated tap in the kitchen) to validate the performance of the softener and the UV unit;

- Train one technician designated by PSPC to maintain the equipment installed; and
- Provide a maintenance and operations manual for the equipment (French version only).
This document must include the following:
 - Cover page;
 - Overall photograph of the treatment chain with the main components identified;
 - Name, serial number and certification of main equipment;
 - Recommended maintenance and frequency of maintenance for main equipment; and
 - Maintenance manuals for the main equipment installed by the contractor.

4.0 Specific administrative clauses

4.1 General scope of the work

The contractor must provide all of the materials and equipment required, of the described quality, as well as the labour and tools needed to perform the work described in the plans and specifications. The work site is the drinking water production room, located inside the service building. There will be no exterior work required.

4.2 Laws and regulations, permits and patents

The contractor must respect the laws and regulations, codes (with the main ones being: the Quebec Construction Code, NFPA and the Canadian Electrical Code with Quebec amendments), applicable ordinances and the requirements of the relevant authority.

The contractor must obtain all of the permits, licences, patents and certificates required to carry out the work. The contractor must provide certificates indicating that the work is in compliance with the Commission des normes, de l'équité, de la santé et de la sécurité au travail (CNESST) regulations.

4.3 Standards

For any standards mentioned hereinafter, refer to the latest version of those standards.

4.4 Technical specifications

The contractor must provide the PSPC representative with a digital copy for Acrobat Reader (PDF) of the technical specifications indicating the characteristics, construction details, capacity, performance, quality, installation details, etc. for all of the devices and equipment, as well as special details related to installation.

4.5 Marked-up drawings and instruction manuals

The PSPC representative must receive training on the operation and maintenance of all systems and equipment. Before the work is provisionally accepted, the contractor must provide one paper copy and one digital copy (email or USB) to the PSPC representative of the instruction manual including all of the operation and maintenance instructions for the main pieces of equipment requiring periodic maintenance or potential repairs, a copy of the shop drawing as approved, a copy of the manufacturer and the contractor's written warranty, a sheet containing the address for the manufacturer's maintenance service and three copies of the redlined plans.

4.6 Equivalents

The products proposed as equivalents must be approved by the PSPC representative. If changes to the planned installations are required as a result of the equivalents, the additional costs must be covered by the sub-contractor who proposed the equivalent.

4.7 Dimensions

The contractor must verify all of the dimensions before the beginning of work on the site, and notify the PSPC representative and the consultant (project engineer employed by PSPC) of any error and/or omission. Do not take measurements from the scale plans; only the measurements indicated are valid. The measurements indicated on the plans are in metres (unless otherwise specified).

4.8 Access and storage of materials

The work will be carried out on an active CBSA site. Access to the work site is regulated and the contractor must take that into account. The contractor must use the regulated access to enter the work site and repair any damage resulting from its use.

The contractor must not block the entrances and exits to neighbouring buildings and protect the users of those buildings from the hazards resulting from the work site.

The contractor must coordinate with the owner regarding storage areas for materials inside or outside the service building, if applicable.

4.9 Work on-site

The activities of the CBSA take precedence over the project at all times.

4.10 Maintaining water supply during the work

The site will remain in operation, and therefore the PSPC representative and the contractor must put procedures in place to limit the impacts on water quality and distribution. These procedures, and their phasing, must be submitted to the PSPC representative and the consultant for approval. The PSPC representative and the consultant may request changes to reduce the impacts on the production and distribution of drinking water. Except in cases of night work imposed by the owner, the contractor may not make any claims. The contractor must take into account the installation of temporary mains and valves to facilitate the work and limit water shut-offs.

The contractor will conduct water shut-offs for a maximum of four (4) hours each during the course of the work. The contractor must forward all water shut-off requests at least forty-eight (48) hours in advance to the PSPC representative and the consultant for approval. The contractor must not proceed with any shut-off until confirmation is received from the PSPC representative or the consultant. Work during such shut-offs must be done in the presence of the operator. The contractor is not required to maintain the water supply during shut-offs authorized by the PSPC representative and the consultant.

4.11 Materials and installation

The materials used must be new and top-quality. Any equipment that is part of the systems must be CSA-approved for use. It must be installed according to manufacturer recommendations.

4.12 Recyclable materials

The owner reserves the right to collect recyclable materials and has the final say on any materials such as fittings, pipes, process equipment, etc. that are disposed of.

The contractor will be responsible for all materials not collected by the owner, and must load, transport and dispose of them away from the work site or in a site designated by the owner. The contractor is entirely responsible for the site and the disposal method used for the materials.

4.13 Passing near buildings and other existing work

Anywhere the work comes near the buildings and other ongoing work, the contractor must take all necessary precautions to avoid damaging said buildings and work. The contractor is solely responsible for any damage to property.

4.14 Cleaning

At all times, the contractor must take the measures required to regularly clean dirty surfaces during the execution of the work until the end of the work. In addition, the contractor must also take all necessary measures to control dust until the end of the work.

For the work to be accepted, the contractor must clean the places affected by interior and exterior work to the satisfaction of the consultant at the end of every work day.

The work site must be left neat and tidy at the end of every work day to the satisfaction of the owner.

4.15 Restoration of work site

The contractor must plan and is responsible for any holes, sealing any openings and repairs inside the service buildings to install the mains and their supports.

4.16 Contradictions between the plans and specifications

Overall, the specifications take precedence over the plans.

Nonetheless, if there is a contradiction between the specifications and the plans, the contractor must immediately notify the PSPC representative.

The contractor cannot claim any fees for contradictions between the specifications and the plans, between two elements and/or many elements of the specifications or between two or more elements of the plans.

4.17 Communication

Any decisions required for the work to be carried out efficiently must be made in close collaboration between the contractor, the PSPC representative and the consultant. The contractor is not authorized to communicate directly with CBSA personnel. The contractor must not share any information with CBSA personnel.

4.18 Start-up meeting

A start-up meeting with all of the stakeholders will be held at the beginning of the project, and will be coordinated by PSPC. This meeting will cover, but will not be limited to, the following items:

- Roles of the stakeholders;
- Project presentation and background;
- Contractor's proposal (presentation of equipment and certification); and
- Schedule of work for the project.

5.0 General technical clauses

5.1 Object of the work

This call for tenders from PSPC concerns the upgrading of the drinking water treatment system at the St-Armand border crossing.

The work covered in this section consists mainly of, but is not limited to, the following:

- Replacing the existing 37 mm (1 ½ inch) copper pipe fittings before and after the softeners with new 50 mm copper pipe fittings.
- Modifying the wells' force mains as shown on the plans and to allow the following features:
 - Extending the wells' force mains to the wall above the current chlorination by adding sections of 37 mm PVC pipes. Providing and installing a 37 mm valve at the end of the "commercial" well's force main, before the connection with the "Des frères" well force main.
 - Providing and installing the sections of pipe and the required fittings to connect the two wells' force mains into one projected shared 50 mm PVC pipe.

- Providing and installing the fittings required to connect the projected shared main to the 63 mm copper pipe that feeds the softeners.
 - Providing and installing a 50 mm bronze or PVC check valve on the wells' new shared main before the connection to the 63 mm pipe leading to the softeners.
 - Providing and installing two valves, specifically:
 - One 37 mm PVC valve to insulate the "commercial" well's force main before the connection to the main pipe; and
 - One 50 mm PVC valve on the wells' shared main that feeds the softeners.
 - Providing and installing a tee on the 63 mm copper return pipe for the softened water that will direct that water to the UV reactors through a 50 mm PVC pipe. Providing and installing a 50 mm PVC isolating valve on the pipe leading to the UV reactors.
 - Providing and installing a 50 mm PVC bypass pipe with a 50 mm isolating valve to direct the water from the wells directly to the UV reactors while allowing, through a clever valve configuration, the backflow water from the feed pumps to flow through the softeners.
 - Dismantling and relocating the water intake pipe that is currently connected to the "Des frères" well force main onto the new shared pipe.
 - Providing and installing a hydropneumatic tank operating at 200 kPa on the feed pipe for the softeners (63 mm), including the required fittings and an isolating valve to insulate the tank if needed.
 - Providing and installing a pressure switch on the feed pipe for the UV reactors, including the electrical connection from the electrical outlet for the chlorine metering pump. The pressure switch must be configured to ensure the operation of the two well pumps when the pressure drops to 200 kPa and to stop them when the pressure reaches 410 kPa.
 - Providing and installing a pressure regulation valve on the feed pipe for the UV reactors to ensure a pressure of 200 kPa is maintained and will shut off when the maximum level is reached in the contact tanks (existing level indication).
- Replacing the existing 37 mm fittings at the entrance and exit of the softeners with new 50 mm fittings, including the valves and connectors on the 63 mm copper pipes and the softeners' control heads (50 mm).
 - Dismantling and relocating the chlorine metering pump and its containment pan to the location indicated on the plans. Its performance will not be changed and a single intake point will be kept: the one that is currently furthest and that, at the end of the work, will be below the UV reactors.
 - Providing and installing a regulated system for discharging regeneration water from the softeners that includes, but is not limited to:
 - A storage tank for the regeneration water from the softeners in which the contractor will direct the softeners' discharge pipes.

- A duplex peristaltic pumping system to regulate the discharge of regeneration water to the drain, including a level detection or measurement system to control the pumps. The contractor must also provide and install the pipes leading to the tanks and discharging to the drain; and
- Providing and installing a UV disinfection system that includes:
 - Three UV reactors installed in parallel, each with a 5 micron filter, a 10 gpm flow restrictor, a check valve, three isolating valves (before the filter, after the filter, after the UV reactor), a 4-20 mA UV sensor interface and a monitoring module shared between the three UV reactors for diagnosing the reactors;
 - An air release valve on the feed pipe shared by the UV reactors; and
- Connecting the pipes at the exit of the three UV reactors to the feed pipe for the existing contact tanks. It should be noted that a motorized valve whose opening is tied to the level indicator is currently installed in the contact tanks and that the other end of the feed pipe for the tanks must be shut with a PVC plug.
- Providing and installing supports and attachment hardware for all of the equipment and pipes installed as part of the work.
- Adding 12 mm of insulation to the pipes with a vapour barrier and protective covering on all projected pipes of a similar colour and finish to the existing insulation/pipe.
- Identifying the pipes and the projected processing equipment.
- Preparing the shop drawings for the processing equipment.
- Commissioning all of the projected and relocated equipment, including the following work:
 - Verifications, testing and commissioning;
 - Manufacturing and operating warranties;
 - Maintenance and operations manuals in French;
 - Having the personnel trained by the technicians for the providers of the equipment installed;
 - Operating warranties;
 - Providing technical assistance to the equipment suppliers for the testing and commissioning of the UV disinfection system;
 - Providing a report written by the provider on the compliance of the installation and the equipment's operation; and
 - Cleaning and restoring the site after the work is completed.

5.2 Requirements

5.2.1 Shop drawings

The contractor must submit all plans, shop drawings and technical specifications for the proposed equipment within 21 days of the contract award. The contractor is responsible for verifying the exact and final dimensions on the site and including them in the shop drawings to be submitted so that all of the new equipment fits in perfectly with the existing equipment. The contractor must ensure the precision and accuracy of the plans and shop drawings to avoid delays in approval. Any corrections must be minor.

Any shortcomings in these aspects will be attributed to the contractor with regard scheduling delays.

5.2.2 Compliance of drinking water

All materials, equipment and accessories in direct or indirect contact with drinking water must comply with NSF 61.

6.0 Specific technical clauses for components

6.1 Plumbing and valving

Unless otherwise indicated, the contractor must follow these standards for the specified division. These standards are not intended to restrict or replace the opinion of a professional.

All thermoplastic plumbing must come from one single provider.

All accessories and valving must come from one single provider.

The physical locations of the plumbing, valving and accessories to be installed in the building are indicated on the plans in a diagram, and no dimensions are clearly specified.

The contractor is responsible for establishing the final location of the equipment and all other components so that they are accessible to operations personnel.

The fittings must be waterproof, and can be either Chemflare, glued, sleeve, threaded or flanged.

The sleeve joints must be cold welded.

Whether the contractor is part of the process engineering or not, the contractor must provide all of the separable union fittings required to easily dismantle the plumbing. All of the equipment connected to the thermoplastic plumbing must be connected using separable union fittings.

The water systems installed as part of this work include, but are not limited to, the following type of equipment: plumbing, supports, guides, anchors, valving and accessories.

Connections to existing copper pipes must be made using a copper tee of the same diameter welded to the existing pipe. Installing tees made of another material is forbidden.

The existing cut PVC pipes with abandoned sections must be blocked with a glued plug. On sodium hypochlorite pipes, the contractor must use glue specifically made for that purpose.

6.1.1 Thermoplastic plumbing

The minimum requirements for PVC plumbing are:

- Type 1, grade 1120 CPVC under standard ASTM D1758, schedule classification 12454-a, Schedule 80 ASTM D-1 1784 for screwed fittings, Schedule 80 for solvent-glued fittings ASTM D-2564, 2855 with socket fittings.

6.1.2 Pipe supports

The pipes will be supported by supports on the walls or ceiling.

The plumbing and the accessories must be attached in compliance with the manufacturer's recommendations.

Suspension strap supports are forbidden.

All of the supports must include at least the three following components: anchor sleeve, suspension rod, clamp and strap.

The rods must be made of stainless steel, aluminium or fiberglass with mechanical threading that is long enough to adjust the various levels of plumbing.

The space between supports must not exceed 1.5 m.

The supports must be placed less than 300 mm (12") from each of the horizontal elbow fittings.

The height of the suspension rods must be adjusted to allow equal load distribution.

A dielectric fitting must be used when stainless steel comes into contact with another material, or another stainless steel component. In that case, neoprene must be placed between the support and the pipe when the use of a dielectric fitting is possible.

6.1.3 Location

The service plumbing must be installed in the available spaces in the most practical way possible. The circulations proposed in the plans and diagrams are for information purposes. The contractor may propose a different installation and implement it if it is approved by the operator (technician

responsible for the building's operation), the PSPC representative and the consultant. Any unused pipes must be removed up to the main line's closest connection.

6.1.4 Valving

Unless otherwise indicated, the valving must comply with ANSI standards, Class 200, 1400 kPa, shock-resistant, with internally threaded or weldable ends.

All valving components of the same type must be manufactured by a single provider.

The valving components must comply with the standards set by the Manufacturers Standardization Society of the Valve and Fittings Industry.

The materials used to manufacture the valving must comply with the standards set by the American Society for Testing and Materials (ASTM).

Ball valve

The valves must have a diameter equal to or lesser than 63 mm and be screwable: 316 stainless steel, PTFE bushing, robust chrome stopper, Teflon seat and lever control.

The ball valves and the ball check valves must be made of PVC with compatible fittings and bushings.

Ball check valve

The components of the ball check valve (O-ring, ball, body, SPT connection) must be made of Schedule 80 PVC.

The ball check valve must be able to be mounted horizontally or vertically.

The valve must be removable without damaging the plumbing. The ball check valves and foot valves must be "true union" PVC and the inline strainers must be "true union."

Drain valve

Unless otherwise indicated, drain valves must be installed at lower points. The drain valves must be 19 mm in diameter, made of bronze and have threaded ends to connect to a flexible pipe.

Pressure regulating valve

The pressure regulating valve must have a pilot that maintains pressure above 200 kPa before the valve. The valve must be open and closed progressively to avoid pressure surges. This pilot will receive information on the levels in the contact tanks and will shut off when the maximum level is reached and turn on when the minimum level is reached.

The valve must have a position indicator (open/closed).

A support must be installed below and above this valve and the contractor is responsible for connecting and putting the valve into service.

6.1.5 Testing

The testing will be performed by applying 550 kPa of pressure for a 1-hour period. Testing must not be performed until enough time has passed since the last fitting has been connected end-to-end to the glued fitting. The contractor must submit the procedure ahead of time to the PSPC representative and the consultant.

The portion of pipe isolated by drain valves must be filled with water and pressure must be applied to the plumbing. The pump, connecting pipes and all required devices such as pressure gauges, etc. must be provided and installed by the contractor. The pressure gauge must be installed at the lowest point of the plumbing.

Before applying the test pressure, all air must be removed from the plumbing. If there are no permanent air release valves at every high point, the contractor must provide and install main stops at those points so that all the air can be released as the pipe fills with water. Once the air is completely removed, the main stops must be shut and pressure may be applied.

All of the plumbing, fittings, valves and connectors must be carefully examined during testing. All of the plumbing and valves broken by this pressure test must be removed and replaced with adequate equipment by the contractor, and testing may resume until the plumbing is entirely waterproof.

6.2 UV disinfection system

6.2.1 Scope of the work

Provide and install the materials, equipment and installations required to deliver a UV disinfection system consisting of three closed reactors for a pressurized flow with low-pressure, high-intensity mercury lamps. These reactors must be installed in parallel as shown on the operation diagram. The system must be complete and operational with its control equipment and accessories, as indicated and specified in this document. The disinfection system must be installed by the contractor. The system must be commissioned by the contractor with the provider's cooperation.

6.2.2 Acceptable products

A) Quality assurance

The ultraviolet disinfection system must be certified, MELCC approved, and have a data sheet on the department site prior to bid closing.

Any manufacturer that submits a system that is not recognized as an equivalent must submit its product at least 15 days prior to bid opening to be considered.

The proposal must include a detailed description of the unit, the control panel, lamps and ballasts, engineering reports indicating pressure drop, reactor performance, UV dose, testing equipment, and sampling and calculation methods.

Provide a manufacturer's statement indicating any non-compliances or exceptions from the specifications, indicating the specification in question and the proposed alternative, as well as the reason for the exception.

The physical layout of the system as shown in the engineering drawings must be maintained.

B) General requirements

Provide a complete system, pre-mounted on polyester panels in groups of three units, with prefilter(s), reactor(s), automatically closing solenoid valve(s), integrated or external flow restrictor(s), control panel(s) with integrated ballast, safety fan(s), UV intensity sensor(s), UV intensity sensor interface(s) and monitoring and communication module.

C) Design criteria

Provide a set of UV equipment to disinfect potable water. The set must have the following characteristics:

- Peak flow: 1.26 l/s (20 US gpm)
- UV dose: 40 mj/cm²
- Water temperature: between 5°C and 30°C
- Air temperature: between 1°C and 40°C
- UV transmittance @ 254 nm: 75%
- Iron content (fe): <0.3 mg/l
- Hardness: <120 mg/l
- Equipment redundancy: 3 units required (2+1)

The UV system will be pre-mounted on vertical panels in groups of three units, and will occupy the following space:

- Height: +/- 2.15 m / width: +/- 2.21 m maximum
- Connection diameter: 50 mm (2 in)
- Certified in accordance with standard NSF/ANSI 55 Class A.
- Wetted parts are made of Teflon, Viton or stainless steel (type 304 or 316).
- UV lamps can be changed without emptying the water from the system.
- The power supply for the UV system ballast is 120vac, 60Hz, 1 phase.
- Provide a 4-20 mA interface for the UV intensity sensor, with alarm thresholds
- Provide cables with cable troughs, grounded power outlets, cases, covers, etc.

D) Prerequisites for performance

A minimum UV dose of 40 mj/cm² at 1.26 l/s (20 US gpm) at the end of the lamp's service life is required for each unit.

E) Shop drawings

Prepare engineering drawings for review, indicating the following:

- A complete description with sufficient details for comparing items to specifications;
- Dimensions and installation requirements;
- Electrical drawings.

6.2.3 UV reactor characteristics and accessories

A) Prefilter

Prefilters will be provided with a 5-micron filter cartridge. Each prefilter will be designed to handle 75 l/min (20 US gpm) of flow and 690 kPa (100 psi) of pressure. Each unit will be made of NSF polypropylene and incorporate three separate parts, with a locking ring for quick and easy disassembly. The prefilter must include a connection for a pressure gauge and a connection for a lower drain with a drain plug. The input and output connectors are 25 mm (1" FPT).

The prefilters will be provided with a 5-micron filter cartridge made of NSF polypropylene, and will be resistant to a temperature of 38°C.

Two pressure gauges must be installed for each filter, upstream and downstream, to measure the pressure drop associated with clogging in the filter cartridge.

B) UV reactors

The reactor will be made of 316L stainless steel, with 1 ¼ " MNPT input connectors and 1" FNPT output connectors, and an internal flow restrictor. The reactor will be designed for vertical installation. Each reactor must include a safety solenoid valve and a UV intensity sensor.

The UV lamp will be a high-intensity amalgam lamp, and must be under warranty for continuous operation for two years. The lamp power will be 200 watts. The lamp must be inside a shock-resistant quartz sleeve.

The reactor will be cooled by natural air convection, and a safety fan will be included to prevent high temperatures inside the reactor during zero-flow periods.

Each reactor must include a control panel with integrated ballast. The ballast will be designed with a reset button in case of overload. No fuses will be accepted for ballast protection. The power source for the panel will be 120 volts, 60 Hz, one (1) phase, 1.6 amperes. Total consumption will be 160 watts.

C) Interface for UV intensity sensor

Each UV reactor must include a 4-20 mA interface for the UV intensity sensor. The interface must include three separate levels of intensity: low UV anomaly, low UV warning and normal UV. These signals can be connected to an external alarm panel or remote monitoring.

D) System monitoring module

A monitoring module must be installed to monitor system performance. The module must be able to monitor up to nine UV reactors. Each module must include two external contacts (1 nc/1 no). The module must provide information on each reactor's operational history, operating time and UV dose. The module must be able to take a memory card to save all data remotely. The module will allow the user to select a display language (English or French).

6.2.4 Execution

A) Installation

In accordance with approved drawings and manufacturer instructions.

B) Start-up and training

The manufacturer or a certified person must perform the final start-up of the UV disinfection system after it is installed on site. Following start-up, training must be provided to the people responsible for operating the system. On-site service must include at least two days on site, including at least two hours of training for operating personnel.

An operating and maintenance manual must be provided to the operator and the PSPC representative. Two hard copies and one electronic copy (email or USB) must be provided prior to start-up.

C) Leak testing

The testing will comprise a pressure test at 550 kPa for one hour, similar to the test prescribed for piping and valves, as well as all tests used to verify correct operation, to be conducted by a UV reactor supplier technician, who must provide a statement of compliance for the setup and operation.

6.3 Hydropneumatic tank

6.3.1 Scope of work

Provide and install a pulsation dampener with a pressure switch, which will trigger the starting and stopping of the well pumps for respective pressures of 200 and 410 kPa. The system will be complete and operational, with control equipment and accessories, including an isolation valve installed on the tank's service line and a pressure switch for well pump operation.

6.3.2 Acceptable products

The hydropneumatic tank must have a minimum capacity of 300 litres, be preset to 175 kPa, and be able to withstand 1,400 kPa of pressure. It will be adapted for use with potable water (NSF/ANSI 61) and be bolted to the floor.

6.4 Storage tank for softener regeneration water

6.4.1 Scope of work

Provide and install a tank with a minimum capacity of 1,360 litres to receive softener regeneration water and allow for its regulated release to the drain by the pumps.

6.4.2 Acceptable products

Closed tank made of white PEHD, 1,360 litres, compliant with the following minimum requirements:

- Volume of at least 1,360 litres
- Through-wall adaptors:
 - o 25 mm NPT with EPDM joint on the lower part of the tank for pump suction
 - o 50 mm NPT with EPDM joint on the upper part for supply from softeners
 - o 50 mm NPT on the side of the tank, on the upper part, for overflow directed toward the drain
 - o 25 mm NPT on the lower part for emptying directed toward the drain
- Access cover on the upper part with a diameter of at least 400 mm
- Material: PEHD

The contractor must provide and install PVC pipes and isolation ball valves with a diameter corresponding to the through-wall adaptors.

6.5 Duplex pumping system for draining regeneration water

6.5.1 Scope of work

Provide and install two peristaltic pumps to drain the softener regeneration water tank at a flow rate of 76 L/hr. Each pump is designed to provide the required discharge rate, in order to ensure redundancy.

Provide and install the following conduits:

- 25-mm PVC conduit for pump supply from the tank
- Transparent 13-mm PEHD conduit for tank return
- Transparent 13-mm PEHD conduit for drain backflow

Provide and install a detection or level measurement system in the tank to control the start-up and stoppage of the drain pumps.

6.5.2 Acceptable products

A) Design

The two pumps must be identical. The operating point of the peristaltic pumps is 76 L/hr at 400 kPa, with a rotation speed of 55 rpm. The peristaltic pumps must meet the following minimum requirements:

- Maximum flow rate of 122 L/hr at 100% motor speed at 60Hz;
- Maximum backflow pressure of 6 bar (70 psi);
- The pump will turn at a maximum speed of 55 rpm to reach a flow rate of 78 L/hr and 88 rpm to reach a maximum flow rate of 122 L/hr;
- ANSI 150# 12-mm universal flange, 316 stainless steel, single piece with 316 stainless steel insert. The hose is used as a seal between the cast casing and the pump connections;
- Natural rubber hose, construction reinforced with cord at each layer of material;
- The reduction gear is attached to the pump shaft to allow for slight movement, ensuring a longer life for the reducer;
- Pump maintenance must be performed quickly on site;
- The pump can run dry without the risk of premature wear on the hose;
- The rotation direction of the pump can be reversed;
- The carbon steel side cover has a plexiglass window for inspection of the rotation of the cast rotor;
- Spacing between the rotor and the reduction gear eliminates any risk of cross-contamination between the product and the oil;
- The speed reducer is equipped with a heavy-duty bearing;
- Includes a 1/2 HP motor, 56c TEFC casing;
- One reduction gear to adjust the rotor rotation to 58 rpm for a frequency of 60 Hz;
- Consistent torque ratio of 10:1;
- Power: 230v/3/60Hz;
- NEMA 4x variable speed drive, input 230 v, output 115 volts/1 ph 60Hz, with potentiometer for manual adjustment, installed and prewired on the pump;
- The pump is provided assembled and pre-filled with lubricant;
- Two-year warranty on manufacturer defects in the pump, excluding lubricant and hose;
- One-year warranty on the motor and speed reducer;

B) Alarms

The system must be able to transmit the following alarms:

- Error relays indicating an error and/or providing a warning to the controller/control panel; (option, not included) or status relays;
- Three indicator lights showing operating conditions:
 - o Green light: pump functioning;
 - o Yellow light: minor error warning;
 - o Red light: major operating error alarm, pump stopped.

7.0 Specific technical clauses – electricity

7.1 Work description

Provide all labour, materials, equipment, tools and services required to complete the electrical work set out in the plans and specified in this section or other sections of the specifications.

7.2 Scope of work

- Dismantle and dispose of the electrical elements associated with the mechanical process elements dismantled as part of the work;
- Provide and install all equipment, wiring, conduits, accessories, and supports required to connect the new mechanical process equipment;
- All related work required for the completion of the work.

7.3 Codes, standards, permits, taxes

The work must be performed in accordance with the requirements of applicable standards and other authorities having jurisdiction. The following list is not exhaustive and refers to the following standards:

- Quebec Construction Code (National Building Code);
- Quebec Construction Code, Chapter V, Electricity (Canadian Electrical Code, Part I with Québec Amendments: CSA C22.10-18 (current edition); and
- National Fire Code.

The contractor must obtain, at the contractor's own expense, all required permits from the municipal authorities to undertake the work.

The electrical contractor must include in its bid all taxes involved in the work.

7.4 Inspection and testing

Before powering on any part of the electrical system, the contractor must carry out the usual electrical tests (voltage and amperage measurements) on all feeders and branch circuits, and verify that the results comply with the electrical code and are to the consultant's satisfaction.

7.5 Grounding and bonding

Ground the networks using the rods in the ground in accordance with the Quebec Construction Code, Chapter V – Electricity, Section 10.

Maximum earth resistance must be 10 ohms.

Grounding conductors must be sized in accordance with the electrical code.
Bond all equipment using appropriate connectors.

Green wire sized in accordance with the electrical code is required in all conduits.

Bond all sections of cable trays as required by the electrical code, section 12-2208.

Bond all wall mounts and stand-alone structures using a #6 insulated green conductor.

7.6 Conduits and junction boxes

Conduits used will be rigid steel, thin-wall conduits (EMT), rigid PVC, flexible conduits and flexible liquid-tight conduits.

Conduits for direct burial will be rigid PVC only.

Provide liquid-tight fittings, conduits and junction boxes for wet areas.

All straps, fittings and connectors for EMT conduits will be stainless steel, unless otherwise indicated by the PSPC representative and the consultant.

All interior junction boxes will be cast metal, rigid PVC, aluminum or steel.

All conduits must be installed parallel to construction lines unless otherwise indicated.

7.7 Conductors and cables

Unless otherwise specified in the plans, all new conductors must be RW90 type stranded copper. In equipment rooms, the minimum size must be #12 AWG stranded.

Where aluminum conductors (NUAL) are specified in the plans, provide connecting lugs of the required size for conductor insertion and appropriate coating.

Connecting lugs are the responsibility of the contractor. Where parallel wiring is installed, the contractor must supply and install all necessary lugs for the connections.

Where PVC, EMT and/or flexible metal conduit is installed, the contractor must supply and install a minimum #12 AWG green conductor for ground continuity.

Connectors used to connect conductors must be suitable for copper or aluminum conductors.

7.8 Motors and motor controls

Low-voltage control conductors are the responsibility of the mechanical contractor. Wiring with a voltage of 120 V or more is the responsibility of the electrical contractor. They will coordinate for the provision and installation of conduits, fittings, cables, supports, etc. for a complete installation.

Confirm the load, voltage and phase of all equipment with the mechanical contractor before ordering and installing materials.

Control equipment, time switches, gas detection systems and other equipment provided by the mechanical contractor will be installed and connected by the electrical contractor. Confirm interlocks and wiring for motorized shutters, flow switches, etc.

8.0 Guidelines

The federal government must comply with acts, regulations, codes and decisions of authorities having jurisdiction. The contractor must perform the work in accordance with the applicable federal, provincial or municipal acts, regulations, codes, guides and standards, including but not limited to:

- Canadian Environmental Protection Act
- Canadian Drinking Water Guidelines (Health Canada)
- Environment Quality Act
- Regulation Respecting the Quality of Drinking Water
- Canada Occupational Health and Safety Regulations, Parts X and XIV
- An Act Respecting Occupational Health and Safety, R.S.Q., c. S-2.1
- Regulation Respecting Occupational Health and Safety, c. S-2.1, r. 19.01
- Safety Code for the Construction Industry (S-2.1, r. 6)
- CAN/CSA B483.1 – Drinking Water Treatment Systems
- NSF/ANSI 55 – Ultraviolet Microbiological Water Treatment Systems
- NSF/ANSI 61 – Drinking Water system components – Health Effects
- National Plumbing Code – Canada 2010
- Régie du bâtiment du Québec – article 2.2.10.17, Construction Code¹

For the employees who install or connect water treatment devices, the contractor must produce evidence of a subcategory 15.5 – Plumbing Contractor licence (Régie du bâtiment du Québec). A resource holding a subcategory 15.5 – Plumbing Contractor licence must be available until the contract has been completed.

As required by standard CAN/CSA-B483.1-07, “Drinking water treatment systems and components shall comply with the requirements specified in this Standard and the structural integrity and materials extraction requirements specified in NSF/ANSI 42, NSF/ANSI 44, NSF/ANSI 53, NSF/ANSI 55, NSF/ANSI 58, NSF/ANSI 61, or NSF/ANSI 62, as applicable.”

Use of PEX (cross-linked polyethylene) pipe is allowed and if used, the contractor must demonstrate that for the material used, the flame-spread rating does not exceed 25 and the smoke developed rating does not exceed 50 (cf: Quebec Construction Code).

¹ For more details, visit [2.2.10.17 – Dispositifs de traitement de l’eau potable](#)

9.0 Health and safety

Public Services and Procurement Canada (PSPC) recognizes that it is required to safeguard the health and safety of all persons working on government construction projects. It also recognizes that federal government employees and private sector employees are entitled to receive the full protection afforded by occupational health and safety regulations.

To meet this requirement and improve protection of the health and safety of all persons on federal construction sites, PSPC agrees to comply with the occupational health and safety regulations of the provinces and territories, as well as with the Canada Occupational Safety and Health Regulations and Part II of the Canada Labour Code.

In accepting this mandate, the contractor operating in the workplace must do the following:

- Mark off and control access to the work area;
- Ensure that workers have received necessary training and information to carry out the work safely and that all required protective devices and equipment are available and used in accordance with standards, acts and regulations;
- Comply at all times with the provisions of the Act Respecting Occupational Health and Safety and the Safety Code for the construction industry;
- Inform workers that they have the right to refuse any work that poses a hazard to their safety and health;
- Depending on the workplace environment, workers must wear required personal protective equipment (PPE) in accordance with standards and acts and regulations in effect. The purchase and maintenance of PPE are the contractor's responsibility;
- Workers must have a means of communication in their possession in order to respond in an emergency;
- Implement safety measures, where necessary, to protect users and workers on the site, such as signage, tape or fences, to identify and isolate risks to users' health during the work.

Furthermore, in light of the COVID-19 situation, the contractor must provide a prevention plan for health and safety measures for site visits to control the risk of COVID-19 transmission. The plan must be reviewed and approved by PSPC prior to any contractor travel.

In the event of an unexpected incident, the contractor must take all necessary measures, including work stoppage, to protect the health and safety of workers, occupants, and the public, and must contact the technical official.

10.0 Documents provided

- Appendix 1: MP-01 Plan (location and illustration diagram of conduit positions)
- Appendix 2: MP-02 Plan (operation diagram)
- Appendix 3: Results for physicochemical quality of St-Armand wells

11.0 Information ownership

Any information received and documents produced in connection with this mandate remain the sole property of PSPC and CBSA. The contractor may not disclose, reproduce or make reference to any documents consulted or produced in connection with this mandate without the explicit prior written consent of PSPC or CBSA. This measure applies to all document formats, including electronic versions. PSPC and CBSA reserve the right to use the documents produced by the contractor.

APPENDIX A

RAW WATER ANALYTICAL RESULTS, JULY 23RD 2020

Parameters	Units	Guidelines	“Commercial” well	“Des frères” well
Physico-chemistry				
Hardness	mg CaCO ₃ /L	80-100 (OG)	372	320
Turbidity	NTU	1 (OG)	0.1	0.1
Total dissolved solids	mg/l	500 (AO)	831	477
pH		7.0 – 10.5 (OG)	7.97	7.98
Tannins and lignins	mg/l	0.1 (OG)	<0.2	<0.2
Alkalinity	mg CaCO ₃ /L		334	300
Chloride	mg/l	250 (AO)	248	59
Conductivity	µS/cm		1630	850
Colour	TCU	15 (AO)	<3	<3
Fluoride	mg/l	1.5 (MAC)	<0.1	<0.1
Ammoniacal nitrogen	mg N/L		0.05	<0.05
Nitrite	mg N/L	1 (MAC)	<0.02	<0.02
Nitrate	mg N/L	10 (MAC)	0.15	0.36
Total Kjeldahl nitrogen	mg N/L		<0.8	<0.8
Sulfide	mg/l	0.05 (AO)	<0.2	<0.2
Sulfate	mg/l	500 (AO)	45	19
Absorbance			0.030	0.033
Transmittance	%		93	93
Total organic carbon	mg/L		1.6	1.4
Bacteriology				
E. coli count	CFU/100 ml	DN (MAC)	0	0
Total coliforms count	CFU/100 ml	DN (MAC)	0	1
Atypical bacteria count	CFU/100 ml	200 (OG)	0	0
Total metals				
Iron	mg/l	0.3 (AO)	<0.1	<0.1
Lead	mg/l	0.005 (MAC)	0.010	0.010
Manganese	mg/l	0.02 (AO) / 0.12	0.010	<0.003
Selenium	mg/l	0.05 (MAC)	<0.001	0.001
Sodium	mg/l	200 (AO)	151	24.7

OG : operational guideline

AO : aesthetic objective

MAC : maximum acceptable concentration