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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

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Title - Sujet IML - Syst pompage d'eau de mer	
Solicitation No. - N° de l'invitation EE519-170902/A	**Amendment No. - N° modif.** 001
Client Reference No. - N° de référence du client EE519-170902	**Date** 2016-09-29
GETS Reference No. - N° de référence de SEAG PW-$QCW-028-16866	
File No. - N° de dossier QCW-6-39161 (028)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2016-10-13**	**Time Zone** **Fuseau horaire** Heure Avancée de l'Est HAE
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Simoneau, Steve	**Buyer Id - Id de l'acheteur** qcw028
Telephone No. - N° de téléphone (418) 649-2816 ( )	**FAX No. - N° de FAX** (418) 648-2209
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:** Institut Maurice Lamontagne, Mont-Joli, Québec	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**

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Signature **Date**

Canada

AMENDMENT 001

Title : Maurice-Lamontagne Institute – Modification to the Raw and Filtered Sea Water Pumping Systems

Included in the present amendment:

1. Solicitation closing date extension
2. Questions and answers 1 to 17
3. Addendum no 1

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1. SOLICITATION CLOSING DATE EXTENSION

Solicitation closing date is postponed from October 6, 2016 to **October 13 2016.**

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2. QUESTIONS AND ANSWERS 1 TO 14

Question 1: I would like to know which type of epoxy should be used on the raw water building's floor. It is suggested to refer to the specifications, but there is nothing in the specifications to that effect (Plan S02/03)?

Answer 1: STONCHEM 501, as distributed by Stonhard or approved equivalent. See included Addendum 1.

Question 2: According to the plans provided, we are to replace the Victaulic #995 couplings on the 250 mm HDPE pipes with electro-fusion fittings (rings). It has been my experience that this cannot be carried out directly because a ring cannot be electro-fused directly on the threads left by the Victaulic hugger. The part must be replaced so that the end is smooth. Could you clarify this operation in the addendum as it complicate the work considerably?

Answer 2: The operators at the IML have already replaced several Victaulic couplings with electro-fused rings without issues. However, the fusions will be pressure tested (without issues) prior to the commissioning of the facilities. Proceed as indicated on the plans.

Question 3: Will the General Contractor AND the sub-contractors require a valid Designated Organization Screening (DOS) clearance to be awarded the contract?

Answer 3: The sub-contractors' employees working on this project will require the clearance, not the organisation. The General Contractor will take the necessary steps to ensure that these individuals obtain clearance.

Question 4: Will we be permitted to use the power supplies on site?

Answer 4: Yes.

Question 5: Will the launching ramp be available for diving? Will the berth also be available?

Answer 5: Yes, as long as coordination with the IML takes place prior to using the facilities.

Question 6: Gorman Rupp raw water pumps:

a. May we submit other equipment equivalent to the Gorman Rupp pumps?
b. Based on Gorman Rupp preliminary shop drawings, these pumps do not quite meet the specifications. Will the manufacturer modify and adapt these pumps specifically for this project?
c. May we submit EBARA pumps as equivalent? Please provide the exact specifications and adaptations required.

Answer 6:

a. Equivalents will not be accepted.
b. Yes, the pumps must be specifically adapted to this project.
c. No.

Question 7: Filtered water pumps:

a. Can we supply a vertical SOLID SHAFT motor as they are asking for a mechanical seal?
b. Do they really need a NON-REVERSE RATCHET on the motor?
c. The specifications state a 88.5% efficiency. NOBODY will be able to supply this. Our offering of 83.5% is the best anyone can do.
d. Surprised they did not ask for a PERFORMANCE TEST! Can we offer this as an adder? This will confirm actual efficiency.

Answer 7:

a. Yes.
b. Yes. This is a requirement.
c. The level of efficiency required in the specifications is not realistic. Therefore, the minimum efficiency will be 75% for stainless steel pumps. See included in Addendum 1.
d. Performance tests will be added to the specifications for all of the pumps required in this project. See included Addendum 1.

Question 8: Could you confirm that all of the supports to be replaced in the filtered water well will be audited expenditures?

Answer 8: Yes, the supports identified "To be verified on site" will be audited expenditures.

Question 9: Could you confirm the elevations of the floors, the finished floors and the pipe inverts for the raw water pumping facility?

Answer 9: The pipe sizes and locations indicated on the plans are approximate. The General Contractor will verify the sizes and elevations on site. The suction pipe's invert is indicated on plan C02. Finally, the plans are to scale with regard to the size of the pumping chamber and the pipe lengths.

Question 10: Section 15 01 00, article 3.5 "Special Joints"

a. Which pumps are PMMN-121 and 122?
b. What are the specifications for these joints?
c. Where are they located on plans RMC16014C (M02/02) or RMC16013C (M02/04)?

Answer 10:

a. Pumps PMMN-121 and 122 do not exist. This is a mistake. See included Addendum 1.
b. Not applicable.
c. Not applicable.

Question 11: Will all of the questions and answers be reviewed during the site visit?

Answer 11: No, because the main questions and items are included in this Amendment and the Addendum 1.

Question 12: Continuation of service: Filtered water facility

a. Could you confirm that the station must remain in operation during construction?
b. Could you confirm the number of pumps required in order to maintain services? Is it possible to isolate a single cell?
c. Details on the exterior of the station or where to install a balloon to isolate the station are not available. Could you provide this information?
d. Given the issues regarding electro-fusion couplings, could you confirm the replacement of some HDPE pipes and how to maintain service if they are incorporated in concrete?

Answer 12:

a. Only one out of two wells at the station must remain in service during construction. Work will be carried out in one wet well, while the other well will remain in service.
b. Only one pump is required in order to maintain service.
c. The balloon will be installed outside the station, at the back of the Victaulic coupling located near the wall. Divers will be required in order to install and remove the balloon. Once the electro-fusion coupling and the butterfly valve near the wall are installed, the well may be isolated without a balloon.
d. Refer to answer #2.

Question 13: The installation of a screen is required in the future water intake. Is this screen required to be incorporated in concrete or is it required to be removable? Can it be installed after the removal of the concrete formworks?

Answer 13: The grid must be removed for cleaning purposes. The plans describe a system to lock and unlock the screen.

Question 14: Regarding the water intake, will it be possible to leave the interior concrete formworks in place after concrete placement? Given that the free access to the interior concrete forms is very small, it will be difficult to remove the forms after the concreting of the water intake.

Answer 14: Yes, the interior concrete forms may remain in place.

Question 15: On Plan RM16013C-M03, it is mentioned to change all existing ball valves with PVDF ball valves. What are the ''to be replaced'' ball valves dimensions?

Answer 15 : All 50mm diameter valves are to be replaced. See Addendum 1.

Question 16 : Will you provide a Specification section in regards to the painting of the floor. On Plan RM16014C S02/03, there is a reference but it does not exist?

Answer 16 : The painting will be specified in the « structure » section in the Addendum 1.

Question 17: On the plan RM16014C S03/03, it is requested a PRF W152x152x10 beam. Can you provide more precision? Would a steal beam be acceptable?

Answer 17: This is a reinforced plastic beam fiber and no steel equivalent will be accepted.

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3. ADDENDUM #1

SEE FOLLOWING PAGES

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

Part 1 General

1.1 SCOPE OF WORK

.1 Supply the materials, labour, and all that is required to demonstrate that the equipment installed comply with contract requirements.

.2 The work of this section of the specifications are integral to the contract. This section does not relieve the Contractor of his responsibility to perform all the other tests specifically described in the other sections of the specifications.

.3 The Contractor shall prepare a list of the equipment to be furnished and installed in this contract in order to identify only the corresponding tests.

.4 The Contractor shall pay all costs related to the tests, including costs of new tests, tests required following rework, and tests involved with test delays. Ensure that the specialised personnel attends throughout the test period. Hire and for the services of specialty contractors for more complex testing operations.

.5 The work of this section includes without limitation:

.1 Supply test protocols (procedures) and schedule;

.2 Perform all the tests and verifications required in the contract without limitation, and the tests indicated in the list of tests appended to this section;

.3 Draft a complete report for each series of tests including the relevant forms appended to this section.

1.2 PROVISIONAL ACCEPTANCE TESTS AND COMMISSIONING

.1 The Contractor shall, with supplier and Departmental Representative in attendance, proceed to the commissioning of all the equipment installed, carry out the performance tests, examinations and verifications whether specified in the different sections of the specifications or required by applicable rides and regulations, and provide all required service manuals.

.2 The work of this section may be described as follows, without limitation:

.1 Dry run (verifications) of all of all the structural work and treatment equipment;

.2 Commissioning and operational testing of all the mechanical and electrical equipment and controls;

.3 Commissioning and clear water operational resting of the mechanical process equipment with appurtenances such as blowers, pumps, controls, etc.;

.4 Calibration of all the measuring instruments;

.5 Performance tests and reports;

.6 Operational and performance tests of the mechanical process equipment and controls, conducted with wastewater;

.7 Steady state tests;

.8 Presentation of the equipment service manuals (cf. article 1.4, this section);

.9 Assistance during commissioning and testing of the equipment and during the training of the personnel.

.3 Prior to commissioning any equipment, prepare a procedure specific to the commissioning of the equipment concerned, and have the procedure approved by the Commission de la santé et sécurité au travail du Québec (CSST). The procedure shall cover all the aspects pertaining to employee safety during commissioning. Notify CSST in writing within a reasonable time of the expected date of each commissioning.

.4 The Contractor shall prepare and submit to Departmental Representative a planning program for the commissioning work as well as a test protocol which must include the following information:

.1 Protection measures with respect to CSST clauses;

.2 Date tests are to be conducted;

.3 Test duration;

.4 Description of testing method;

.5 Name of specialised firm or subcontractor (where testing method requires specialised personnel), etc.

.5 Operational tests

.1 The Contractor shall supply and install only the equipment, materials and materiel that are compatible with their intended use, their installation and the operating conditions in which they are expected to perform.

.2 The Contractor shall proceed to the commissioning of the installations and participate with the Departmental Representative to the verification of the compliance points with the drawings and the specifications.

.3 The Contractor shall proceed to operational tests, including dry runs, on all the equipment and materiel as instructed by the Departmental Representative in order to assess whether the specific operating environment and conditions are complied with. The Contractor shall provide at own cost all the qualified personnel, the equipment and all that is required to perform the tests.

.4 The Contractor shall provide Departmental Representative with minimum two (2) weeks notification before proceeding to final tests with Departmental Representative in attendance to demonstrate the good functioning of the equipment. Tests with Departmental Representative shall be performed only alter the Contractor has conducted his own tests and made the adjustments as he saw fit. Should the tests fail, the Contractor shall implement corrective measures and redo the tests to Departmental Representative's satisfaction.

.6 Performance tests

.1 The Contractor shall proceed to performance tests in order to assess whether performance criteria are met. Performance tests are carried out when previous operational testing and related adjustments have been effected. Operational testing and performance tests may be carried out simultaneously.

.2 The Contractor shall demonstrate to the Departmental Representative that the operations of the equipment complies with manufacturers' performance curves and/or the performance approved at the shop drawings control stage. Submit the recordedcurves and/or the performance results obtained during field tests and provide all the information and data pertaining to the assessment of the systems.

.3 The full testing runs and test reports shall be paid by the Contractor. Test protocols shall be submitted to the Departmental Representative for approval. Tests to be performed are described in several sections of the specifications.

.4 For each performance test a complete report shall be provided with the results obtained. The report, in three (3) copies, summarizes:

.1 The test protocol used;

.2 The relevant conditions during testing;

.3 The instrumentation diagrams;

.4 An interpretation and discussion of the results and findings;

.5 The conclusion and recommendations.

.7 Commissioning

.1 The Contractor shall commission each individual system (and equipment). The Contractor shall in addition take all the usual precautions such as lubricating, greasing, and other verifications likely to discover any obstruction, etc. The Contractor shall ensure that the manufacturers' instructions are complied with.

.2 The equipment and premises shall be cleaned beforehand. The Contractor shall provide a document certifying that all the equipment was started, that all verifications were performed and that the equipment provided is free of any design and fabrication defects.

.8 Instructing the operating personnel

.1 During testing and commissioning, the Contractor shall deliver training to the operating personnel and explain how to operate and maintain the equipment. The explanations shall appear in the service manuals. Make sure that the manufacturers' representatives attend the events and deliver the training. The maintenance manuals shall be handed out before the training sessions.

.2 The required explanations shall be delivered by qualified persons and suppliers' representatives shall attend tests and commissioning events. In addition to testing and commissioning periods, representatives for each equipment item shall provide at least four (4) hours to review the operating and maintenance manuals with the operating personnel.

.3 Qualified representatives assigned by the suppliers of equipment shall be available on request to perform troubleshooting during commissioning and subsequent operational phase throughout the guarantee period.

.9 Steady state tests

.1 The Contractor shall commission and operate the overall system on a steady basis (non-stop, 24 hours a day) during a fifteen-day (15) period. Where the conditions encountered during the steady state testing are not representative of actual operating conditions, the Contractor shall to the best of his knowledge take the required measures to simulate next-to-normally expected operating conditions. During steady state testing, the Contractor provides the operation and maintenance of the equipment with respect to all the conditions described in the operating manual and in other manuals mentioned in article 1.4 of this section entitled "MANUALS (ASSEMBLY — OPERATING — MANOEUVRING -- MAINTENANCE) AND AS-BUILT DRAWINGS".

.2 Where during the fifteen (15) steady state testing days any component in the process fails, steady state testing of that component is postponed until the equipment is repaired and launched again.

1.3 TESTING PARTICULARS (TEST TYPES, METHODS, STANDARDS)

.1 The articles below provide details on the nature of the tests to be performed. They may differ from one installation to another and may at times involve more complex work likely to require the services of specialised firms or laboratories. The method to be used actually depends on the type of installation and the conditions of this contract. **Where in doubt concerning the testing methods to be used, the requirements pertaining to testing, and the reports to prepare, it is the Contractor's responsibility to seek advice from the Departmental Representative before establishing his price.**

1.4 MANUALS (ASSEMBLY — OPERATING — MANOEUVRING -- MAINTENANCE) AND AS-BUILT DRAWINGS

.1 When the Contractor delivers Work part of this contract to the Departmental Representative in view of obtaining provisional acceptance, the Contractor shall submit all the assembly manuals, operating manuals, manoeuvring manuals and maintenance manuals including as-built drawings, whether explicitly required in the contract or deemed relevant for the operation and maintenance of the work.

.2 All documents shall be handed to the Departmental Representative in three (3) bilingual copies (French and English) as preliminary drafts. After Departmental Representative's examination and acceptance of the preliminary draft, the Contractor shall produce the final version in five (5) bilingual copies (French and English).

.3 The manuals are 8'/2" x 11" loose-leaf binders with rigid vinyl cover. The manuals specifically cover all the equipment sold by suppliers to the Contractor and installed by the latter.

.4 Each manual will be written in French and English. When equipment will be delivered to the site, the General Contractor will make sure to obtain the manuals (assembly, operating, manoeuvring, and maintenance) from the supplier, even where such manuals are in English and any unilingual document in English shall be translated/re-written in French before it is submitted to the Departmental Representative.

.5 Manuals are to be divided in sections as indicated below and each section clearly identified with celluloid tabs (numbered or otherwise identified) attached to rigid paper separator. A complete manual shall be prepared by the Contractor for each piece of equipment or each cluster of identical pieces of equipment.

.6 It is recommended that the Contractor provide one manual for each discipline or that he consolidates the material (for example, a single manual for a service building which would include building structure, building mechanics (electrical ventilation, and plumbing) as well as architecture.

.7 As-built drawings of the Work performed are placed in jackets and appended to the assembly, operating, manoeuvring and maintenance manuals.

.8 Content of each manual shall cover the following:

.1 Identification:

.1 Enter the client' s name, the project designation (name), the discipline involved in the manual, and the date on both the cover and edge of the binder;

.2 A title page identifying:

.1 The project (designation);

.2 The Owner (with full address);

.3 The Contractor (with full address);

.4 The name of the supplier or subcontractor (with full address).

.3 A second page showing:

.1 Equipment identification: designation and brand;

.2 Location of the equipment: pumping station, treatment plant, etc.;

.3 Supplier's order number;

.4 Model number and serial number;

.5 General (significant) dimensions;

.6 Manufacturing date and delivery date.

.4 On a third page:

.1 A Table of Contents listing the sections in the manual, that is:

.1 Section 1 — Introduction:

.1 General (supplier's descriptive brochure on the equipment);

.2 Description of equipment warranty (date, object, term, etc.);

.3 Procedure in case of damage during shipment, missing parts, defects, errors;

.4 Storage of the equipment (whether assembled or not).

.2 Section 2 — Installation (equipment assembly and installation):

.1 Installation drawings with detailed dimensions (where possible, insert As-Built drawings);

.2 General installation recommendations;

.3 Particular instructions related to project at hand;

.4 Anchoring drawings where applicable;

.5 Electrical connections where applicable (w/drawings);

.6 Mechanical and plumbing hook-ups and connections where applicable (w/drawings).

.3 Section 3 — Commissioning and operation:

.1 Relationship of equipment concemed and other equipment;

.2 General and specific safety instructions;

.3 Drawings of the control system; components of the control panel and description of the front of the panel;

.4 Start and stop;

.5 Normal operation: manual, automatic;

.6 Abnormal operation: troubleshooting guide, emergency instructions.

.4 Section 4 — Controls, slaving and protections:

.1 Slaving to other equipment;

.2 Thermal (and other) protections;

.3 Adjustments and calibration;

.4 Signals, alarms and telemetry;

.5 Hour meter (operation);

.6 Operation time-switch;

.7 Heating and ventilation.

.5 Section 5 — Preventative and corrective maintenance:

.1 Cleaning, lubrication and adjustments: frequency, method, products;

.2 Check-list;

.3 Problem-solving guide;

.4 Procedure in case of major breakdown or repair.

.6 Section 6 — Parts and supplies inventory:

.1 Complete list of parts w/exploded view of the equipment, and numbered parts for positive identification;

.2 List of common wear parts and maintenance products with name, address and telephone number of the vendor(s);

.3 List of local specialists available for servicing (i.e., electrician, plumber, etc.) with name, address and telephone number;

.4 List of parts and products on hand (provided).

.7 Section 7 — Special conditions:

.1 Description provided in relevant sections of the specifications;

.5 A final page where is stated:

.1 The written guarantee of Contractor's work (labour and materials).

.2 The content of each manual shall be adjusted with respect to the work at hand as specified in the contract documents (work, structure, equipment). However, the provisions of this article of the specifications shall be complied with by the Contractor with respect to manuals' sections, their principle and format.

1.5 FLOW MEASUREMENT SYSTEMS

.1 General

.1 In every and ail cases, submit a report stating ail the data required toward assessing the system, including the chan specific to the system installed on the site.

.2 Magnetic flowmeter

.1 Verify signal accuracy by simulation of different conditions between 0 to 100% or 4 to 20 mA (4 points minimum). During three (3) days at the same time, read and record ail the flowmeters and assess whether raw water and distributed water balance.

.2 Air flowmeter

.1 Verify signal accuracy by simulation of different conditions between 0 to 100% or 4 to 20 mA (4 points minimum). During three (3) days at the same time, read and record ail the flowmeters and assess whether nominal blower outflow balances with total air intake at corresponding basins.

1.6 VOLUMETRIC AIR BOOSTERS

.1 Field tests

.1 Shop tests are designed to establish the efficiency of the boosters in tenus of flow, pressure, absorbed power, vibration and noise intensity. All the boosters supplied shall have undergone shop tests at both the manufacturer's and supplier's premises in compliance with NQ 4943-155/92-02-17.

.2 Measure noise intensity generated by the booster at one (1) metre of outside face and 1.5 m above ground level. Carry out measurements in expected operational conditions and in compliance with the le edition (1983) of the Hydraulic Institute Standards for Centrifugai, Rotary and Reciprocating Pumps (HIS).

.2 On site tests

.1 Carry out on-site testing in normal operating conditions, that is, fluid level in the basins shall have been adjusted prior to testing.

.2 Perform ail tests in compliance with NQ 4943-155/92-02-17. Replace Appendix F of NQ standard with the relevant forms mentioned in article 1. 11, this section.

.3 In each and every case, complete a provisional acceptance test card as well as the eight (8) forms enclosed or any other relevant information allowing to assess the system.

1.7 PUMPS (UNITS)

.1 On site tests

.1 Take into account ail the possible conditions when assessing the performance of vacuum pumping units and other pumps.

.2 When calibrating the pumping stations, take the following precautions:

.1 Clearly identify the pump and attending controls;

.2 Use minimum level differential of 300 mm during measurements;

.3 Where the affluent flow is not constant and the well cannot be isolated, make measurements outside peak hours or isolate the well using balloons;

.4 Where there are upstream pumping stations, ascertain that they do not enter into operation during the measurement period;

.5 Where the intake pipe is submerged, use another measurement method (dilution, weir, etc.);

.6 In order to validate results, carry out each measurement at least three (3) times.

.2 Provide actual pumping curves along with the report and enter the calibration results with the operational (performance) curves. Provide ail the relevant data concerning the system's assessment such as pressure during measurement, amperage, etc. Perform each measurement at least three (3) times in order to validate the results.

.3 Complete the following record documents in each and every case:

.1 Provisional acceptance test card;

.2 Record describing dimensions and calculations performed as well as adjustment values;

.3 Pump testing form (results);

.4 Verification record of the control panel.

1.8 EQUIPMENT WITH 4-20 MA

.1 Verify signal accuracy by simulating different conditions between 0 %to 100 % and/or between 4 to 20 mA (minimum 4 points per equipment).

1.9 RELATED AND MISCELLANEOUS EQUIPMENT

.1 Chemical products (dosing system)

.1 Verification of chemical products dosage pipes for leaks (watertightness);

.2 Verification of chemical products delivery at dosage points;

.3 Verification of chemical dosage pumps maximum flow;

.4 Verification of mixers installation and operation;

.5 Verification of dosage proportioning with flow;

.6 Verification of suction systems and chemical preparation

.2 Mechanical conduits and equipment

.1 Verify piping installation and water tightness;

.2 Verify anchor bases of piping and equipment;

.3 Verify quality of welds (visual);

.4 Verify the fastening of equipment to the structure;

.5 Verify that mobile parts turn freely;

.6 Verify valve positions.

.3 Piping, valves and check-valves

.1 Verify the opening and closing of each valve and check-valve;

.2 Verify water tightness;

.3 Verify hand wheel lock;

.4 Verify that operational keys were actually provided;

.5 Verification of compliance with drawings, specifications and shop drawings.

.4 Miscellaneous (fluid level)

.1 Verify signal transmission for different values between 0 to 100 (or 4 to 20 mA) (minimum 4 values);

.2 Simulate the different alarm set points;

.3 Simulate the different control set points;

.4 Verify the installation of floats, probes (sensors);

.5 Verify the elevation of floats, probes;

.6 Verification of compliance with drawings, specifications and shop drawings.

.5 Gauges (stop valves and drain valves)

.1 Verify pumps, operating and at standstill;

.2 Verification of compliance with drawings, specifications and shop drawings.

.6 Electrical

.1 Conduct a verification of distribution, phase load balance, voltage, loads and ground, branch circuits, lighting systems, motors, heating units and attending controls;

.2 Measure the dielectric value of circuits, power cables and equipment;

.3 Verify earth resistance value before energizing the equipment.

.7 Heating and ventilation system

.1 Verify the general operation of the different systems;

.2 Verification of equipment compliance with drawings, specifications and shop drawings;

.3 Proceed to ventilation balance test and submit a report.

1.10 CONTROL PANELS

.1 Verification of compliance control panel elements with drawings, specifications and chop drawings;

.2 Perform all the operation tests by simulation of all operational and alarin conditions (low level, etc.);

.3 Verify operations in power outage and restart conditions;

.4 Enclosures and lamicoid identification plates;

.5 Main switch (disconnect) and breaker;

.6 Auxiliary contacts;

.7 Adjustment of protections (provide record of adjustments performed);

.8 Verification of indicator lights.

1.11 LIST OF TESTS AND TEST FORMS

.1 The following list is not complete and does not discharge the Contractor of his responsibility under this contract. In addition, the list shall not be considered as an authorisation to perform work likely to entail extra costs. The list (table) includes tests to be performed on several pieces of equipment, some of which may fali outside the realm

of this contract. The Contractor shall verify the list and retain only the tests to be conducted under this contract before establishing his tender.

LIST OF TESTS

SALINITY CONTROL SYSTEM FOR THE WATER IN THE BASINS

AIRLIFT CIRCULATION SYSTEM FOR THE WATER IN THE TANKS

- Tests: Provide a report for each series of tests and make sure that the operating personnel attends.
- Carry out any other test described in the specifications.

NOTE: THIS LIST IS NOT NECESSARILY COMPLETE AND DOES NOT DISCHARGE THE CONTRACTOR OF HIS RESPONSIBILITIES UNDER THIS CONTRACT. MOREOVER, THE LIST SHALL NOT BE CONSIDERED AS AN AUTHORISATION TO PERFORM WORK LIKELY TO ENTAIL EXTRA COSTS.

	Description	Reference to Article and Section	Date Expected	Date Performed
1.0	**VERIFICATION OF THE PUMPING SYSTEMS** Verify the state and quality of each structure — Verify that construction debris have been removed Verify compliance with drawings, specifications and shop drawings of - pumps and accessories: . verify the fastening of equipment to the structure; . verify that moving parts rotate freely; . verify the position of valves; . ascertain motors direction of rotation; . verify pumps connection devices; . verify the operation of protection devices (floats, overload, humidity, vibrations, etc.); . perform a lifting test of each pump with hoisting systems installed; . verify the compliance of the control panel; . verify the compliance of equipment with shop drawings, plans and specifications. - Pumps and accessories (shop tests): . verify pumping efficiency in terms of outflow, pressure and absorbed energy; . verify dynamic balance, vibration rate. - Pumps and accessories (on site testing): . verify working order and operation of detection and protection systems; . verify for any unwanted vibrations; . ascertain motor water tightness; . perform flow tests on each pump and pump combination at normal operation and at overflow levels and submit a report complete w/performance curves; - Pumps control panel: . verification of the indicator lights, ammeters, voltmeters, totalizers, push-buttons, etc.; . verification of relay adjustments and/or others; . verification of different operating sequences, interconnection and timing systems; . verify electric voltage with a portable voltmeter and adjust the control panel voltmeter; . verify load amperage using a clip-on ammeter and adjust the ammeters; . verification of the identification plates; . verification of protection adjustments (adjust where needed).			
2.0	FLOW METERING SYSTEMS - Magnetic flowmeter: . verify upstream and downstream conditions with manufacturer in attendance; . verify grounding; . calibrate flowmeter for different flow conditions; . following calibration of the equipment, verify results obtained as follows: time X pump capacity over three (3) consecutive days making one survey/day; . verification of compliance with drawings, specifications and shop drawings. - Air flowmeter: . verify upstream and downstream conditions with manufacturer in attendance; . verify grounding; . calibrate flowmeter for different flow conditions; . following calibration of the equipment, verify results obtained as follows: time X pump capacity over three (3) consecutive days making one survey/day;			

	Description	Reference to Article and Section	Date Expected	Date Performed
	. verification of compliance with drawings, specifications and shop drawings. . shop calibration and written certificate; . verification using a tachometer other than the device at the station; . verify the receiving of reflective curves and labels.			
3.0	VOLUMETRIC AIR BOOSTERS - Boosters and accessories — Verify compliance with drawings, specifications and shop drawings of: . motor isolation; . fastening of equipment to the structure; . flexible connections at intake and outlet; . verification of the bearings; . presence of foreign objects in booster housing; . aspiration filter and clogging indicator; . levelling of the booster; . hand turn of the shaft; . verify oil level; . installation of protection system/device; . position of valves; . operation of the safety valve; . control machines direction of rotation; . verify dimensions of pulleys and ratios; . verify rotors turning freely; . verify greasing of bearings; . verify operation of thermometer; . verify operation of gauge; . verify operation of flaps; . verify installation of pulley safety key; . verify tension in belts; . verify fastening of pulley wheelguard; . verify reception of replacement pulleys; . verify reception of tachometer; - Boosters control panel: . enclosure and lamicoid identification plates; . main disconnect switch; . breaker; . overload relays and adjustment of the protections; . auxiliary contacts; . verification of indicator lights, ammeters, totalizers, push-buttons, etc.; . verification of control panel components with plans, specifications and shop drawings. - Boosters and accessories — shop tests: . determination of flow curves against pressure and temperature (for all 3 regimens); . determination of flow curves against capacity (for all 3 regimens); . voltage and amperage measurement; . operating temperature measurement; . rotation speed measurement — motor and booster (for all 3 regimens); . verification of vibration intensity at each bearing point (triaxial); . verification of temperature at the bearings;			

	Description	Reference to Article and Section	Date Expected	Date Performed
	. verification of overall mechanical behaviour; . presentation of certified calculations and curves. - Boosters and accessories — Field tests at 100% flow rate: . Using a pitot tube, a U-tube pressure gauge, and a certified thermometer, verify specifications; . verify rotation speed of boosters using a tachometer; . evaluate booster noise level inside and outside building; . evaluate vibration intensity at boosters and motors; . proceed to graphic analysis of vibrations; . verify electric voltage and amperage under load; . verify isolation of winding; . verify temperature of bearings with independent devices; . verify protection systems; . presentation of certified curves; . perform the first oil change with Departmental Representative and Operator representative in attendance; . comparison of actual power consumption against manufacturer's guaranteed values. - Boosters and accessories — tests alter provisional acceptance: . vibration measurement (6 months alter provisional acceptance).			
4.0	EQUIPMENT WITH 4-20 MA Verify signal accuracy by simulating different conditions between 0 % and 100 % and/or between 4 to 20 mA (minimum 4 points per equipment).			
5.0	RELATED EQUIPMENT AND MISCELLANEOUS. - Chemical products . verification of water tightness of chemical dosing tubes and tanks; . verification of chemical delivery at dosing points; . verification of maximum flow of chemical dosage pumps (new and existing); . verify installation and operation of mixers; . verify proportioning of dosage with flow rate; . verify operation of suction systems and chemical product preparation; - Mechanical conduits and equipment . verify installation and water tightness of conduits; . verify compliance of anchor bases of conduits and equipment; . verify quality of welds visually; . verify fastening of equipment onto structure; . verify that pumps and working parts turn freely; . verify valve positions; . verify motor direction of rotation; . perform a field test and fill an inspection form for each motor: measure current, voltage, resistance. - Piping, valves and check-valves . verify opening and closing of each valve and check-valve; . verify water tightness; . verify handwheel lock; . verify that operating keys have been provided; . verification of compliance with plans, specifications and shop drawings. - Miscellaneous (flow, level, pressure, contact, etc.) . verify signal transmission for different values between 0 to 100% (or between 4 to 20 mA) (minimum			

	Description	Reference to Article and Section	Date Expected	Date Performed
	of 4 values); . simulate the different alarm set points; . simulate the different control set points; . verify accuracy of the information transmitted by the recorder and adjust as needed; . verify the installation of floats, probes; . verify elevations of floats and probes against drawings; . verification of compliance with drawings, specifications and shop drawings. - Gauges (including diaphragm, stop valve and purge valve) . verify adequate functioning (pumps in action & stopped); . purge the lower portion of diaphragms; . verification of compliance with plans, specifications and shop drawings. - Electrical . verification of distribution, phase balance, voltage, load and ground, branch circuits, lighting systems, motors, heaters and attending controls; . measure dielectric value of circuits, power cables and equipment; . verify earth resistance before energizing; . verify motor winding isolation using a megger. - Ventilation and heating systems . verify general operation of the different systems; . verify compliance of equipment with plans, specifications and shop drawings. - Control panel . verify compliance of control panel components with drawings, specifications and shop drawings; . perform ail operational testing by simulating operating and alarm conditions (high level, low level, high temperature, low pressure, etc.); . verify adequate operation during power outage and when current returns; . lamicoid identification plates; .enclosure; . main disconnect switch; . breaker; . overload relay; . auxiliary contacts; . adjustment of the protections (provide record of adjustments performed); . verification of indicator lights, ammeters, totalizers, push-buttons, etc. - Control display and related equipment (modems, keyboard, cd-writer, etc.) . verify compliance of equipment with specifications; . verify screen pages (compliance and functioning); . verify recording of alarms and status signals; verify reception of values in proper fields; . validate pid loops; . verify adequate remote transmission of the alarms; . verify adequate wireless transmission of signals. . verify adequate functioning of backups (data); . verify compliance of report production; . verify functioning during power outage and when current returns. - Inline (continuous) analyser (pH, dissolved oxygen) . verify equipment installation; . verify flow rate			

	Description	Reference to Article and Section	Date Expected	Date Performed
	. Calibrate the device; . verify compliance of the different parameters recording; . verify functioning of communication port; . verify data transfer.			
6.0	VERIFYING PERFORMANCE UNDER LOAD, COMMISSIONING AND OPERATIONAL TESTING - For each trial and at least two (2) weeks before testing, the Contractor shall provide the Departmental Representative with a test protocol. - The protocol shall include the measures that the Contractor intends to implement in order to comply with CSST regulations. - Commission each equipment cluster (system). - Participate to the verification of compliance assessment with plans, specifications and chop drawings. - Perform the tests described in the specifications; deliver training to the operator; and more particularly, carry out the following tests:			

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

1.2 MATERIAL TO BE INSTALLED

.1 Anchors, bolts, sleeves and other elements to be incorporated in concrete.

1.3 OPENINGS

.1 Unless otherwise indicated on the plans, the openings required for the passage of HDPE pipes or other elements not indicated on the plans are included in the work. Follow the instructions of the Engineer.

1.4 REFERENCES

.1 Execute the cast-in-place structures in accordance with the CSA-A23.1 and A23.3 standards (latest edition).

1.5 CONCRETE QUALITY CONTROL

.1 The Departmental Representative will entrust concrete quality control to a laboratory specialized in this type of work and will pay for all of the expenses related to the inspections and testing.

.2 The laboratory will be the Engineer's representative for everything related to the proportioning of concrete and, as such, will be authorized to issue instructions, which the General Contractor and concrete supplier will follow.

.3 At least three (3) weeks prior to the work, the following will be submitted for approval:

.1 Samples of coarse and fine aggregates;

.2 A copy of the supplier's testing reports, as well as a testing certificate from a qualified independent laboratory confirming that the materials listed below comply with the requirements:

- Portland cement;
- Supplementary cementing materials;
- Additives;
- Aggregates;
- Water;

.3 The concrete proportioning;

.4 The type and brand of the additives.

.4 The laboratory will be notified at least 24 hours in advance of the date and time of each concrete placement.

.5 During each concrete placement, cooperate with the laboratory's staff so that they can monitor the execution appropriately and take the samples required for control and testing.

.6 For each 10 cubic meters of concrete poured in one placement, the laboratory will take a sample of the concrete in order to test the compressive strength at 7 and 28 days, i.e. three (3) standard tubes. The Laboratory will take no less than one sample per day of each class of concrete placed and from each separate element, and no less than three (3) samples per separate type of concrete.

.7 The laboratory will conduct slump and air content tests every time a sample will be taken in order to verify strength and as often as required due to the nature of the structure.

.8 The laboratory will provide relevant instructions regarding concrete placement conditions, protection structures, curing and other installation procedures.

.9 As soon as the tests on the materials will be complete, certified copies of the reports, which will include all of the relevant information, will be sent to the Departmental Representative, the Engineer, the General Contractor and the concrete supplier.

.10 The cost of additional tests in order to verify the strength of the concrete should the formwork be removed early, or for any other specific need required for the work, will be paid by the General Contractor. The Engineer will be informed of any additional testing.

.11 If the tests carried out by the laboratory show that the concrete does not comply with the requirements of the specifications, the cost of any additional verification required by the Engineer and performed by the laboratory, whether related to aggregates, proportioning, mixing at the construction site or at the concrete plant, will be paid by the General Contractor.

.12 Anticipate the need for a sheltered area where the concrete tubes will be stored at the appropriate temperature before they are shipped to the testing laboratory.

Part 2 Products

2.1 MATERIALS

.1 Cement: Cements will comply with the CAN/CSA-A3000 standard (latest edition). Cements will be type 10 or type 10E-SF.

.2 Water: Water will comply with the requirements of the CSA-A23.1 standard (latest edition).

.3 Fine and coarse aggregates: Compliant with the CSA-A23.1 standard (latest edition). In the case of fiber-reinforced concrete, coarse aggregate will be of the "TrapRock" type and meet the requirements of the CSA-A23.1 standard (latest edition). Coarse aggregates will meet the 20-5 mm grade in accordance with the CSA-A23.1 standard (latest edition).

.4 All of the aggregates used in the concrete will not be subject to alkali-aggregate reactions.

.5 The additives used in the concrete will comply with the CSA-A23.1 standard (latest edition).

.6 Non-shrink mortar or grout: premixed product containing natural non-oxidizing aggregates, cement, plasticizer and water reducer. The strength of the grout at 28 days will exceed 50 MPa.

.7 Trial mixes will be prepared before work begins in order to determine the appropriate mixing sequence, as well as the proportions of other additives, and achieve the prescribed mix.

2.2 PROPORTIONING OF CONCRETE

.1 The types of concrete specified below are identical to the concrete required during the construction of the existing water intake and mains.

.2 Type 1 concrete – To fill the trench and concrete banks.

.1 Compressive strength: 35 MPa at 28 days. The water-cement ratio will be lower than 0.45.

.2 Slump:

.1 For a mix without the addition of a superplasticizer at the construction site: between 50 mm and 100 mm.

.2 Adding a superplasticizer to the mix is permitted to achieve a slump higher than 100 mm.

.3 The percentage of air content in fresh concrete will range between 5% and 8%. The air void spacing factor in hardened concrete after placement will be lower than 230 μm and meet the requirements of Article 14.3.3 of the CSA-A23.1 standard (latest edition).

.3 Type 2 concrete – Fiber-reinforced concrete for the water intake's concrete block.

.1 Concrete will contain Portland cement with silica fume (type 10E-SF). Maximum cement content will be 450 kg/m³.

.2 Concrete will contain "TrapRock" type aggregate. The sand/stone volume ratio will be 45/55.

.3 Concrete compressive strength: 50 MPa at 28 days. The water-cement ratio will be lower than 0.40.

.4 Concrete will contain an anti-leaching agent that will optimize resistance to leaching. Resistance to leaching will be lower than 5%.

.5 Concrete slumping to the plastic state at the placement point will be equal to 175 ±40 mm after the addition of a superplasticizer. Slumping will be measured in accordance with the requirements of the CSA-A23.1 standard (latest edition).

.6 Air content in fresh concrete will range between 5% and 8%. The air void factor of the hardened concrete after placement will be lower than 230 μm and meet the requirements of Article 14.3.3 of the CSA-A23.1 standard (latest version).

.7 The concrete mix will include synthetic structural fiber reinforcement (Grace Structural Fiber or equivalent). The quantity of synthetic fiber will be at least 4,6 kg/m³. The fiber will be incorporated to the mix in accordance with the instructions of the manufacturer. The fibers will be at least 50 mm long. Longer mixing time may be required in order to distribute the fiber evenly in the mix.

.4 Type 3 concrete – Concrete for structural slab

.1 Compressive strength: 30 MPa at 28 days. The water-cement ratio must be lower than 0.50.

.2 Slump

.1 For a concrete mix without the addition of superplasticizers at the construction site: between 30 mm and 100 mm.

.2 Adding superplasticizers to the concrete mix is permitted in order to obtain a slump of more than 100 mm.

.3 The fresh concrete's air content must range between 5% and 8%. The spacing factor in the hardened concrete's air void system (after placement) must be lower than 230 mm and meet the requirements of the CSO-A23.1 standard (latest version).

2.3 ADDITIVES

.1 The use of additives will only be allowed in order to correct a specific deficiency in the mix or to meet concrete placement requirements as recommended by the testing laboratory and with the approval of the Engineer.

.2 Permission to use additives will be denied if, during the work, the setting of the concrete is not satisfactory.

.3 In cold weather, accelerators may be used providing approval is given. In such cases, the use of accelerators will meet the requirements of the CSA-A23.1 standard (latest edition) with regard to concreting in cold temperatures. The use of calcium chloride is not permitted.

.4 In hot weather, set retarders may be used in order to improve the finish, providing that the required approvals are obtained.

2.4 CONCRETE PROCUREMENT

.1 The supplier of ready-mix concrete is responsible for the proportioning of the concrete and will control the quality and consistency of the product at his own expense.

.2 The selection of the concrete supplier is subject to acceptance by the Engineer.

Part 3 Execution

3.1 GENERAL

.1 The Engineer will be notified of the date and time of every concrete placement at least 24 hours in advance.

.2 The framework (anchors) and elements to be incorporated in concrete will not move during the placement of the concrete.

.3 Prior to concrete placement, the General Contractor will make sure that there is no ice on the framework and/or form walls. If there is ice on the framework or form walls, it will be

removed with steam or through any other method approved by the Engineer. However, the use of de-icing agents is not permitted.

.4 The General Contractor will make sure that the formwork and form bottoms are clean prior to concrete placement.

.5 A concreting log will be maintained, which will indicate the date and location of each placement, concrete characteristics, ambient air temperature and descriptions of the testing samples taken.

.6 Pumping concrete will be permitted once the materials and concrete mix is approved.

3.2 CONCRETE PREPARATION AND DELIVERY

.1 The concrete will be proportioned and premixed at the plant and delivered at the construction site in mixer trucks that will satisfy the requirements of the CSA-A23.1 standard (latest edition).

.2 Necessary actions will be taken in order to ensure that based on the ambient temperature at the time of concrete placement, the temperature of the concrete will be lower than that which is indicated in Table 16 of the CSA-A23.1 standard (latest edition).

.3 Concrete delivery will be organized and sequenced in such a way as to ensure that concreting is carried out without interruption.

.4 Adding water to the concrete prior to unloading from the mixer truck is not permitted, unless previously authorized by the Engineer. If the addition of water is authorized, the quantity of water added to the concrete will be indicated on the delivery slip.

3.3 CONCRETE PLACEMENT (FILLER CONCRETE)

.1 Place the concrete in cold or hot weather in accordance with the CAN/CSA-A23.1 standard (latest edition). The concrete will be placed in a single continuous operation until the required level is reached. The amount of concrete will allow the completion of each placement without interruption.

.2 The location and size of the sleeves and openings indicated on the drawings will be verified.

.3 Should difficulties arise during the placement of the concrete, the ingredients or proportions of the mix will be modified in accordance with the instructions of the laboratory and additive(s) will be added as instructed by the laboratory at no additional cost to the Client.

.4 If the concrete must be placed in formworks higher than 1.50 meter, an appropriate tube will be used to place the concrete.

.5 Vibration: The General Contractor will vibrate the concrete in order to ensure the proper consolidation of the entire volume of placed concrete.

3.4 CONCRETE PLACEMENT UNDER WATER

.1 Authorization from the Engineer prior to concrete placement is required. The Engineer will also be notified 48 hours prior to concrete placement. The reinforcing steel and any element to be incorporated in the concrete will be placed prior to the verification by the Engineer.

.2 In order for new concrete to adhere properly to existing concrete and anchor rods, contact surfaces will be cleaned immediately before concrete placement. The large deposits will be cleaned with compressed air and water jets.

.3 Concrete placement under water consists in pouring concrete in formwork containing water using a concrete pump connected to a concrete placement tube.

.4 The concrete will contain an anti-leaching agent that will optimize the concrete's resistance to leaching (less than 5% loss).

.5 Concreting will be carried out in accordance with the requirements of the CSA-A23.1 standard (latest edition). Unless otherwise indicated, tests will be carried out in accordance with the requirements of the CSA-A23.2 standard (latest edition).

.6 The concrete will be placed in a single continuous operation until the required level is reached. The amount of concrete will allow the completion of each placement without interruption and all of the material necessary for the execution of each step of the work will be provided.

.7 Concrete placement under water will be carried out using a pump. Any other means of placement will not be permitted. Concreting with water will meet the following requirements:

.1 Using the concrete pump's discharge hose as a tremie pipe: the diameter of the pump's hose will be at least 75 mm.

.2 Begin to pour the concrete using with a capped tremie pipe filled with concrete and keep the end of the pipe at least 300 mm in the fresh concrete.

.3 If any water infiltrates the pipe, remove the latter immediately. Fill the pipe with concrete and continue placement in accordance with the prescriptions.

.4 If placement is interrupted and a horizontal construction joint is required, the laitance on the concrete's surface will be removed with water jets within 24 to 38 hours. The loose particles will be removed before the next placement.

.5 Concrete placed under water will not be vibrated, disturbed or moved in any way after placement.

.6 Ensure that the concrete in the top section of the formwork has not leached by overflowing the formwork until good quality concrete is obtained.

.7 The General Contractor will make sure that the excess concrete is recovered and that it does not fall in the water. The recovery method will be approved by the Engineer prior to concreting.

3.5 CONCRETE CONSOLIDATION

.1 Concrete consolidation will be carried out in accordance with the CSA-A32.1 standard (latest edition).

.2 An adequate number of approved internal mechanical vibrators will be used.

.3 The vibrators will be handled by experienced operators.

3.6 CURING AND PROTECTION

.1 The concrete will be cured and protected in accordance with the recommendations of the CSA-A23.1 standard (latest edition) while respecting the following requirements.

.2 All of the tools required to cure and protect the concrete will be readily available and ready for use prior to concrete placement.

.3 When the concrete will be sufficiently set, the exposed surfaces will be kept continuously moist for at least seven consecutive days after placement. The water used for hardening will be clean and free of any substance that may stain or discolour the concrete.

.4 Exposed surfaces include the top of the trench and concrete surfaces uncovered after the removal of formworks within seven days following concrete placement. Given the inconvenience of keeping horizontal surfaces wet, a liquid concrete curing compound may be applied as recommended by the manufacturer. It will be applied consistently, in two consecutive coats, perpendicular from one another, as soon as the concrete will be sufficiently set.

.5 Special precautions will be taken during curing should exceptional conditions occur, such as high temperatures, low relative humidity and strong winds.

.6 Newly placed concrete will be protected from direct sunlight, drying winds, cold, excessive heat and running water with satisfactory tarpaulins or other membrane that will cover or confine the freshly finished concrete surfaces completely until the end of the curing period.

3.7 SURFACE FINISH

.1 The concrete's surface will be broom finished (rough texture), with the exception of concrete blocks, where a smooth finish is required.

3.8 EPOXY COATING FOR CONCRETE FLOORS

.1 All paint and coating work (preparation, cleaning, priming, application, etc.) will be in accordance with the manufacturer's recommendations.

.2 All of the following areas will be coated:

.1 Floor of the raw water pumping station, including all equipment bases;

.2 Floor of the filtered water pumping building, including all equipment bases.

.3 Provide the Client with samples of the various non-slip finishes available for approval. Provide the aggregate material appropriate for the selected finish. ◀

.4 Clean the surface using a solvent in accordance with the SSPC-SP1 standard. Follow the manufacturer's recommendations.

.5 Prepare the concrete surface in accordance with the SSPC-SP 13 / NACE No 6 standard (*Surface Preparation of Concrete*). Required surface profile: CSP 1-3 (ICRI). Follow the manufacturer's recommendations.

.6 Surface preparation will be approved by the Departmental Representative prior to the application of primer.

.7 Apply Sherwin Williams' *GENERAL POLYMERS 3579* primer for epoxy coating.

.8 Apply Sherwin Williams' *GENERAL POLYMERS 3744* epoxy coating. Mix the aggregate material recommended by the manufacturer with the Sherwin Williams epoxy coating in accordance with the non-slip finish selected by the Client. ◄

.9 Refer to the technical data sheet in appendix to this section regarding surface preparation and products.

.10 Contact Mr. Yannick Croteau, Sherwin Williams' representative, to obtain technical support (514-754-8008).

3.9 DEFECTIVE CONCRETE

.1 Concrete that will not meet the requirements of the plans and specifications or concrete with apparent surfaces not accepted by the Engineer will be deemed defective.

.2 Repairing the concrete surface will not begin before the Engineer has observed the defect.

.3 Defects that do not affect structural integrity, such as concrete that does not comply with dimensions, details and elevations indicated on the plans, holes from anchors and concrete surfaces with small voids caused by air bubbles or shallow honeycomb patterns:

.1 Localised defects will be repaired in accordance with proven and durable methods and materials providing that the repaired surfaces are and will remain identical to adjacent surfaces.

.2 Sections of structures showing too many defects will be demolished and rebuilt at no cost to the Client.

.4 Concrete with defects that affect structural integrity, such as concrete not strong enough or covered in honeycomb patterns or imperfections that will compromise structural integrity will be demolished and rebuilt at no cost to the client.

.5 Surfaces of apparent repairs will be subject to approval by the Engineer, who may require repairs to representative defects in order to ensure consistency and similitude, as well as the concealment of joints. If repairs are not accepted due to their appearance, the defective sections of concrete will be rebuilt to the satisfaction of the Engineer.

.6 Drippings, streaks and other unsightly irregularities on exposed surfaces will be removed/eliminated within 24 hours after the removal of the formwork.

3.10 ELEMENTS INCORPORATED IN CONCRETE AND OPENINGS

.1 Openings, sleeves, fasteners, anchor bolts and other elements to be incorporated in concrete will be made or placed in accordance with the requirements of the other sections of these specifications. Sleeves, openings, etc., with sides exceeding 100 mm and not indicated in the construction drawings will not be installed or made without authorization from the Engineer.

END OF SECTION

Recommandation de revêtement (s)

Date : 2016-09-27
Nom du projet : Poste de Pompage Maurice Lamontagne
Propriétaire : Inconnu
Emplacement : Rimouski, QC
Destinataire : Christian Gagnon - Tetratech Inc.
Environnement (ISO12944) : C1 Bâtiment Chauffer | Atmosphère neutre
Température de service : Cargaison :
Description du substrat : Plancher de béton
Système proposé : Système de revêtement époxie Haute-performance pour plancher
Préparé par : Yanick Croteau Inspecteur NACE niv 3 # 37801 | SSPC PCS #412120

Étendue des travaux :

Préparer et peindre un plancher de béton dans une usine de pompage.

Méthode de préparation des surfaces:

Béton:

Effectuer un nettoyage au solvant selon la norme SSPC-SP1, tel que requis pour enlever les dépôts d'huile, de graisse ou tout autre contaminant. Performé la préparation de surface selon la norme:

SSPC-SP 13 / NACE No 6 - Nettoyage du béton

Profil de surface requis : CSP 1-3 (ICRI)

Directives d'application et d'installation :

Suivre les directives d'applications sur la fiche technique de chacun des produits.

Couche	Nom du produit	Solide Volume %	ÉFS mil(s) (microns) Min	ÉFS mil(s) (microns) Max	Rendement théorique p.c / gal	COV	Numéro fiche technique
1	**GENERAL POLYMERS® 3579** Révêtement Époxie Standard Apprêt / Résine	96%	6,0 (150)	20,0 (500)	77 - 256	<50 g/L	GP3579
2	**GENERAL POLYMERS® 3744** Époxie Haute-performance résistante aux produits chimiques	96%	6,0 (150)	10,0 (250)	154 - 256	<50 g/L	GP3744
	Épaisseur totale du système:		12,0 (300)	30,0 (750)			

Notes :

- Pour les recommandations d'installation et autres informations importantes : consulter les fiches techniques et signalétiques de chacun des produits.
- Vérifier la conformité du profil de surface selon la norme ASTM D4417 (dernière version) pour l'acier et avec les comparateurs visuels CSP de l'ICRI .
- Choisir le média approprié afin d'obtenir la finition antidérapante requise.

yanick croteau — Service à l'ingénierie | Engineering Services Group

Inspecteur en revêtements NACE - Niveau III # 37801 | Spécialiste en revêtements industriels - SSPC # 412120
NACE Certified Coatings Inspector - Level III # 37801 | SSPC Certified Protective Coatings Specialist # 412120
Sherwin-Williams - Revêtements Industriels et Marins | Protective & Marine Coatings

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Joint Surface Preparation Standard

SSPC-SP 13/NACE No. 6
Surface Preparation of Concrete

This SSPC: The Society for Protective Coatings/NACE International (NACE) standard represents a consensus of those individual members who have reviewed this document, its scope, and provisions. It is intended to aid the manufacturer, the consumer, and the general public. Its acceptance does not in any respect preclude anyone, whether he has adopted the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not addressed in this standard. Nothing contained in this SSPC/NACE standard is to be construed as granting any right, by implication or otherwise, to manufacture, sell, or use in connection with any method, apparatus, or product covered by Letters Patent, or as indemnifying or protecting anyone against liability for infringement of Letters Patent. This standard represents current technology and should in no way be interpreted as a restriction on the use of better procedures or materials. Neither is this standard intended to apply in all cases relating to the subject. Unpredictable circumstances may negate the usefulness of this standard in specific instances. SSPC and NACE assume no responsibility for the interpretation or use of this standard by other parties and accept responsibility for only those official interpretations issued by SSPC or NACE in accordance with their governing procedures and policies which preclude the issuance of interpretations by individual volunteers.

Users of this SSPC/NACE standard are responsible for reviewing appropriate health, safety, environmental, and regulatory documents and for determining their applicability in relation to this standard prior to its use. This SSPC/NACE standard may not necessarily address all potential health and safety problems or environmental hazards associated with the use of materials, equipment, and/or operations detailed or referred to within this standard. Users of this SSPC/NACE standard are also responsible for establishing appropriate health, safety, and environmental protection practices, in consultation with appropriate regulatory authorities if necessary, to achieve compliance with any existing applicable regulatory requirements prior to the use of this standard.

CAUTIONARY NOTICE: SSPC/NACE standards are subject to periodic review, and may be revised or withdrawn at any time without prior notice. The user is cautioned to obtain the latest edition. SSPC and NACE require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of initial publication.

Reaffirmed 2003-03-17
Approved 1997

Foreword

This standard covers the preparation of concrete surfaces prior to the application of protective coating or lining systems. This standard should be used by specifiers, applicators, inspectors, and others who are responsible for defining a standard degree of cleanliness, strength, profile, and dryness of prepared concrete surfaces.

This standard was originally prepared in 1997 by SSPC/NACE Joint Task Group F on Surface Preparation of Concrete. It was reaffirmed in 2003 by SSPC Group Committee C.2 on Surface Preparation and NACE Specific Technology Group 04 on Protective Coatings and Linings—Surface Preparation. This standard is issued by SSPC Group Committee C.2 and by NACE International under the auspices of STG 04.

Joint Surface Preparation Standard

SSPC-SP 13/NACE No. 6
Surface Preparation of Concrete

Contents

Section 1: General

1.1 This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.

1.2 The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces.

1.3 An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

1.4 When required, a minimum concrete surface strength, maximum surface moisture content, and surface profile range should be specified in the procurement documents (project specifications).

1.5 The mandatory requirements of this standard are given in Sections 1 to 7 as follows:

Section 1:	General
Section 2:	Definitions
Section 3:	Inspection Procedures Prior to Surface Preparation
Section 4:	Surface Preparation
Section 5:	Inspection and Classification of Prepared Concrete Surfaces
Section 6:	Acceptance Criteria
Section 7:	Safety and Environmental Requirements

1.6 Appendix A does not contain mandatory requirements.

Section 2: Definitions

Coating: See *Protective Coating or Lining System*.

Concrete: A material made from hydraulic cement and inert aggregates, such as sand and gravel, which is mixed with water to a workable consistency and placed by various methods to harden and gain strength.

Curing (Concrete): Action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration so that potential properties of the mixture may develop.

Curing Compound (Membrane Curing Compound): A liquid that can be applied as a coating to the surface of newly placed concrete to retard the loss of water.[1]

Efflorescence: A white crystalline or powdery deposit on the surface of concrete. Efflorescence results from leaching of lime or calcium hydroxide out of a permeable concrete mass over time by water, followed by reaction with carbon dioxide and acidic pollutants.[2]

Fin: A narrow linear projection on a formed concrete surface, resulting from mortar flowing into spaces in the form work.[1]

Finish: The texture of a surface after consolidating and finishing operations have been performed.[1]

Finishing: Leveling, smoothing, consolidating, and otherwise treating surfaces of fresh or recently placed concrete or mortar to produce desired appearance and service.[1]

Hardener (Concrete): A chemical (including certain fluorosilicates or sodium silicate) applied to concrete floors to reduce wear and dusting.[1]

High-Pressure Water Cleaning (HP WC): Water cleaning performed at pressures from 34 to 70 MPa (5,000 to 10,000 psig).[3]

High-Pressure Waterjetting (HP WJ): Waterjetting performed at pressures from 70 to 210 MPa (10,000 to 30,000 psig).[3]

Honeycomb: Voids left in concrete due to failure of the mortar to effectively fill the spaces among coarse aggregate particles.[1]

Laitance: A thin, weak, brittle layer of cement and aggregate fines on a concrete surface. The amount of laitance is influenced by the type and amount of admixtures, the degree of working, and the amount of water in the concrete.[2]

Lining: See *Protective Coating or Lining System*.

Placing: The deposition, distribution, and consolidation of freshly mixed concrete in the place where it is to harden.[1]

Porosity: Small voids that allow fluids to penetrate an otherwise impervious material.

Protective Coating or Lining System (Coating): For the purposes of this standard, protective coating or lining systems (also called *protective barrier systems*) are bonded thermoset, thermoplastic, inorganic, organic/inorganic hy-

brids, or metallic materials applied in one or more layers by various methods such as brush, roller, trowel, spray, and thermal spray. They are used to protect concrete from degradation by chemicals, abrasion, physical damage, and the subsequent loss of structural integrity. Other potential functions include containing chemicals, preventing staining of concrete, and preventing liquids from being contaminated by concrete.

Release Agents (Form-Release Agents): Materials used to prevent bonding of concrete to a surface.[1]

Sealer (Sealing Compound): A liquid that is applied as a coating to a concrete surface to prevent or decrease the penetration of liquid or gaseous media during exposure. Some curing compounds also function as sealers.

Soundness: A qualitative measure of the suitability of the concrete to perform as a solid substrate or base for a coating or patching material. Sound concrete substrates usually exhibit strength and cohesiveness without excessive voids or cracks.

Spalling (Concrete): The development of spalls which are fragments, usually in the shape of a flake, detached from a larger mass by a blow, by the action of weather, by pressure, or by expansion within the larger mass.[1]

Surface Porosity: Porosity or permeability at the concrete surface that may absorb vapors, moisture, chemicals, and coating liquids.

Surface Preparation: The method or combination of methods used to clean a concrete surface, remove loose and weak materials and contaminants from the surface, repair the surface, and roughen the surface to promote adhesion of a protective coating or lining system.

Surface Profile (Texture): Surface contour as viewed from edge.

Surface Air Voids: Cavities visible on the surface of a solid.

Section 3: Inspection Procedures Prior to Surface Preparation

3.1 Concrete shall be inspected prior to surface preparation to determine the condition of the concrete and to determine the appropriate method or combination of methods to be used for surface preparation to meet the requirements of the coating system to be applied. Inherent variations in surface conditions seen in walls and ceilings versus those in floors should be considered when choosing surface preparation methods and techniques. For example, walls and ceilings are much more likely than floors to contain surface air voids, fins, form-release agents, and honeycombs.

3.2 Visual Inspection

All concrete surfaces to be prepared and coated shall be visually inspected for signs of concrete defects, physical damage, chemical damage, contamination, and excess moisture.

3.3 Concrete Cure

All concrete should be cured using the procedures described in ACI[(1)] 308.[4] Curing requirements include maintaining sufficient moisture and temperatures for a minimum time period. Surface preparation performed on insufficiently cured or low-strength concrete may create an excessively coarse surface profile or remove an excessive amount of concrete.

3.4 Concrete Defects

Concrete defects such as honeycombs and spalling shall be repaired. The procedures described in NACE Standard RP0390,[5] ICRI[(2)] 03730,[6] or ACI 301[7] may be used to ensure that the concrete surface is sound prior to surface preparation.

3.5 Physical Damage

3.5.1 Concrete should be tested for soundness by the qualitative methods described in NACE Publication 6G191[8] or Paragraph A1.4.3.

3.5.2 When qualitative results are indeterminate, or when a quantitative result is specified, concrete shall be tested for surface tensile strength using the methods described in Paragraph A1.6.

3.5.3 Concrete that has been damaged because of physical forces such as impact, abrasion, or corrosion of reinforcement shall be repaired prior to surface preparation if the damage would affect coating performance. Repairs should be made in accordance with ACI 301,[7] NACE Standard RP0390,[5] or Paragraph A1.4.

3.6 Chemical Damage

3.6.1 Concrete is attacked by a variety of chemicals, as detailed in ACI 515.1R[9] and PCA[(3)] IS001.[10]

(1) American Concrete Institute International (ACI), 38800 International Way, Country Club Drive, Farmington Hills, MI 48331.
(2) International Concrete Repair Institute (ICRI), 3166 S. River Road, Suite 132, Des Plaines, IL 60018.
(3) Portland Cement Association (PCA), 5420 Old Orchard Rd., Skokie, IL 60077.

3.6.2 All concrete surfaces that have been exposed to chemicals shall be tested and treated for contamination as described in Paragraph 3.7.

3.6.3 Concrete that has been exposed to chemicals shall be tested for soundness by the qualitative methods described in NACE Publication 6G191[8] or Paragraph A1.4.3.

3.7 Contamination

3.7.1 Contamination on concrete surfaces includes all materials that may affect the adhesion and performance of the coating to be applied. Examples include, but are not limited to, dirt, oil, grease, chemicals, and existing incompatible coatings.

3.7.2 Contamination may be detected by methods described in NACE Publication 6G191[8] and Paragraph A1.5. These methods include, but are not limited to, visual examination, water drop (contact angle) measurement, pH testing, petrographic examination, and various instrumental analytical methods. Core sampling may be required to determine the depth to which the contaminant has penetrated the concrete.

3.7.3 Concrete surfaces that are contaminated or that have existing coatings shall be tested by the method described in Paragraph A1.6.3 to determine whether the contamination or existing coating affects the adhesion and performance of the coating to be applied. Concrete surfaces that have existing coatings shall also be tested by the method described in Paragraph A1.6.3 to determine whether the existing coating is sufficiently bonded to the concrete.

3.7.4 In extreme cases of concrete damage or degradation, or thorough penetration by contaminants, complete removal and replacement of the concrete may be required.

3.8 Moisture

Moisture levels in the concrete may be determined by the methods described in Paragraph 5.6.

Section 4: Surface Preparation

4.1 Objectives

4.1.1 The objective of surface preparation is to produce a concrete surface that is suitable for application and adhesion of the specified protective coating system.

4.1.2 Protrusions such as from burrs, sharp edges, fins, and concrete spatter shall be removed during surface preparation.

4.1.3 Voids and other defects that are at or near the surface shall be exposed during surface preparation.

4.1.4 All concrete that is not sound shall be removed so that only sound concrete remains.

4.1.5 Concrete damaged by exposure to chemicals shall be removed so that only sound concrete remains.

4.1.6 All contamination, form-release agents, efflorescence, curing compounds, and existing coatings determined to be incompatible with the coating to be applied shall be removed.

4.1.7 The surface preparation method, or combination of methods, should be chosen based on the condition of the concrete and the requirements of the coating system to be applied.

4.1.8 All prepared concrete surfaces shall be repaired to the level required by the coating system in the intended service condition.

4.2 Surface Cleaning Methods

4.2.1 The surface cleaning methods described in Paragraphs 4.2.2 and 4.2.3 shall not be used as the sole surface preparation method of concrete to be coated as they do not remove laitance or contaminants or alter the surface profile of concrete. These methods shall be used as required, before and/or after the mechanical and chemical methods described in Paragraphs 4.3 and 4.4.

4.2.2 Vacuum cleaning, air blast cleaning, and water cleaning as described in ASTM[(4)] D 4258[11] may be used to remove dirt, loose material, and/or dust from concrete.

4.2.3 Detergent water cleaning and steam cleaning as described in ASTM D 4258[11] may be used to remove oils and grease from concrete.

4.3 Mechanical Surface Preparation Methods

4.3.1 Dry abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and centrifugal shot blasting, as described in ASTM D 4259,[12] may be used to remove contaminants, laitance, and weak concrete,

[(4)] ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

to expose subsurface voids, and to produce a sound concrete surface with adequate profile and surface porosity.

4.3.2 High-pressure water cleaning or waterjetting methods as described in SSPC-SP 12/NACE No. 5,[2] ASTM D 4259,[12] or "Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment,"[(5)13] may be used to remove contaminants, laitance, and weak concrete, to expose subsurface voids, and to produce a sound concrete surface with adequate profile and surface porosity.

4.3.3 Impact-tool methods may be used to remove existing coatings, laitance, and weak concrete. These methods include scarifying, planing, scabbling, and rotary peening, as described in ASTM D 4259.[12] Impact-tool methods may fracture concrete surfaces or cause microcracking and may need to be followed by one of the procedures in Paragraphs 4.3.1 or 4.3.2 to produce a sound concrete surface with adequate profile and surface porosity. The soundness of a concrete surface prepared using an impact method may be verified by one of the surface tensile strength tests described in Paragraph A1.6.

4.3.4 Power-tool methods, including circular grinding, sanding, and wire brushing as described in ASTM D 4259,[12] may be used to remove existing coatings, laitance, weak concrete, and protrusions in concrete. These methods may not produce the required surface profile and may require one of the procedures described in Paragraphs 4.3.1 or 4.3.2 to produce a concrete surface with adequate profile and surface porosity.

4.3.5 Surface preparation using the methods described in Paragraphs 4.3.1 through 4.3.4 shall be performed in a manner that provides a uniform, sound surface that is suitable for the specified protective coating system.

4.4 Chemical Surface Preparation

Acid etching, as described in ASTM D 4260[14] and NACE Standard RP0892,[15] may be used to remove laitance and weak concrete and to provide a surface profile on horizontal concrete surfaces. This method requires complete removal of all reaction products and pH testing to ensure neutralization of the acid. Acid etching is not recommended for vertical surfaces and areas where curing compounds or sealers have been used. Acid etching shall only be used where procedures for handling, containment, and disposal of the hazardous materials are in place. Acid etching with hydrochloric acid shall not be used where corrosion of metal in the concrete (rebar or metal fibers) is likely to occur.

4.5 Flame (Thermal) Cleaning and Blasting

4.5.1 Flame cleaning using a propane torch or other heat source may be used to extract organic contaminants from a concrete surface. To remove the extracted contaminants this type of cleaning may need to be followed by the cleaning methods described in ASTM D 4258.[11]

4.5.2 Flame cleaning and blasting using oxygen-acetylene flame blasting methods and proprietary delivery equipment may be used to remove existing coatings, contaminants, and laitance and/or create a surface profile on sound concrete.

4.5.3 The extent of removal when employing flame methods is affected by the rate of equipment advancement, the flame adjustment, and the distance between the flame and the concrete surface. Surface preparation using flame methods shall be performed in a manner that provides a uniform, sound surface that is suitable for the specified protective coating system.

4.5.4 High temperatures reduce the strength of or damage concrete; therefore, surfaces prepared using flame methods shall be tested for soundness and surface tensile strength. Concrete surfaces found to be unsound or low in tensile strength shall be repaired or prepared by other mechanical methods described in Paragraph 4.3.

4.6 Surface Cleanliness

After the concrete surface has been prepared to the required soundness and surface profile, surfaces may still need to be cleaned by one of the methods described in Paragraph 4.2 to remove the residue created by the surface preparation method or to remove spent media.

4.7 Moisture Content

If the moisture level in the concrete is higher than the specified limit tolerable by the coating, the concrete shall be dried or allowed to dry to the level specified in the procurement documents before inspection and application of the coating (see Paragraph 5.6).

4.8 Patching and Repairs

4.8.1 Prior to proceeding with patching and repairs, the prepared concrete surface shall be inspected according to Section 5. After the patching and repairs of the concrete surface are completed, the repaired areas shall be reinspected according to Section 5.

4.8.2 All gouges, surface air voids, and other surface anomalies shall be repaired to a level required by the coating system as specified in the procurement documents.

[(5)] WaterJet Technology Association, 917 Locust, Suite 1100, St. Louis, MO 63101-1419.

4.8.3 All repair materials, both cementitious and polymeric, should be approved or recommended by the coating manufacturer as being compatible with the coating to be applied. Repair materials not recommended or approved by the coating manufacturer shall be tested for compatibility prior to their application.

4.8.4 The repair material shall be cured according to the manufacturer's published instructions.

4.8.5 The repaired section may require additional surface preparation prior to coating application.

Section 5: Inspection and Classification of Prepared Concrete Surfaces

5.1 Surface Tensile Strength

5.1.1 All prepared concrete surfaces should be tested for surface tensile strength after cleaning and drying but prior to making repairs or applying the coating.

5.1.2 Surface tensile strength should be tested using a method agreed upon by all parties. (See Paragraph A1.6 for commentary on these methods.)

5.2 Coating Adhesion

5.2.1 If specified in the procurement documents and accepted by all parties, a test patch shall be applied to determine the compatibility of and adhesion between the prepared surface and the coating system. (See Paragraph A1.6.3 for commentary on this method.)

5.2.2 Coating adhesion should be tested using one of the methods agreed upon by all parties. (See Paragraph A1.6 for commentary on these methods.)

5.3 Surface Profile

5.3.1 If a specific surface profile is required for the performance of the coating system to be applied, the profile shall be specified in the procurement documents.

5.3.2 The surface profile of prepared concrete surfaces should be evaluated after cleaning and drying but prior to repairs or application of the coating.

5.3.3 The surface profile may be evaluated by comparing the profile of the prepared concrete surface with the profile of graded abrasive paper, as described in ANSI[(6)] B 74.18,[16] by comparing the profile with the ICRI Guideline No. 03732[17] (surface profile chips), or by another agreed-upon visual comparison.

5.4 Surface Cleanliness

5.4.1 All prepared concrete surfaces shall be inspected for surface cleanliness after cleaning and drying but prior to making repairs or applying the coating. If the concrete surfaces are repaired, they shall be reinspected for surface cleanliness prior to applying the coating.

5.4.2 Prepared concrete surfaces may be inspected for surface cleanliness by lightly rubbing the surface with a dark cloth or pressing a translucent adhesive tape on the surface. The test method and acceptable level of residual dust shall be agreed on by all parties.

5.4.3 The method used to verify compatibility of the coating to be applied over a contaminated surface or over contaminated surfaces that have been cleaned and prepared should be approved by the coating manufacturer and specified in the procurement documents.

5.5 pH

5.5.1 If a specific pH range is required for proper performance of the coating system to be applied, the pH of the concrete shall be specified in the procurement documents.

5.5.2 The pH of concrete surfaces prepared by acid etching should be tested after etching and rinsing but before the prepared surface has dried.

5.5.3 ASTM D 4262[18] should be used to determine pH.

5.6 Moisture Content

5.6.1 If a specific moisture content is required for proper performance of the coating system to be applied, the moisture content of the concrete shall be specified in the procurement documents.

5.6.2 Prepared concrete surfaces should be tested for residual moisture after cleaning and drying but prior to the application of the coating.

5.6.3 ASTM D 4263,[19] ASTM F 1869,[20] or ASTM F 2170[21] should be used to determine the residual moisture content in concrete.

5.6.4 If required or accepted by all parties, any of the methods described in Paragraph A1.8.4 may be used to determine the moisture content of the concrete surface.

[(6)] American National Standards Institute (ANSI), 1819 L Street NW, Washington, DC 20036.

Section 6: Acceptance Criteria

6.1 The acceptance criteria for prepared concrete surfaces shall be specified in the procurement documents.

6.2 The procurement documents may refer to the specifications in Table 1.

Table 1:
Suggested Acceptance Criteria for Concrete Surfaces After Surface Preparation

Property	Test Method	Light Service[A]	Severe Service[B]
Surface tensile strength	See Paragraph A1.6	1.4 MPa (200 psi) min.	2.1 MPa (300 psi) min.
Surface profile	Visual comparison[16]	Fine (150) abrasive paper min.	Coarse (60) abrasive paper min.
Surface cleanliness	Visible dust[11]	No significant dust	No significant dust
Residual contaminants	Water drop[15,22]	0° contact angle	0° contact angle
pH	ASTM D 4262[18]	(pH of rinse water) -1, +2[C]	(pH of rinse water) -1, +2[C]
Moisture content[D]	ASTM D 4263[19]	No visible moisture	No visible moisture
Moisture content[D]	ASTM F 1869[20]	15 g/24 hr/m^2 (3 lb/24 hr/1,000 ft^2) max.	15 g/24 hr/m^2 (3 lb/24 hr/1,000 ft^2) max.
Moisture content[D]	ASTM F 2170[21]	80% max.	80% max.

[A] Light service refers to surfaces and coatings that have minimal exposure to traffic, chemicals, and changes in temperature.
[B] Severe service refers to surfaces and coatings that have significant exposure to traffic, chemicals, and/or changes in temperature.
[C] The acceptance criterion for ASTM D 4262 is as follows: The pH readings following the final rinse shall not be more than 1.0 lower or 2.0 higher than the pH of the rinse water (tested at the beginning and end of the final rinse cycle) unless otherwise specified.
[D] Any one of these three moisture content test methods is acceptable.

Section 7: Safety and Environmental Requirements

7.1 Disposal of contaminants, old coatings, acid from etching, and contaminated water and blasting media shall comply with all applicable facility, local, state, and federal regulations.

7.2 Handling of hazardous materials, machinery operations, worker protection, and control of airborne dust and fumes shall comply with all applicable facility, local, state, and federal health and safety regulations.

References

1. ACI 116R (latest revision), “Cement and Concrete Terminology” (Farmington Hills, MI: ACI).

2. SSPC-Guide 11 (latest revision), “Guide for Coating Concrete” (Pittsburgh, PA: SSPC).

3. SSPC-SP 12/NACE No. 5, “Surface Preparation and Cleaning of Metals by Waterjetting Prior to Coating” (Pittsburgh, PA: SSPC, and Houston, TX: NACE).

4. ACI 308 (latest revision), “Standard Practice for Curing Concrete” (Farmington Hills, MI: ACI).

5. NACE Standard RP0390 (latest revision), “Maintenance and Rehabilitation Considerations for Corrosion Control of Existing Steel-Reinforced Concrete Structures” (Houston, TX: NACE).

6. ICRI Guideline No. 03730 (latest revision), “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion” (Des Plaines, IL: ICRI).

7. ACI 301 (latest revision), “Specifications for Structural Concrete” (Farmington Hills, MI: ACI).

8. NACE Publication 6G191 (withdrawn), “Surface Preparation of Contaminated Concrete for Corrosion Control” (Houston, TX: NACE). (Available from NACE as an historical document only).

9. ACI 515.1R (latest revision), “Guide to the Use of Waterproofing, Dampproofing, Protective, and Decorative Barrier Systems for Concrete” (Farmington Hills, MI: ACI).

10. IS001 (latest revision), “Effects of substances on concrete and guide to protective treatments” (Skokie, IL: PCA).

11. ASTM D 4258 (latest revision), “Standard Practice for Surface Cleaning Concrete for Coating” (West Conshohocken, PA: ASTM).

12. ASTM D 4259 (latest revision), “Standard Practice for Abrading Concrete” (West Conshohocken, PA: ASTM).

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14. ASTM D 4260 (latest revision), “Standard Practice for Acid Etching Concrete” (West Conshohocken, PA: ASTM).

15. NACE Standard RP0892 (latest revision), “Coatings and Linings Over Concrete for Chemical Immersion and Containment Service” (Houston, TX: NACE).

16. ANSI B74.18 (latest revision), “Specifications for Grading of Certain Abrasive Grain on Coated Abrasive Products” (Washington, DC: ANSI).

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18. ASTM D 4262 (latest revision), “Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces” (West Conshohocken, PA: ASTM).

19. ASTM D 4263 (latest revision), “Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method” (West Conshohocken, PA: ASTM).

20. ASTM F 1869 (latest revision), “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride” (West Conshohocken, PA: ASTM).

21. ASTM F 2170 (latest revision), “Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes” (West Conshohocken, PA: ASTM).

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Appendix A: Comments
(This section does not contain any mandatory requirements.)

A1.1 General[23,24,25,26]

A1.1.1 This standard does not recommend surface preparation methods or differentiate levels of surface preparation that are specifically required for various protective system designs, types, thicknesses, and end-use requirements. These specifications should be decided and agreed upon by all parties (the specifier, facility owner, coating manufacturer, and contractor).

A1.1.2 Concrete and its surfaces are not homogeneous or consistent and, unlike steel, cannot be discretely defined. Therefore, visual examination of a concrete surface is somewhat subjective. The acceptance or rejection of a prepared concrete surface should be based on the results of specific tests, including, but not limited to, tests for surface tensile strength, contamination, and moisture.

A1.1.3 Joints, cracks, and curing shrinkage of concrete should be considered in the design of the protective coating system; however, these topics are beyond the scope of this standard. See NACE Standard RP0892,[15] ACI 515.1R,[9] and SSPC-TU 2[27]/NACE 6G197 for more information.

A1.1.4 When a significant amount of weak, deteriorated, or contaminated concrete is removed during the course of surface preparation to achieve a sound surface, the profile of the remaining concrete is often too rough for the intended coating system. In these cases, and where form voids and surface air voids must be filled, patching or grouting materials are specified to repair or level the concrete surface. See NACE Standard RP0892,[15] ACI 515.1R,[9] NACE Standard RP0390,[5] SSPC-TU 2/NACE 6G197,[27] and Paragraph A1.4.4 for more information about patching materials.

A1.2 Concrete Finishing and Surface Characteristics[23]

A1.2.1 The method used to finish concrete surfaces affects the concrete's surface profile, composition, porosity, and density. These surface properties affect the adhesion and performance of concrete coatings. Typical surface properties obtained using the most common finishing methods are given in Table A1. These properties are evaluated prior to surface preparation.

A1.2.2 No preferred method of finishing concrete to accept coatings has been established by the concrete coating industry. The surface cure, surface preparation method, and type of coating system to be applied are all factors in determining the suitability of any specific concrete finishing method. For example, broom finishing is sometimes used because it gives a profile for the coating; however, most of the profile may be removed during surface preparation if the surface is not properly cured, negating this inherent advantage of the broom finish. When sacking is used to fill voids in formed concrete surfaces, subsurface voids are created, and the added cement is usually removed during surface preparation due to improper cure of the added cement paste.

Table A1:
Typical Surface Properties of Finished Concrete

Method	Profile[A]	Porosity[A]	Strength[A]	Problems
Formed concrete	Smooth to medium	Low to medium	Medium	Voids, protrusions, release agents
Wood float	Medium	Medium	Medium	
Metal trowel	Smooth	Low	High	
Power trowel	Smooth	Very low	High	Very dense
Broom finish	Coarse to very coarse	Medium	Medium	
Sacking	Smooth	Low to medium	Low to high[B]	Weak layer if not properly cured
Stoning	Smooth to medium	Low to medium	Low to high[B]	Weak layer if not properly cured
Concrete block	Coarse to very coarse	Very high	Medium	Pinholes
Shotcrete[C]	Very coarse	Medium	Medium	Too rough for thin coatings

[A] These surface properties are based on similar concrete mix, placement, and vibration and prior to surface preparation.
[B] Strength depends on application and cure.
[C] Shotcrete may be refinished after placement, which would change the surface properties given in this table.

A1.2.3 Use of a metal trowel is gaining acceptance as the preferred finishing method for horizontal surfaces to be coated, provided the surface is not excessively trowelled, the concrete is cured properly, and the laitance is removed prior to coating.

A1.2.4 Photographic examples of concrete finishes are shown in ASTM PCN:03-401079-14.[28]

A1.3 Concrete Cure[29]

A1.3.1 Maintaining sufficient moisture and proper temperature in concrete in the early stages of cure is important to ensure development of the designed strength. Keeping the surface moist until sufficient strength has developed at the surface is important to ensure formation of sufficient surface strength, to reduce curling, and to reduce surface cracking.

A1.3.2 ACI 308[4] recommends seven days of moist curing for Type I portland cement concrete and three days for Type III portland cement concrete, if the temperature is above 10°C (50°F). ACI 308 also recommends numerous methods to properly cure concrete, including the use of sealing materials and other methods to keep concrete moist.

A1.3.3 ACI 308[4] also gives recommendations on the use of curing compounds, which are commonly used immediately after placement and finishing of concrete surfaces to reduce moisture loss and improve surface cure. The curing compound should either be compatible with the coating or be removed during surface preparation.

A1.4 Identification and Repair of Surface Defects and Damage[30]

A1.4.1 Physical and Chemical Damage

A1.4.1.1 Existing concrete structures that have been subjected to mechanical damage (caused by impact or abrasion), chemical attack, or rebar corrosion are restored to provide a uniform, sound substrate prior to coating application.

A1.4.1.2 In order to best receive and hold the patching material all deteriorated concrete should be removed and the surrounding sound concrete cut using the procedures described in ICRI 03730.[6] Some contaminants have a detrimental effect on the rebar or the applied coating if they are not completely removed.

A1.4.1.3 A number of polymeric grouts and patching materials can be used, especially when the coating is to be applied immediately. These materials should be compatible with the coating to be applied.

A1.4.2 Other Defects and Imperfections

A1.4.2.1 Defects such as honeycombs, scaling, and spalling do not provide a sound, uniform substrate for the coating. These defects are repaired by removing all unsound concrete and then patching the concrete prior to surface preparation. NACE Standard RP0390[5] and ICRI 03730[6] describe removal and repair procedures for concrete

that is spalled because of rebar corrosion.

A1.4.2.2 Surface air voids, pinholes, or excessive porosity may affect the application or performance of the coating. The maximum substrate void size or surface porosity that can be tolerated depends on the coating system under consideration. If voids are not filled before the coating is applied, the trapped air vapor expands and contracts and may affect the performance of the coating. For liquid-rich coatings, excess porosity at the surface may result in pinholes in the coating. Voids are usually filled after surface preparation and prior to coating application.

A1.4.2.3 Protrusions such as form lines, fins, sharp edges, and spatter may cause holidays or thin sections in the coating if they are not removed. Protrusions and rough edges are usually removed during surface preparation.

A1.4.3 Testing for Surface Soundness

A1.4.3.1 NACE Publication 6G191[8] describes the following commonly used methods for determining surface soundness:

A screwdriver, file, or pocket knife is lightly scratched across the concrete surface. If the metal object rides over the surface without loosening any particles and leaves no more than a shiny mark, the surface is sound. If this process gouges the surface, the surface is not sound.

The concrete surface is lightly struck with the edge of a hammer head. If the hammer rebounds sharply with no more than a small fracture at the impact area, the surface is sound. If it lands with a dull thud and leaves powdered dusts in the indentation, the surface is not sound.

A chain is dragged across horizontal concrete surfaces. Differences in sound indicate unsound concrete and holes or pockets within the concrete.

A1.4.4 Patching of Concrete Surface Imperfections

A1.4.4.1 Materials such as grouts, putties, and sealers are used to repair, patch, smooth, or seal the concrete surface to provide a substrate that is suitable for the coating system to be applied. These materials are applied after surface preparation and require the following characteristics:

(1) good adhesion;

(2) adequate strength;

(3) low volumetric and linear shrinkage;

(4) compatibility with the coating to be applied; and

(5) proper consistency for the application.

In addition, the patching material is often required to cure sufficiently, be traffic bearing, and be ready to recoat in a short time frame (usually within 24 hours).

A1.4.4.2 Shrinkage of the patching material may reduce the adhesion of that material to the concrete substrate. Differences in thermal expansion between the concrete, patching material, and coating system cause stresses during thermally induced movement that may reduce adhesion between these layers.

A1.4.4.3 The most common types of patching materials are cementitious, polymer-modified cementitious (usually acrylic), and polymeric (usually epoxy). Cementitious materials are lower in cost than polymeric materials, but polymeric materials generally cure faster and have higher strengths, better adhesion, and increased chemical resistance.

A1.4.4.4 Patching materials are available in a range of consistencies for application to vertical or horizontal surfaces by a variety of methods. The amount of filler also varies. For example, grouts for deep patching are typically highly filled, while porosity sealers may be minimally filled or unfilled. Numerous proprietary materials are low-shrinking, nonshrinking, or expanding.

A1.4.4.5 Additional surface preparation may need to be performed on cured patching materials to ensure that the laitance is removed and/or that the patched surface meets the profile requirements of the coating system.

A1.4.4.6 Photographic examples of patched concrete surfaces are shown in ASTM PCN:03-401079-14.[31]

A1.5 Identification and Removal of Contaminants[22,32,33,34]

A1.5.1 Hydrophobic Materials

A1.5.1.1 Hydrophobic materials such as form-release agents, curing compounds, sealers, existing coatings, oil, wax, grease, resins, and silicone may be detected by a simple water drop test. Analytical techniques such as infrared analysis or gas chromatography may also be used to detect and identify these contaminants.

A1.5.1.2 Oils and greases can be removed by steam cleaning, flame blasting, baking soda blasting, or using degreasers and absorbents.

A1.5.1.3 If they are incompatible with the coating to be applied, existing curing compounds, sealers, form-release agents, and coatings should be removed by the least destructive, most practical, economical, and safe method that is successful. Methods such as grinding, abrasive blasting, wet abrasive blasting, waterjetting, scarifying, flame blasting, or paint stripping may be used.

A1.5.2 Salts and Reactive Materials

A1.5.2.1 Salts and reactive materials such as laitance, efflorescence, acids, alkalis, and by-products of chemical attack of concrete can sometimes be detected by pH testing, soundness testing using the screwdriver test, or visual examination (see PCA IS214).[35] When these methods are not successful, chemical analysis techniques are required.

A1.5.2.2 Residual acids and alkalis are first neutralized and then removed by high-pressure water cleaning. Salts and efflorescence can be removed by abrasive blasting, high-pressure water cleaning, or applying a weak acid or alkali solution and then high-pressure water cleaning.

A1.5.3 Microorganisms

A1.5.3.1 Microorganisms such as fungus, moss, mildew, algae, decomposing foods, and other organic growths can sometimes be detected by visual examination (see PCA IS214).[35]

A1.5.3.2 Microorganisms are removed by washing with sodium hypochlorite (household bleach) and rinsing with water. High-pressure water cleaning or abrasive blasting may also be used.

A1.6 Adhesion Testing[36]

The two commonly used methods for testing adhesion of coatings to concrete substrates are ASTM D 4541[37] (modified for concrete substrates as discussed in Paragraph A1.6.1) and ACI 503R.[38] Testing for surface tensile strength consists of scoring (core drilling) the concrete surface, bonding a test fixture with an adhesive, pulling the fixture with an adhesion tester, and noting the pull-off strength or adhesion value. Testing for coating adhesion is performed using the same procedure, noting the adhesion value, and noting the adhesion failure mode (see Paragraph A1.6.4).

A1.6.1 The procedure described in ASTM D 4541[37] may be used to determine pull-off strength or coating adhesion strength using a portable adhesion tester, typically either a manual tester with a 20-mm (0.78-in.)-diameter loading fixture (test dolly) or a pneumatic adhesion tester with a 13-mm (0.5-in.) loading fixture. ASTM D 4541 states that "Scoring around the fixture violates the fundamental in situ criterion that an unaltered coating be tested," but it also states that scoring should be noted in the results when employed.[37] The procedure in ASTM D 4541 should be modified for use on concrete substrates by scoring or core drilling prior to attaching the loading fixture. Scoring around the test fixture ensures that the pulling force is applied only to the area directly beneath the fixture. Without scoring, stress is transferred through the coating film beyond the area of the test fixture. This could result in significant error when testing thick or reinforced coatings. A water-lubricated diamond-tipped core bit should be used for scoring to reduce the possibility of microcracks in either the coating or the concrete substrate. The procedure may also be modified by using a larger (5-cm [2-in.] or more) loading fixture. A larger test fixture typically yields more accurate results than a smaller fixture because the greater surface area reduces the effect of inconsistencies, such as a piece of aggregate or a void, in the substrate.

A1.6.2 ACI 503R[38] discusses the process of applying a coating or adhesive coring to the substrate, bonding a 5-cm (2-in.) pipe cap to the coating, and applying tension with a mechanical testing device attached to a dynamometer. As with ASTM D 4541,[37] the tensile load and mode of failure are noted.

A1.6.3 A test patch involves applying the coating system to a small section (with the minimum size to be specified) of prepared concrete and testing for tensile strength and adhesion by either of the methods described in Paragraphs A1.6.1 and A1.6.2. The prepared concrete substrate—at least the portion to be patched—should meet the acceptance criteria as detailed in Section 6. The coating system should be applied in accordance with the coating manufacturer's published instructions. The last coat of the coating system serves as the adhesive for the loading fixture, or, when this is not recommended (e.g., for solvent-based topcoats), the loading fixture is attached to the coating system by an adhesive. If agreed by all parties, the primer alone may suffice as the test patch and the adhesive for the loading fixture.

A1.6.4 The acceptable adhesion strength and mode of failure may vary depending on the type of coating tested. The coating manufacturer should be consulted to determine the preferred test method, the suitability of that method, and acceptance criteria for the specified coating. When adhesion testing is performed, the mode of failure should be noted. The failure can be described using one or more of the following terms.

(1) Concrete (substrate) cohesive failure: This failure mode is defined as failure within the concrete, below the concrete/coating interface. This result, if the adhesion value is sufficient, is considered to be the most desirable for coatings applied to concrete. If concrete cohesive failure occurs but the adhesion value is low, the failure may be because of low concrete strength or microcracking from scoring. If only a thin layer of concrete is pulled with the fixture and the adhesion value is

low, it may be because of a weak concrete surface layer or laitance.

(2) Coating adhesive failure: This failure mode is defined as failure directly at the concrete/coating interface. For most coating systems, failure in this mode indicates a problem with surface preparation, residual contamination, or the coating.

(3) Coating cohesive failure or coating intercoat adhesion failure: This failure mode is defined as failure within the coating system, above the concrete/coating interface. This mode of failure indicates a problem with the coating material or with the coating application.

(4) Fixture adhesive failure: This failure mode is defined as failure within the fixture adhesive or at the fixture adhesive/coating interface. When this failure mode is encountered, the test should be repeated.

A1.7 Surface Profile

A1.7.1 In addition to removing laitance, weak concrete, and contamination at the concrete surface, surface preparation usually opens the pores and/or creates a profile on the concrete surface. Profile increases the surface area available for bonding between the concrete and the coating, enhances adhesion at the concrete/coating interface, and helps the coating resist peeling and shear forces.

A1.7.2 The depth of surface profile required depends on:

(1) tensile and shear strength of the concrete and the coating system;

(2) adhesion of the coating system to the concrete;

(3) internal stresses in the coating system created during application (e.g., from shrinkage);

(4) difference in the coefficient of thermal expansion between the coating and the concrete;

(5) modulus or stress-relaxation properties of the coating system;

(6) thermal and chemical exposure environment; and

(7) coating thickness.

A1.7.3 At this time, no recognized testing equipment or method is used to quantify the surface profile of concrete that is analogous to the replica tape method used on steel. The profile can be subjectively compared to the standard classification for coated abrasive paper as described in ANSI B74.18,[16] or by comparing the profile with the ICRI Guideline No. 03732[17] (surface profile chips). For extremely coarse prepared concrete surfaces (assuming that the coating system can cover and perform over such a substrate), the profile may be estimated as an average distance between peaks and valleys on the concrete surface and quantified in mm (mils).

A1.8 Moisture in Concrete[39,40,41,42]

A1.8.1 The movement of moisture in concrete during the curing process and after application of the coating is important to consider in the design of the concrete structure. Concrete is normally placed with water levels in excess of that required to completely hydrate the cement. Excess free water in the concrete can adversely affect the application and cure of many coatings. Pressure caused by excess moisture in the concrete or from ground water may be substantial and, in some instances, may be sufficient to disbond barrier coating systems that appear to be well bonded. These pressures are commonly referred to as hydrostatic, capillary, and osmotic pressures.

A1.8.2 Concrete has traditionally been coated no sooner than 28 days after concrete placement (see Paragraph A1.10). In addition to allowing the concrete to sufficiently cure (see Paragraph A1.3), this waiting period allows excess moisture to evaporate prior to applying a barrier coating system. The waiting period is especially important if a vapor barrier (or positive-side waterproofing) is installed, which prevents moisture from exiting into the ground.

A1.8.3 The drying rate of concrete is a function of the concrete temperature, thickness, porosity, and initial free-water content. The drying rate is also a function of the velocity and dew point of the drying air. Excess free water can be removed by dehumidifiers, surface air movers, or surface heaters provided that (1) the forced drying does not begin until sufficient concrete strength is developed and (2) it does not adversely affect the concrete properties. Dehumidifiers lower the air dew point, can increase the air temperature, and perform best when the area is enclosed. Surface air movers direct low-dew point air across the concrete surface at high velocities, but they should be periodically repositioned to ensure uniform drying over the entire surface. Surface heaters increase the mobility of free water; they work best if the heat penetrates the concrete and if they do not raise the dew point of the drying air.

A1.8.4 Moisture Test Methods[40,41]

The following are some of the common methods used to identify or quantify the free moisture in concrete prior to the application of coatings.

ASTM D 4263, Plastic sheet method[19]

ASTM F 1869, Calcium chloride test[20]

ASTM F 2170, Relative humidity test[21]

ASTM E 1907, Conductivity test[43]

ASTM E 1907, Calcium carbide method[43]

ASTM E 1907, Capacitance-impedance method[43]

A1.8.5 Use and Interpretation of Moisture Test Methods

A1.8.5.1 The plastic sheet method[19] and the calcium chloride test are commonly used and accepted in the United States. The hygrometer and conductivity tests are cited in numerous British standards and are accepted in the United Kingdom, while the carbide method is accepted in other parts of Europe.

A1.8.5.2 All of these methods are quantitative except the plastic sheet method.[19] The plastic sheet, calcium chloride, and capacitance-impedance methods are nondestructive, while the hygrometer, conductivity, and calcium carbide methods involve drilling into the concrete.

A1.8.5.3 Testing duration is 16+ hours for the plastic sheet method[19] and 72 hours for the calcium chloride and relative humidity tests. The other methods give results immediately if the testing equipment has been calibrated.

A1.8.5.4 The plastic sheet method may indicate whether excess moisture is present at the time of the test. However, because the method depends on a moisture differential—a higher relative humidity in the concrete than in the air above the concrete surface—during the test span, potential problems are not always evident at the time the test is performed.

A1.8.5.5 Information on the tolerance of a specific coating system for free water or moisture migration should be provided by the coating manufacturer. A free water content of less than 5% by weight is acceptable for most coatings. Alternatively, concrete with a relative humidity of less than 80% or a moisture transmission rate of less than 15 g/24 hr/m^2 (3 lb/24 hr/1,000 ft^2) has proved acceptable for most coatings.

A1.8.5.6. Occasionally, despite moisture testing, a problem is not identified until after a low-permeability coating is applied.

A1.9 Surface Preparation Methods[17,32,44,45,46]

The surface preparation methods described in this standard are listed in Table A2 with their intended use, profile created, typical problems encountered when using each method, and solutions to those problems.

A1.9.1 Photographic examples of prepared concrete surfaces are shown in ASTM PCN:03-401079-14.[47]

A1.10 The 28-Day Waiting Period[48,49]

A1.10.1 The traditional 28-day waiting period after concrete placement and prior to coating installation is a controversial topic that involves all parties. Although the waiting period is not usually required for surface preparation, it affects the timing of surface preparation because many coatings are applied within 24 hours after surface preparation.

A1.10.2 The 28-day waiting period originated from the structural benchmark to test concrete strength at 28 days after placement to verify that the tested strength met the design strength. The 28-day benchmark became the industry standard to identify the point in time when the concrete was considered fully cured. The 28-day waiting period was adopted by the coating industry because it usually allows sufficient time for concrete surface strength to develop and for excess moisture to evaporate.

A1.10.3 Many factors can reduce or increase the time required for strength and moisture levels to be acceptable. In addition, many construction schedules do not allow for a 28-day waiting period. For these reasons, quantifying surface requirements as in Paragraph A1.12 are preferred over the traditional 28-day waiting period.

A1.10.4 NACE Standard RP0892[15] and ACI 515.1R[9] do not recommend a specific cure period but do address surface dryness, surface strength requirements, and other surface quality issues.

A1.11 Temperature Considerations

The temperature of the surface at the time of the coating application and the temperature progression during the application are both important. Rising concrete temperatures during the application of the coating systems may cause blistering and pinhole problems in the coating caused by out-gassing from the concrete. Coating application during periods of falling temperatures may be required to prevent this problem. Although controlling the ambient temperature in outdoor installations is difficult, concrete is often shaded from direct sunlight during coating application. In addition to potential problems from moisture in the concrete as described in Paragraphs A1.8.1 and A1.8.2, monitoring the dew point during periods of changing weather is often recommended to ensure that coatings are not applied over moisture that has condensed on the concrete surface.

Table A2:
Surface Preparation Methods

Preparation Method	When Used	Profile Created[A]	Problems	Solutions
Dry abrasive blasting	Removal, profile, cleaning	Fine (150) to extra coarse (40)	-Dust on surface -Airborne dust -Noise	-Vacuum cleaning -Vacuum attachments -None
Wet abrasive blasting	Removal, profile, cleaning	Fine (150) to extra coarse (40)	-Wets concrete -Creates sludge	-Let concrete dry -Cleaning
High-pressure water cleaning	Removal, cleaning	Fine (150) to extra coarse (40)	-Wets concrete -Creates sludge	-Let concrete dry -Cleaning
Waterjetting (with or without abrasive)	Removal	Rougher than extra coarse	-Creates sludge -Wets concrete -Coarse profile	-Cleaning -Let concrete dry -None[B]
Impact tools	Removal, profile, cleaning	Rougher than extra coarse	-Airborne dust -Fracturing -Coarse profile	-Vacuum attachments -Other methods -None[B]
Power tools	Removal	Smooth (no grit equivalent)	-Airborne dust -Fine profile	-Vacuum attachments -Other methods
Flame blasting	Removal, profile, cleaning	Rougher than extra coarse	-Excess removal -Damages concrete	-Experience[B] -Remove damaged concrete
Acid etching	Profile, cleaning	Fine (150) to coarse (60)	-Hazardous -Not for vertical or overhead surfaces -Neutralization -Wets concrete -Curing membrane	-Other acids -Other methods -pH testing -Let concrete dry -Other methods

[A] Profile is described using graded abrasive paper sizes. These are typical surface profile values only. Results may vary significantly because of concrete properties and surface preparation practices.
[B] For coating systems that do not perform over a coarse profile, refinishing the concrete or an underlayment may be required.

A1.12 Recommendations for Procurement Documents (Project Specifications) for Concrete Surface Preparation

Because of the wide range of concrete types, existing concrete conditions, ambient conditions, types of protective coatings to be applied, and project scheduling, producing a comprehensive standard that can be used as a project specification is not possible. Therefore, the following is a checklist of items that should be included in a comprehensive procurement document.

A1.12.1 SSPC-SP 13/NACE No. 6

A1.12.2 Contaminants

A1.12.2.1 Types anticipated

A1.12.2.2 Detection methods

A1.12.2.3 Preferred removal method

A1.12.2.4 Other acceptable removal methods

A1.12.3 Surface Preparation

A1.12.3.1 Preferred method

A1.12.3.2 Other acceptable methods

A1.12.4 Surface Tensile Strength

A1.12.4.1 Minimum allowable

A1.12.4.2 Test method and mode of failure

A1.12.5 Surface Profile

A1.12.5.1 Minimum and maximum allowable

A1.12.5.2 Test method or visual comparison

A1.12.6 Surface Uniformity

A1.12.6.1 Maximum allowable void size

A1.12.7 Repairs and Patching

A1.12.7.1 Preferred materials

A1.12.7.2 Other acceptable materials

A1.12.8 Cleanliness

A1.12.8.1 Maximum allowable residual dust level

A1.12.8.2 Test method or visual comparison

A1.12.9 Moisture Content

A1.12.9.1 Maximum allowable

A1.12.9.2 Test method and when to test (e.g., before or after surface preparation, or immediately before coating)

A1.12.10 Surface Flatness and Levelness

A1.12.10.1 Minimum and maximum slope allowed

A1.12.10.2 Minimum flatness allowed

A1.12.10.3 Test method or visual comparison

Revêtements Industriels et Marins

GENERAL POLYMERS® 3579
APPRÊT/LIANT ÉPOXY STANDARD

PARTIE A GP3579 **SÉRIE**
PARTIE B GP3579B01 **DURCISSEUR STANDARD**

Rév. 23 sept. 2014

RENSEIGNEMENTS SUR LE PRODUIT

DESCRIPTION DU PRODUIT

L'apprêt/liant époxy standard GENERAL POLYMERS 3579 est un apprêt époxy à teneur élevée en solides, clair ou pigmenté et une résine liante. L'apprêt/liant époxy standard GENERAL POLYMERS 3579 est offert en rouge, blanc, gris ou clair, offre une bonne résistance à l'opalescence et une faible viscosité favorisant la pénétration dans le substrat de béton et une excellente humidification de l'agrégat.

AVANTAGES

- Bonne résistance à l'opalescence à température ambiante
- Faible module d'élasticité, recuit de détente
- Utilisation acceptable dans les installations vérifiées par la USDA

USAGES TYPES

L'apprêt/liant époxy standard GENERAL POLYMERS 3579 est un apprêt époxy pour revêtements, coulis, mortiers et ragréages. Il peut également servir de résine liante. Pour les coulis, mortiers et ragréages. Convient à l'industrie des mines et minéraux.

LIMITATIONS

- La dalle au sol nécessite un pare-vapeur et un pare-humidité.
- Le substrat doit être sec et propre.
- Les conditions fraîches et humides peuvent causer de l'opalescence.
- Le substrat doit être sain, propre et exempt de contaminants pouvant nuire à l'adhérence.
- Durant l'installation et le cycle de durcissement initial, la température du substrat et de l'air ambiant doit être d'au moins 10 °C (50 °F). La température du substrat doit être au moins 3 °C (5 °F) plus élevée que le point de rosée (pour une application à température inférieure, communiquer avec les services techniques).
- Au besoin, assurer une ventilation adéquate et le port de vêtements et de masques de protection appropriés.
- **Respecter rigoureusement les taux d'étalement publiés.**

PRÉPARATION DE LA SURFACE

L'inspection et la préparation du substrat à recevoir une matière résineuse sont déterminantes. Lire et suivre les « Instructions pour la préparation de surfaces de béton » (Formulaire G-1) pour plus de détails.

CARACTÉRISTIQUES DU PRODUIT

Couleur :	Clair, rouge, gris, blanc
Ratio du mélange :	2:1
Volume des solides :	96 % ± 2 %, mélangé
Poids des solides :	96 % ± 2 %, mélangé
COV (méthode EPA 24) :	<50 g/L mélangé; 0,41 lb/gal
Viscosité, mélangé :	2 100 Pa s

Taux d'étalement recommandé, par couche :

	Minimum	Maximum
Mils humides (microns) **:**	**6** (150)	**20** (500)
~Recouvrement pi²/gal (m^2/L) :	**varie selon l'utilisation**	

Temps de séchage à 6 mils (150 microns) humides :

	23 °C (73 °F)
Au toucher :	6 à 8 heures
Recouvrement :	10 à 20 heures

Si le délai maximum de recouvrement est dépassé, poncer la surface avant d'appliquer une nouvelle couche. Le temps de séchage dépend de la température, de l'humidité et de l'épaisseur du feuil.

Durée de vie :	gallon	25 à 30 minutes	à 23 °C (73 °F)

Durée de conservation :	Partie A :	36 mois, non ouvert
	Partie B (standard) :	36 mois, non ouvert
	Entreposer à l'intérieur entre 10 °C et 32 °C (50 °F et 90 °F)	
Point d'éclair :	>110 °C (>230 °F), ASTM D 93, mélangé	

PERFORMANCE

Nom du test	Méthode	Résultats
Adhérence	ACI 503R	300 psi, rupture du béton
Résistance à la compression	ASTM D695	9 000 psi
Inflammabilité		Auto-extinction sur béton
Résistance à la flexion	ASTM D790	6 000 psi
Dureté, Shore D	ASTM D2240	75/65
Résistance à la traction	ASTM D638	3 000 psi

suite au verso

Revêtements Industriels et Marins

GENERAL POLYMERS® 3579
APPRÊT/LIANT ÉPOXY STANDARD

PARTIE A	GP3579	SÉRIE
PARTIE B	GP3579B01	DURCISSEUR STANDARD

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RENSEIGNEMENTS SUR LE PRODUIT

APPLICATION

INSTRUCTIONS D'APPLICATION

1. Ajouter 2 parts de 3579A (résine) à 1 part de 3579B (durcisseur) par volume. Mélanger à basse vitesse et à l'aide d'une pale de malaxage de type Jiffy pendant 3 minutes et jusqu'à l'obtention d'un mélange homogène. Pour obtenir le durcissement et la performance indiqués, suivre rigoureusement les recommandations de ratio du mélange.

2. Appliquer 3579 par pulvérisation, rouleau ou pinceau. Appliquer uniformément, en évitant les flaques. La couverture dépendra de la porosité du substrat et de la texture de la surface.

3. L'application de 3579 varie selon l'utilisation.

Remarque : L'époxy a tendance se voiler à la surface surtout dans un environnement humide. Après avoir appliqué l'apprêt sur la surface et avant chaque application de couche subséquente, la surface doit être examinée pour détecter toute opalescence (film gras blanchâtre ou mat). L'opalescence doit être entièrement retirée avant d'appliquer un revêtement à l'aide d'une eau tiède savonneuse ou d'un nettoyage au solvant.

Les matériaux époxy peuvent sembler durcis et secs au toucher avant la pleine liaison chimique. Laisser l'époxy durcir 2 à 3 jours avant de l'exposer à l'eau ou autres produits chimiques afin de maximiser le rendement.

FORMATS DISPONIBLES

Emballage :

Partie A :	1 gallon (3,8 L) et 5 gallons (18,9 L)
Partie B :	1 gallon (3,8 L) et 5 gallons (18,9 L)
Poids :	9,4 ± 0,2 % lb/gal; 1,13 kg/L mélangé, peut varier selon la couleur

INSTRUCTIONS DE NETTOYAGE

Nettoyer les appareils de malaxage et d'application immédiatement après usage. Utiliser du toluène ou du xylène. Respecter toutes les précautions en matière d'incendie et de santé lors de la manipulation ou de l'entreposage des solvants.

CONSIGNES DE SÉCURITÉ

Consulter la fiche signalétique (MSDS) avant d'utiliser ce produit.

Les fiches techniques et les instructions peuvent être modifiées sans préavis. Consulter le représentant Sherwin-Williams afin d'obtenir de l'information technique et des instructions supplémentaires.

ENTRETIEN

L'inspection occasionnelle du matériau installé ainsi que des réparations ponctuelles peuvent prolonger la durée de vie du système. Pour de plus amples renseignements, communiquer avec les services techniques.

LIVRAISON

- Les livraisons à l'est des Rocheuses sont expédiées FAB Cincinnati, Ohio.
- Les livraisons à l'ouest des Rocheuses sont expédiées FAB Victorville, Californie.

Pour de plus amples renseignements sur les livraisons internationales, communiquer avec votre représentant local.

AVIS DE NON-RESPONSABILITÉ

Toutes les informations et recommandations mentionnées dans cette fiche technique sont basées sur des tests effectués par ou pour Sherwin-Williams. Ces informations et recommandations peuvent être modifiées et visent les produits offerts au moment de la publication. Consulter le représentant Sherwin-Williams afin d'obtenir la plus récente copie de l'information technique et du Bulletin d'application.

GARANTIE

Les produits de Sherwin-Williams sont garantis contre tout défaut de fabrication conformément aux procédures de contrôle de la qualité applicables de Sherwin-Williams. La responsabilité à l'égard des produits prouvés défectueux, le cas échéant, se limite au remplacement du produit défectueux ou au remboursement du prix d'achat du produit défectueux tel qu'établi par Sherwin-Willams. AUCUNE AUTRE GARANTIE N'EST OFFERTE PAR SHERWIN-WILLIAMS, EXPRESSE OU IMPLICITE, LÉGALE, EN VERTU DE LA LOI OU AUTRE, INCLUANT LA QUALITÉ MARCHANDE OU L'APTITUDE À UN USAGE PRÉCIS.

Revêtements Industriels et Marins

GENERAL POLYMERS® 3744
ÉPOXY CR HAUTE PERFORMANCE

PARTIE A	GP3744A	SÉRIE
PARTIE B	GP3744B01	DURCISSEUR STANDARD
PARTIE B	GP3744B02	DURCISSEUR RAPIDE

Rév. 23 sept. 2014

RENSEIGNEMENTS SUR LE PRODUIT

DESCRIPTION DU PRODUIT

L'époxy CR haute performance GENERAL POLYMERS 3744 est un revêtement époxy et une résine liante deux composants à teneur élevée en solides. L'époxy CR haute performance GENERAL POLYMERS 3744 peut être utilisé directement sur des substrats apprêtés approuvés ou à titre de couche de scellant lustrée sur les systèmes décoratifs. Sa résistance à un large éventail de produits chimiques assure une protection dans les environnements agressifs. L'époxy CR haute performance GENERAL POLYMERS 3744 est extrêmement durable et résistant à l'impact et à l'abrasion.

AVANTAGES

- Résistance à l'impact et à l'abrasion
- Résistance aux taches
- Résistance aux produits chimiques
- Offert avec agent antimicrobien
- Offert en version durcissement rapide
- Utilisation acceptable dans les installations vérifiées par la USDA

USAGES TYPES

L'époxy CR haute performance GENERAL POLYMERS 3744 doit être utilisé dans les endroits qui nécessitent l'entretien de systèmes époxy haute performance, esthétiques et résistants aux produits chimiques.

LIMITATIONS

- La dalle au sol nécessite un pare-vapeur et un pare-humidité.
- Le substrat doit être sain, sec et exempt de contaminants pouvant nuire à l'adhérence.
- Durant l'installation et le cycle de durcissement initial, la température du substrat et de l'air ambiant doit être d'au moins 10 °C (50 °F). La température du substrat doit être au moins 3 °C (5 °F) plus élevée que le point de rosée (pour une application à température inférieure, communiquer avec les services techniques).
- La température maximale de la surface sèche ne doit pas dépasser 71 °C (160 °F).
- Respecter rigoureusement les taux d'étalement publiés.
- Appliquer à 10 mils avec le blanc pour une couverture complète.

PRÉPARATION DE LA SURFACE

L'inspection et la préparation du substrat à recevoir une matière résineuse sont déterminantes. Lire et suivre les « Instructions pour la préparation de surfaces de béton » (Formulaire G-1) pour plus de détails.

CARACTÉRISTIQUES DU PRODUIT

Couleur :	Clair
Ratio du mélange :	2:1
Volume des solides :	96 % ± 2 %, mélangé
Poids des solides :	98 % ± 2 %, mélangé
COV (méthode EPA 24) :	<50 g/L; 0,41 lb/gal
Viscosité, mélangé :	2 017 Pa s, clair

CARACTÉRISTIQUES DU PRODUIT (SUITE)

Taux d'étalement recommandé, par couche :

	Minimum	Maximum
Mils humides (microns) **:**	**6** (150)	**10** (250)
~Recouvrement pi²/gal (m^2/L) :	**240** (6)	**160** (4)

Temps de séchage à 6 mils (150 microns) humides :

Durcisseur standard	**23 °C (73 °F)**
Au toucher :	4 à 6 heures
Recouvrement :	12 à 16 heures
Circulation légère :	24 heures minimum
Durcissement complet :	7 jours

Si le délai maximum de recouvrement est dépassé, poncer la surface avant d'appliquer une nouvelle couche. Le temps de séchage dépend de la température, de l'humidité et de l'épaisseur du feuil.

Durée de vie : gallon 30 minutes à 23 °C (73 °F)

Durcisseur rapide	
Au toucher :	**3 à 4 heures**
Recouvrement :	**6 à 8 heures**
Circulation légère :	**10 à 12 heures**
Durcissement complet :	**7 jours**

Durée de conservation :	Partie A :	36 mois, non ouvert
	Partie B (standard) :	36 mois, non ouvert
	Partie B (rapide) :	12 mois, non ouvert
	Entreposer à l'intérieur entre 10 °C et 32 °C (50 °F et 90 °F)	
Point d'éclair :	>130 °C (>266 °F), ASTM D 93, mélangé	

PERFORMANCE

Nom du test	Méthode	Résultats
Résistance à l'abrasion	ASTM D4060, roue CS17, 1 000 cycles	100 mg de perte
Adhérence	ACI 503R	300 psi
Inflammabilité		Auto-extinction sur béton
Résistance à la flexion	ASTM D790	12 400 psi
Lustre à 23 °C (73 °F), 50 % HR	60° brillancemètre	85 unités
Dureté, Shore D	ASTM D2240	80
Résistance à l'impact	MIL-D-3134J	Direct – po-lb > 160, réussi Inverse – po-lb > 80, réussi
Résistance aux températures élevées	MIL-D-3134J	Aucun écoulement ou glissement à la température requise de 70 °C (158 °F)
Résistance à la traction	ASTM D638	6 000 psi
Absorption de l'eau	ASTM C413	0,10 %

suite au verso

Revêtements Industriels et Marins

GENERAL POLYMERS® 3744
ÉPOXY CR HAUTE PERFORMANCE

PARTIE A	GP3744A	SÉRIE
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Rév. 23 sept. 2014

RENSEIGNEMENTS SUR LE PRODUIT

APPLICATION

INSTRUCTIONS D'APPLICATION

1. Mélanger préalablement 3744A (résine) à basse vitesse et l'aide d'une pale de malaxage de type Jiffy. Mélanger pendant 1 minute et jusqu'à l'obtention d'un mélange homogène, en prenant soin de ne pas introduire d'air dans le produit.

2. Ajouter 2 parts de 3744A (résine) à 1 part de 3744B (durcisseur) par volume. Mélanger à basse vitesse et l'aide d'une pale de malaxage de type Jiffy pendant 3 minutes et jusqu'à l'obtention d'un mélange homogène. Pour obtenir le durcissement et la performance indiqués, suivre rigoureusement les recommandations de ratio du mélange.

3. Appliquer 3744 à l'aide d'un racloir ou d'une truelle et repasser à l'aide d'un rouleau à poils de 1/4 po à un taux d'étalement de 160 à 240 pi^2 par gallon pour générer 6 à 8 mils EFH, sans faire de flaques en assurant une couverture uniforme. **Prendre soin d'éviter les flaques et d'assurer un étalement uniforme.**

4. Laisser durcir 24 heures avant de permettre une circulation piétonne légère et l'exposition à l'eau.

Remarque : Les matériaux époxy peuvent sembler durcis et secs au toucher avant la pleine liaison chimique croisée. Laisser l'époxy durcir 2 à 3 jours avant de l'exposer à l'eau ou autres produits chimiques afin de maximiser le rendement.

FORMATS DISPONIBLES

Emballage :	
Partie A :	1 gallon (3,8 L) et 5 gallons (18,9 L)
Partie B :	1 gallon (3,8 L) et 5 gallons (18,9 L)
Poids :	9,68 ± 0,2 % lb/gal; 1,16 kg/L mélangé, peut varier selon la couleur

RÉSISTANCE AUX PRODUITS CHIMIQUES

Pour des renseignements complets sur la résistance aux produits chimiques, consulter le *Chemical Resistance Guide* et communiquer avec les services techniques.

INSTRUCTIONS DE NETTOYAGE

Nettoyer les appareils de malaxage et d'application immédiatement après usage. Utiliser du toluène ou du xylène. Respecter toutes les précautions en matière d'incendie et de santé lors de la manipulation ou de l'entreposage des solvants.

CONSIGNES DE SÉCURITÉ

Consulter la fiche signalétique (MSDS) avant d'utiliser ce produit.

Les fiches techniques et les instructions peuvent être modifiées sans préavis. Consulter le représentant Sherwin-Williams afin d'obtenir de l'information technique et des instructions supplémentaires.

ENTRETIEN

L'inspection occasionnelle du matériau installé ainsi que des réparations ponctuelles peuvent prolonger la durée de vie du système. Pour de plus amples renseignements, communiquer avec les services techniques.

LIVRAISON

- Les livraisons à l'est des Rocheuses sont expédiées FAB Cincinnati, Ohio.
- Les livraisons à l'ouest des Rocheuses sont expédiées FAB Victorville, Californie.

Pour de plus amples renseignements sur les livraisons internationales, communiquer avec votre représentant local.

AVIS DE NON-RESPONSABILITÉ

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3.4 FLANGE CONNECTIONS

.1 Non-metallic trims, with the exception of red rubber, will only be coated with lubricant when specified in the material classification standards or in the manufacturing specifications.

.2 Unless otherwise indicated in the plans, the VAN STONE sealant rings or approved equivalent will be welded perpendicular to the pipes.

.3 Two to four threads will protrude from the flange bolts when tightened.

.4 The bolts will be tightened gradually and evenly so that even pressure will be applied on the trims.

.5 Any drippings from the welding of the flanges connecting the instruments will be removed and the inside of the welds will be grinded smooth.

.6 The inside diameter of the welding neck flange cones to be welded to the end of the instruments' diaphragms will be bored in order to be adaptable to the inside diameter of the pipe.

.7 All of the flanges will be installed perpendicular to the pipe or connection.

.8 Always use new trims, even when the valves have been removed for testing.

3.5 SPECIAL JOINTS

.1 The pipes subjected to important variations in temperature will be equipped with joints that can absorb the heat expansion.

.2 The pipes subjected to heavy vibrations will be equipped with joints capable of absorbing the said vibrations. ◀

.3 The couplings between different types of pipes will be water tight. In addition, dielectric fittings will be used to isolate two incompatible metals in order to avoid corrosion.

3.6 DETAILED PIPE INSPECTION

.1 Before the isometric drawings for the prefabricated piping are produced, the path of the pipes will be examined in order to identify all interferences, if applicable, with structures, machinery and equipment, supports, pipes, valves and any other obstacle, which will be reported to the Departmental Representative in order to take corrective action, if applicable.

3.7 PIPE BENDING

.1 The pipe bends will be made so that the maximum and minimum diameters are not larger than 5%. They will be without flat surfaces or waves.

.2 Pipes will be cold bent to a radius equal to or smaller than five times the pipe's nominal diameter and will be subjected to treatment in order to release internal stress.

.16 The motors will be Premium Efficiency Motors.

.17 Provide a performance test report for each pump ◄

2.2 VERTICAL TURBINE PUMPS AND MOTORS (FILTERED SEA WATER)

.1 For each vertical turbine pump, the General Contractor will supply and install one (1) water lubricating system for the shaft and column.

.2 Each impeller's flow straightener will be in stainless steel 316. The impellers will be in stainless steel 316, equipped with a wear ring. The pump will have a stainless steel 316 open line shaft with a mechanical seal. ◄

.3 The pump's column will be in stainless steel 316 with flange connections that can be disassembled in lengths of 1.2 m.

.4 The transmission shaft will be in stainless steel 316 and provided in lengths of 1.2 m. The shaft's bearings will be in neoprene and supported by stainless steel 316 cross-braces. The maximum deflection allowed is .003 mils.

.5 The pump's head will be in stainless steel 316, with ANSI class 150 flange connections, unless otherwise indicated in the table below. It will be fastened to a steel support plate coated with 25 mm of epoxy. The plate will be bolted to the concrete base with four (4) 25 mm ∅ bolts. The bolts will be anchored to the slab.

.6 The size and capacity of the supporting base plate will suffice to support the entire weight of the suspended parts, plus the hydraulic load, and include a good safety margin.

.7 The size of the bolts for the supporting base plate will suffice to support the suspended equipment safely during the pump's installation or repairs.

.8 The pump's suction will be equipped with a basket-type stainless steel 316 strainer.

.9 The pumps will have the following special features:

	Filtered Sea Water Pumping Facility
Make and Model	SH10C-3 de SIMFLO, EC-2359 de Flow Serve or approved equivalent
Model	SH10C-3
Capacity	28L/s @ 45 m (450 USGPM at 155 ft)
Number of stages	3
Length of column section (mm)	1,219 mm (48 inches) maximum
Junction type	Flange
Shaft diameter (inches)	1
Type of water tight casing (psig)	400
Speed (RPM)	1800
Motor (HP)	30
Variable speed (inverter duty motor)	Yes
Winding thermistor	No
Column (mm)	150

	Filtered Sea Water Pumping Facility
Efficiency minimum	75 %
Connection flange	250 # FF
Discharge (mm)	150
Number of pumps to supply	4

.10 Provice a performance test report for pump.

Part 3 Motors

3.1 VERTICAL TURBINE PUMP MOTOR

.1 The main electric motor will be vertical with a hollow shaft, high efficiency, protected against the weather, induction-type, squirrel-cage, make: US MOTOR, Emerson (or approved equivalent).

.2 The motor will meet the requirements of the CEMA standard. It will be designed based on a continuous service factor that will allow a 15% overload when stopping. The isolation will be Class B and of the best quality, which will allow an increase in temperature of 90°C above the temperature rating point of 40°C. The motor will be equipped with a non-reverse ratchet.

.3 The motor will operate on Hydro-Québec's power network at 600 volts, ±10%.

.4 The following table lists the characteristics of the electric motors:

	Filtered Sea Water Pumping Facility
Power (HP)	30
Supply	575 V, 3 ø, 60Hz
Speed	1,800
Winding thermistor	No

.5 Motors that will not be required to operate at variable speeds will be designed to start with "soft-start / soft-stop" electronic semiconductor motor controllers.

.6 Motors that will be required to operate at variable speeds will be inverter duty.

.7 The General Contractor will verify pump vibrations with the pump supplier in attendance.

3.2 PUMPS AND SPARE PARTS

.1 A replacement raw sea water pump and a complete set of spare parts, including an O-ring, seals of every type (for the nose piece, for the impeller at the shaft sleeve, for the impeller bolt, for the volute, etc.) and a mechanical seal will be supplied.

Part 4 Commissioning and Training

.1 The General Contractor will carry out operational and capacity tests, as well as the commissioning of the equipment with the pump suppliers in attendance, as required by the general administrative clauses. Specifically, the General Contractor will carry out all

.3 The casing of the rectifier is made out of painted steel.

.4 Rectifier made stainless steel supports anchored to the slab made out of stainless steel

.5 Ventilated, thermal protected with automatic starter

.6 Lightning protection

.7 Voltage and amperage measurements terminals

.8 Local ON/OFF terminal

.9 Circuit for a remote ON/OFF

.10 High limit amperage protection system

.11 Ampere meter and volt meter.

.12 Timer for ON/OFF function

.3 The rectifier's power supply will be chosen by the contractor between existing 208V and 575V present in the pump room. At the secondary, the rectifiers should supply 90 A at 18 VDC. Rectifier must be protected at maximum DC current. ←

2.6 ELECTRICAL CABLES AND CONNECTIONS

.1 All the AC cables must be copper and the fabrication and dimensions must comply with in force Electrical Code.

.2 All the immersed DC cables must be specifically designed to permanently resist to sea-water. Contractor must supply a certification of such. The anodes immersed cables must be double insulated, Hallar type and H.M.W.P.E., and protected by a flexible conduit in the sections that are not protected by a metallic channel.

.3 The connections of DC cables located in the two wells should be 316 stainless steel. Copper - steel connections should be protected by sealed with thermos shrinkable water proof gains. ←

.4 The cables splices must be designed for sea-water utilization. Contractor must provide, for approval, a sample and the technical data sheets of the materials taken for the splices execution. As a guide for the splices fabrication, the Contractor must take the following requirements into account:

.1 The anodes cables connection will be double: mechanical and by a weld.

.2 It is the Contractor's responsibility to design and make the splices according to the preceding requirements or otherwise. the Contractor can propose other types of splices or improve the ones described above. In all cases, the Contractor must provide a shop drawing and a sample of his design at least one week before the splices fabrication.

.3 It is specifically indicated that the epoxy layer must be shop made in controlled temperature and moisture conditions, according to the product technical data sheet.

.5 The minimum dimension (No. AWG) of the cables is as follows:

.1 All anodes cables are no 8 type and double isolation gain of Hallar and HMWPE.

.2 The structure negative cables located in the two wells are Nr. 8, RWU 90 type. ←

.3 The anodes main cables and the structure negative cables located in the pump's room are Nr. 1, RWU 90 type. ←

PLANCHER DE BÉTON À PEINDRE SUR TOUTE LA SURFACE, VOIR DEVIS
ALL SURFACE OF THE CONCRETE FLOOR TO PAINT, SEE CONSTRUCTION SPECIFICATION

1

SUPPORTS DE CONDUITES EN ACIER INOXYDABLE
PIPING SUPPORTS IN STAINLESS STEEL

POMPE AUTO-AMORÇANTE, VOIR MÉCANIQUE
SELF PRIMING PUMP, SEE MECHANICAL

MOTEUR
MOTOR

NOUVELLE BASE DE BÉTON, VOIR DÉTAIL
NEW CONCRETE SLAB, SEE DETAIL

SURFACE DE LA DALLE À RAGRÉER AVEC UN MORTIER DE RÉPARATION SIKATOP 123 PLUS OU ÉQUIVALENT APPROUVÉ
SURFACE SLAB TO REFIT WITH MORTAR REPAIR SIKATOP 123 PLUS OR APPROVED EQUAL

NOTE :
POUR LA DÉMOLITION DES BASES DE BÉTON, VOIR MÉCANIQUE.
NOTE :
FOR DEMOLITION OF CONCRETE BASES, SEE MECHANICAL.

1

B
1 | 1

HSS102x76x6.4

HSS102x102x6.4

TE 150ø
ER

EAU BRUTE 150ø
RAW WATER

150ø

75ø

±310

±650

±910

±940

±2810

A
1 | 1

1150

VUE EN PLAN
PLAN VIEW

0 1000

1: 20

INGÉNIEUR
Michaël Rioux
5008878
QUÉBEC

28/09/2016

CLIENT			
Travaux publics et Services gouvernementaux Canada	Public Works and Government Services Canada	SAINTE-FLAVIE INSTITUT MAURICE LAMONTAGNE	TETRA TECH
Direction générale des biens immobiliers	Real Property branch	TITRE: STRUCTURE ADDENDA #1	464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1 Téléphone: 418 723-8151 Téléphone: 1 877 723-8151 Télécopieur: 418 723-7822 Projet: 2050178
Région du Québec	Quebec region		PROJET R.071686.001 / ECHELLE INDIQUÉE / REVISION 0
			DATE 2016-09-28

No.	REVISION	PAR	DATE

DESSINE PAR	APPROUVÉ PAR	NUMERO DE DESSIN	FEUILLE
G.L. techn.	M.R. ing.	RM16013C/S01	1 DE 1

FORMAT BH Impérial 17"x11"

1

SUPERFICIE DE PAVAGE À RÉPARER 380m² INCLUANT SUPERFICIE NÉCESSAIRE POUR LE RACCORDEMENT DES CONDUITES D'EAU BRUTE ET UNE SUPERFICIE CONNEXE À LA ZONE DES TRAVAUX. LES TRAVAUX INCLUENT LES TRAITS DE SCIE, L'ENLÈVEMENT DES MATÉRIAUX CONTAMINÉS, 50mm DE PIERRE CONCASSÉE MG–20, LA PRÉPARATION ET LE PAVAGE EN BÉTON BITUMINEUX DE TYPE ESG–14 SUR 80mm D'ÉPAISSEUR

SURFACE OF PAVING TO BE REPAIRED 380m² INCLUDING SURFACE NECESSARY FOR THE CONNECTION TO THE RAW SEA WATER PIPES AND RELATED SURFACE TO THE ZONE OF WORK. WORK INCLUDES THE KERFS, THE REMOVAL OF CONTAMINATED MATERIALS, 50mm OF STONE CRUSHED MG–20, THE PREPARATION AND PAVING OUT OF ASPHALTIC CONCRETE OF TYPE ESG–14 ON 80mm THICKNESS

RACCORDEMENT À L'EXISTANT, VOIR FEUILLETS RM16013C–C02 ET RM16013C–M02

CONNECTION TO EXISTING INSTALLATIONS SEE DRAWINGS RM16013C–C02 AND RM16013C–M02

ST–LAURENT
RENCE RIVER

5 389 450 m N.

5 389 450 m N.

0+100
0+080
0+060
0+040
0+020
0+000

256 525 m E.

256 550 m E.

RADIER
INVERT
6.656

RADIER
INVERT
5.726

RADIER
INVERT
5.356

RADIER
INVERT
6.646

RADIER
INVERT
6.361

ÉGOUT SANITAIRE
200 mm ø
SANITARY SEWER

0+001 DÉBUT DES TRAVAUX
START POINT OF WORKS

5 389 375 m N.

POSTE DE POMPAGE D'EAU BRUTE EXISTANT À MODIFIER, VOIR PLANS DE MÉCANIQUE DE PROCÉDÉ

EXISTING RAW WATER PUMPING STATION TO MODIFY, SEE MECHANICAL PROCESS DRAWINGS

5 389 350 m N.

ÉGOUT PLUVIAL 600mm ø
STORM SEWER

AQUEDUC 250mm ø
AQUEDUCT

AGRANDISSEMENT
ENLARGEMENT

INSTITUT MAURICE LAMONTAGNE INSTITUTE

F–1

F–2

B

C

PLAN D'ENSEMBLE
GENERAL LAYOUT

0 37.5 m

1:750

INGÉNIEUR · ENGINEER
Serge Ruest
101682
QUÉBEC

FORMAT BH Impérial 17"x11"

CLIENT

Travaux publics et Services gouvernementaux Canada
Public Works and Government Services Canada

Direction générale des biens immobiliers
Real Property branch

Région du Québec
Quebec region

No.	REVISION	PAR	DATE

SAINTE–FLAVIE
INSTITUT MAURICE LAMONTAGNE

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GÉNÉRALITÉ
ADDENDA #1

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APPROUVÉ PAR: S.RUEST

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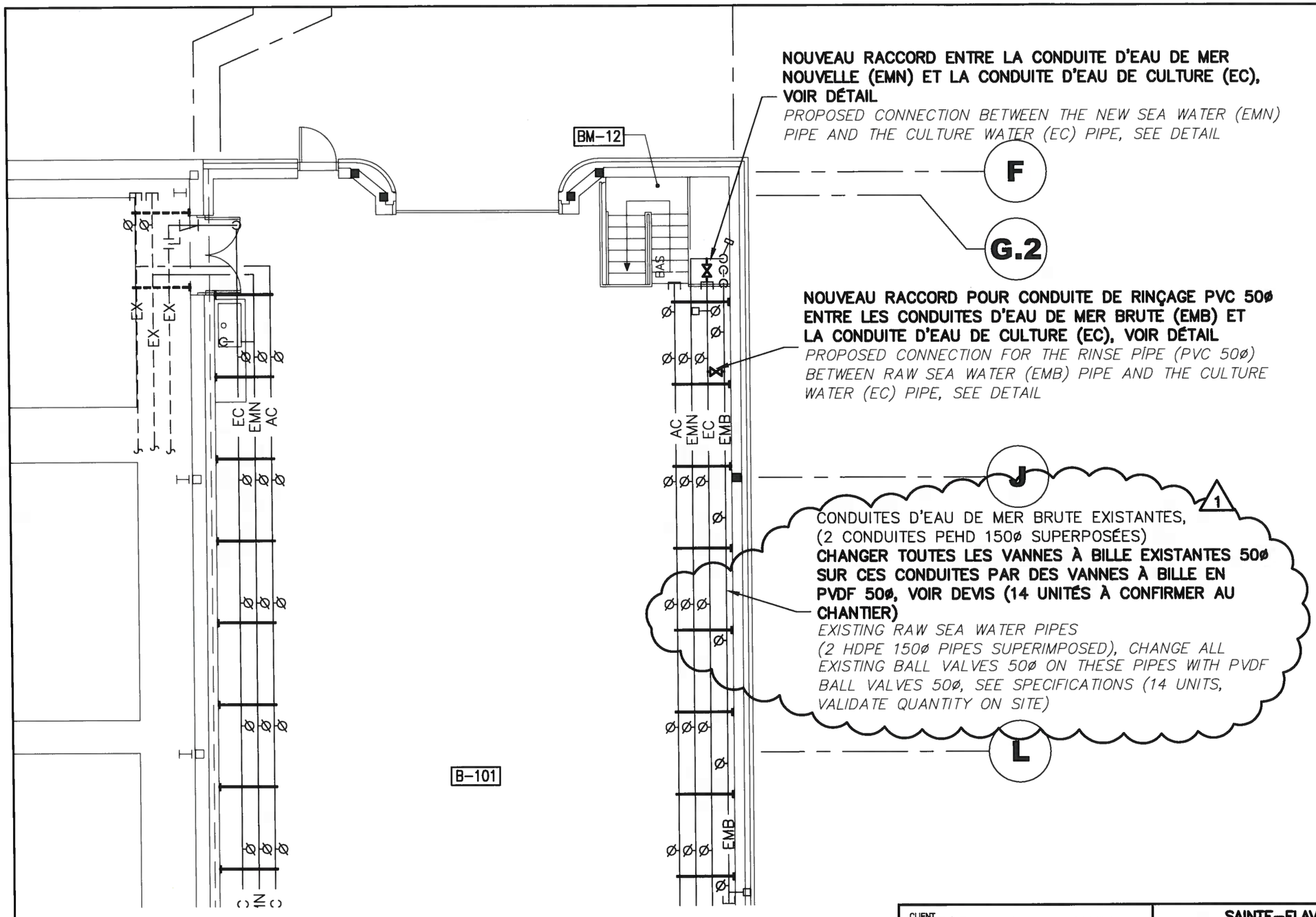
Projet 29501TTB

PROJET	R.071688.001	ECHELLE	REVISION
DATE	2016–09–28	INDIQUÉE	1

NUMERO DE DESSIN: RM16013C–G01
FEUILLE: 1 DE 1



NOUVEAU RACCORD ENTRE LA CONDUITE D'EAU DE MER NOUVELLE (EMN) ET LA CONDUITE D'EAU DE CULTURE (EC), VOIR DÉTAIL

PROPOSED CONNECTION BETWEEN THE NEW SEA WATER (EMN) PIPE AND THE CULTURE WATER (EC) PIPE, SEE DETAIL

F

G.2

NOUVEAU RACCORD POUR CONDUITE DE RINÇAGE PVC 50ø ENTRE LES CONDUITES D'EAU DE MER BRUTE (EMB) ET LA CONDUITE D'EAU DE CULTURE (EC), VOIR DÉTAIL

PROPOSED CONNECTION FOR THE RINSE PIPE (PVC 50ø) BETWEEN RAW SEA WATER (EMB) PIPE AND THE CULTURE WATER (EC) PIPE, SEE DETAIL

J

1

CONDUITES D'EAU DE MER BRUTE EXISTANTES,
(2 CONDUITES PEHD 150ø SUPERPOSÉES)
CHANGER TOUTES LES VANNES À BILLE EXISTANTES 50ø SUR CES CONDUITES PAR DES VANNES À BILLE EN PVDF 50ø, VOIR DEVIS (14 UNITÉS À CONFIRMER AU CHANTIER)

EXISTING RAW SEA WATER PIPES (2 HDPE 150ø PIPES SUPERIMPOSED), CHANGE ALL EXISTING BALL VALVES 50ø ON THESE PIPES WITH PVDF BALL VALVES 50ø, SEE SPECIFICATIONS (14 UNITS, VALIDATE QUANTITY ON SITE)

L

INGÉNIEUR
Yannick Januel
5019364
QUÉBEC
28/09/2016

FORMAT BH Impérial 17"X11"

CLIENT
Travaux publics et Services gouvernementaux Canada
Public Works and Government Services Canada
Direction générale des biens immobiliers
Real Property branch
Région du Québec
Quebec region

No.	REVISION	PAR	DATE

SAINTE-FLAVIE
INSTITUT MAURICE LAMONTAGNE

TITRE
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TETRA TECH
464, boul. St Germain Ouest Rimouski (Québec) G5L 3P1
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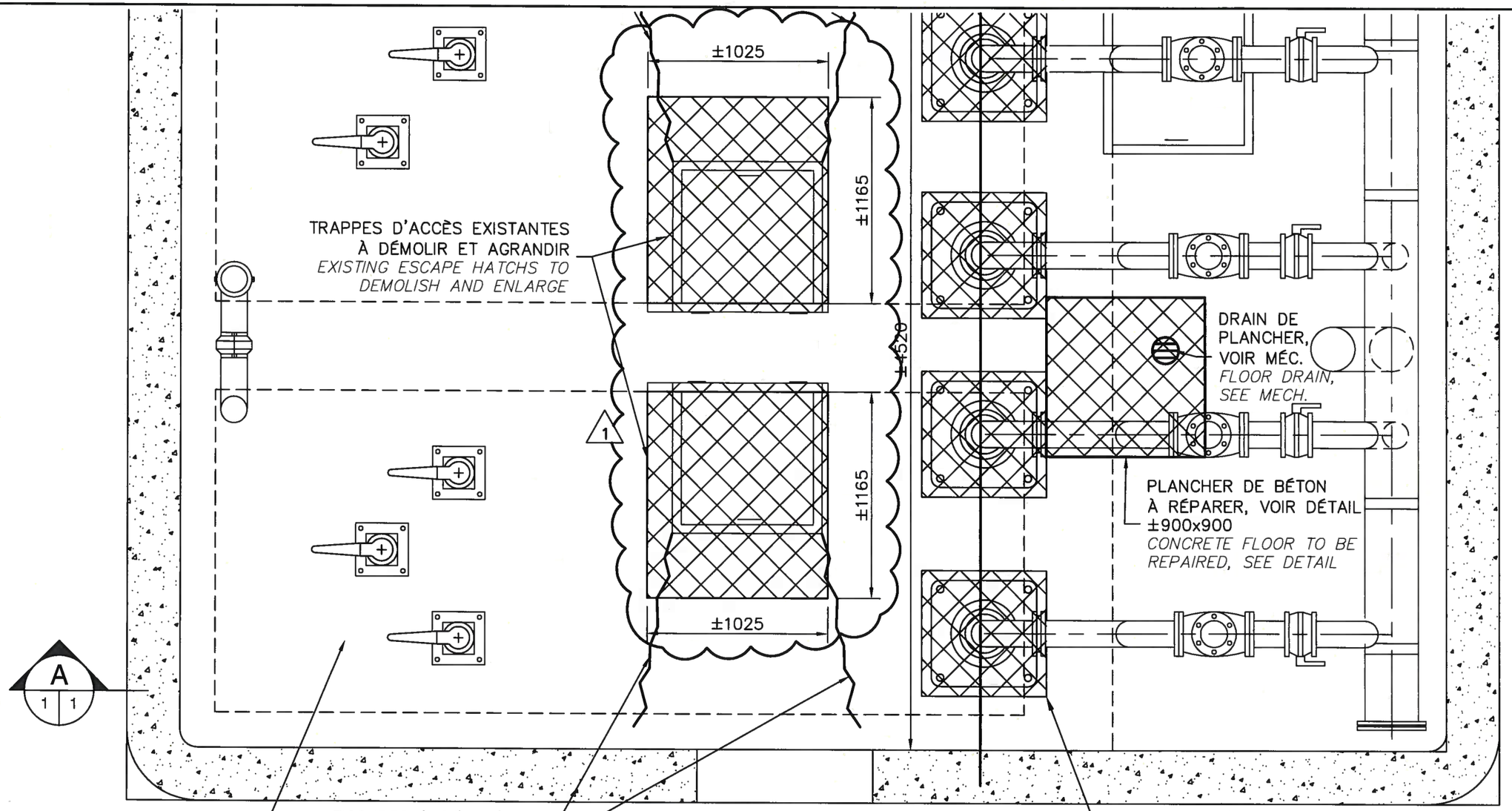
PROJET	R.071686.001	ECHELLE	REVISION
DATE	2016-09-28	INDIQUÉE	1

DESSINE PAR	APPROUVÉ PAR	NUMERO DE DESSIN	FEUILLE
D.CLERMONT	Y.JANUEL	RM16013C-M03	1 DE 1



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VUE EN PLAN
PLAN VIEW

0 1250

1: 25

INGÉNIEUR
Michaël Rioux
5008872
QUÉBEC
28/09/2016

FORMAT BH impérial 17"x11"

CLIENT
Travaux publics et Services gouvernementaux Canada
Public Works and Government Services Canada
Direction générale des biens immobiliers
Real Property branch
Région du Québec
Quebec region

No.	REVISION	PAR	DATE

SAINTE-FLAVIE
INSTITUT MAURICE LAMONTAGNE

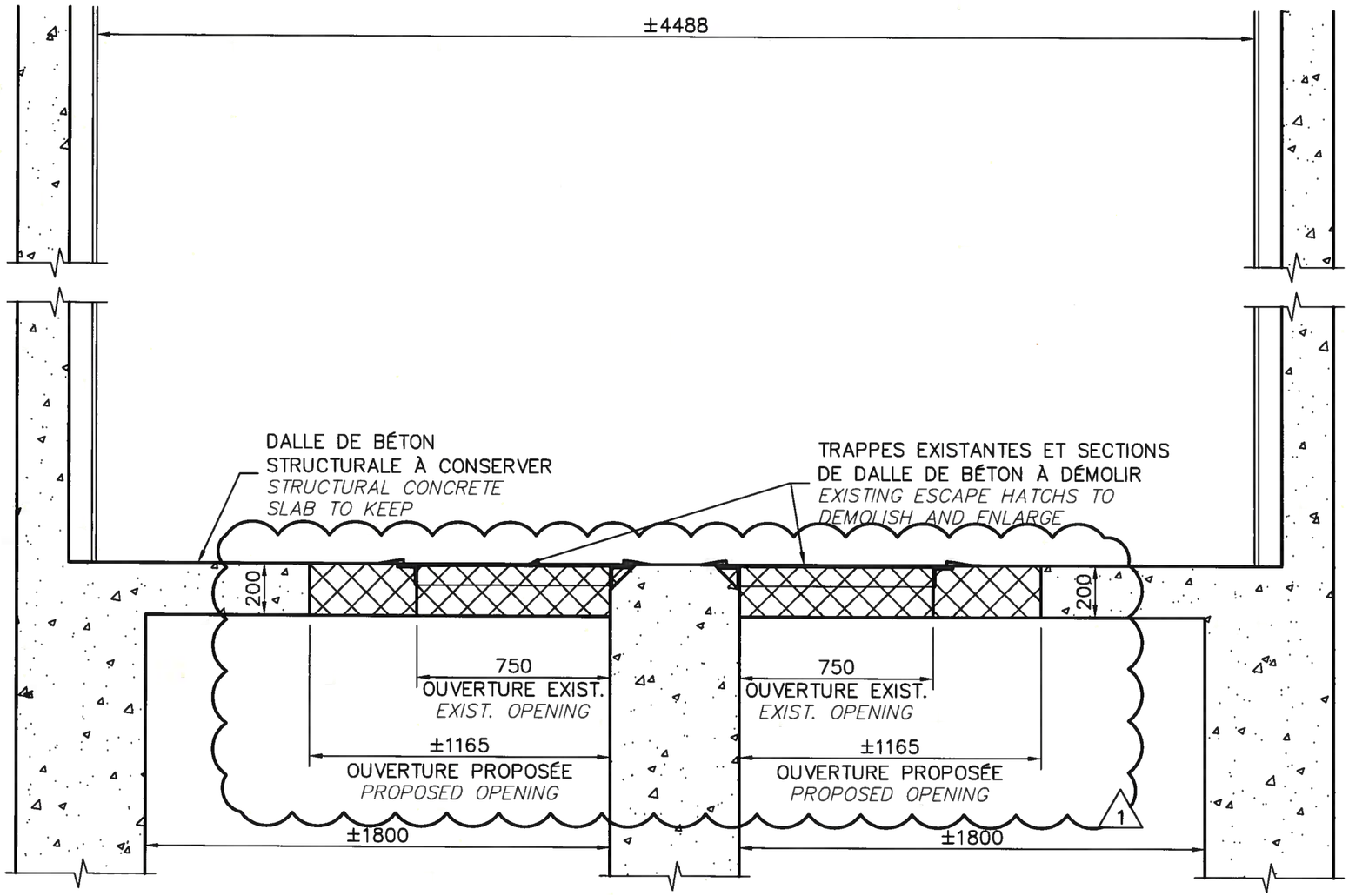
TITRE
STRUCTURE
ADDENDA #1

DESSINE PAR: G.L. techn.
APPROUVE PAR: M.R. ing.

TETRA TECH
464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1
Téléphone: 418 723-8151 Télécopieur: 1 877 723-8151
Télécopieur: 418 723-7822
Projet: 29501TTB

PROJET	R.071686.001	ECHELLE	REVISION
DATE	2016-09-28	INDIQUÉE	0

NUMERO DE DESSIN: RM16014C/S01
FEUILLE: 1 DE 6



COUPE SECTION 1 | 1 1

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1: 20

INGÉNIEUR
Michaël Rioux
5008872
QUÉBEC
28/09/2016

FORMAT BH Imperial 17"x11"

CLIENT	Travaux publics et Services gouvernementaux Canada / Public Works and Government Services Canada Direction générale des biens immobiliers / Real Property branch Région du Québec / Quebec region
SAINTE-FLAVIE INSTITUT MAURICE LAMONTAGNE	
TITRE	STRUCTURE ADDENDA #1

No.	REVISION	PAR	DATE

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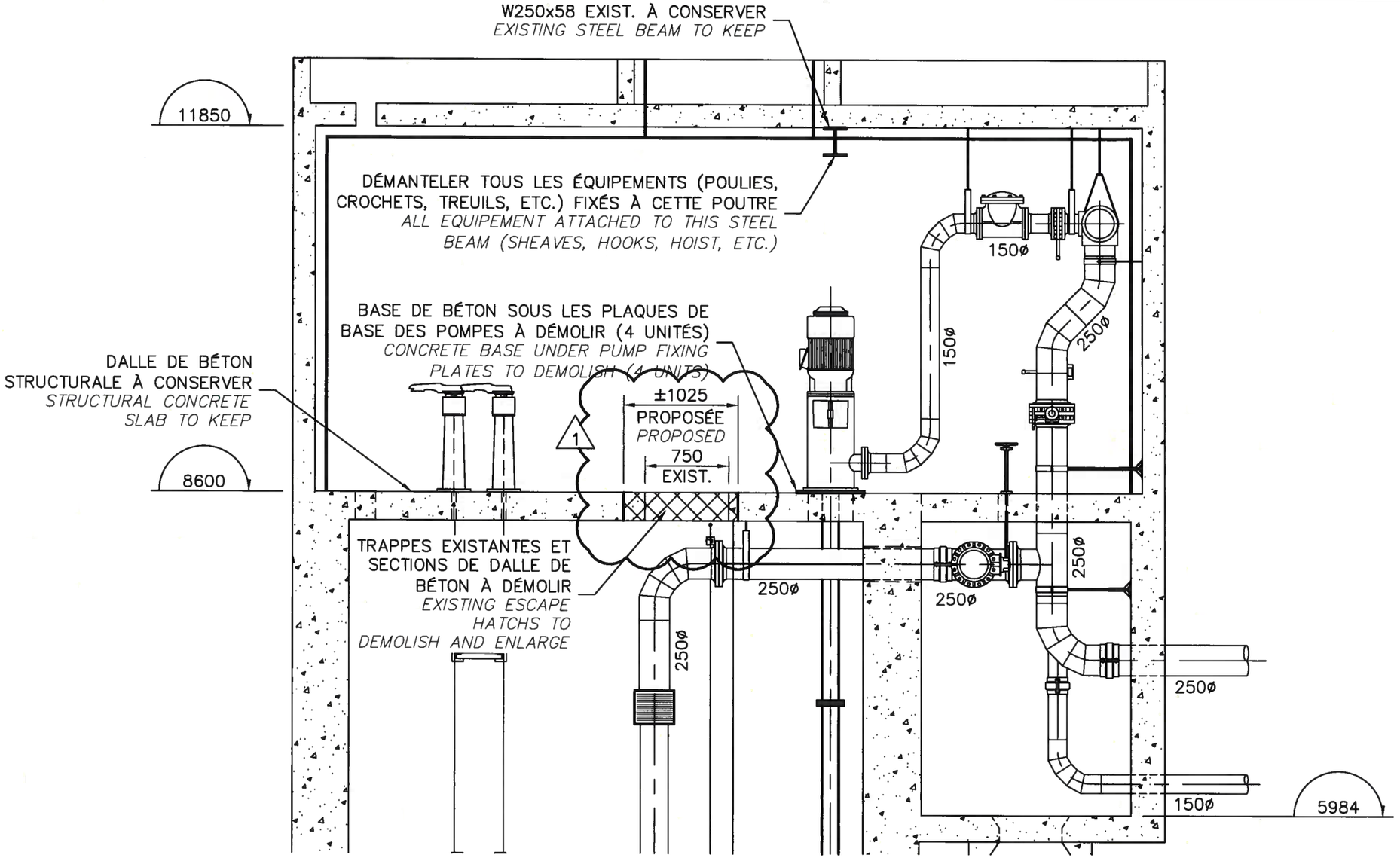
PROJET	R.071686.001	ECHELLE	REVISION
DATE	2016-09-28	INDIQUÉE	0

DESSINE PAR	APPROUVE PAR	NUMERO DE DESSIN	FEUILLE
G.L. techn.	M.R. ing.	RM16014C/S01	2 DE 6



COUPE SECTION A 1 1

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INGÉNIEUR
Michaël Rioux
5008872
28/09/2016

CLIENT			
Travaux publics et Services gouvernementaux Canada	Public Works and Government Services Canada	SAINTE-FLAVIE INSTITUT MAURICE LAMONTAGNE	TETRA TECH
Direction générale des biens immobiliers	Real Property branch	TITRE: STRUCTURE ADDENDA #1	464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1 Téléphone: 418 723-8151 Télécopieur: 418 723-7822 Projet: 205017TB
Région du Québec	Quebec region		PROJET R.071686.001 / ECHELLE INDIQUÉE / REVISION 0
			DATE 2016-09-28

No.	REVISION	PAR	DATE

DESSINE PAR	APPROUVÉ PAR	NUMERO DE DESSIN	FEUILLE
G.L. techn.	M.R. ing.	RM16014C/S01	3 DE 6

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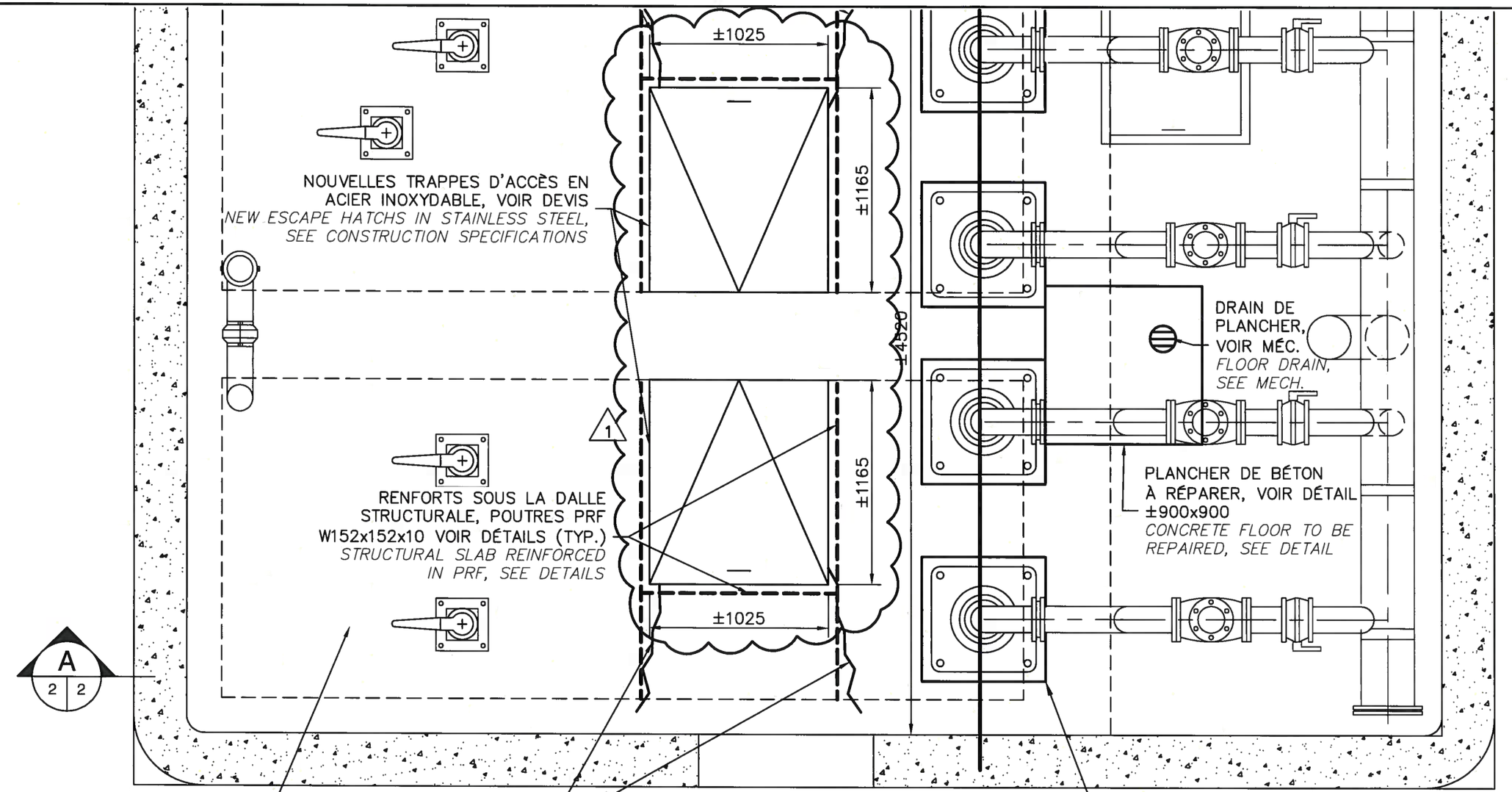

1

VUE EN PLAN
PLAN VIEW

0 — 1250

1: 25

INGÉNIEUR
Michaël Rioux
5008872
QUÉBEC
28/09/2016

CLIENT		
Travaux publics et Services gouvernementaux Canada	Public Works and Government Services Canada	
Direction générale des biens immobiliers	Real Property branch	
Région du Québec	Quebec region	

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SAINTE-FLAVIE
INSTITUT MAURICE LAMONTAGNE

TITRE
STRUCTURE
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TETRA TECH
464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1
Téléphone: 418 723-8151 Téléphone: 1 877 723-8151
Télécopieur: 418 723-7822
Projet: 29501TTB

PROJET	ECHELLE	REVISION
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DATE 2016-09-28		

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G.L. techn.	M.R. ing.	RM16014C/S02	4 DE 6

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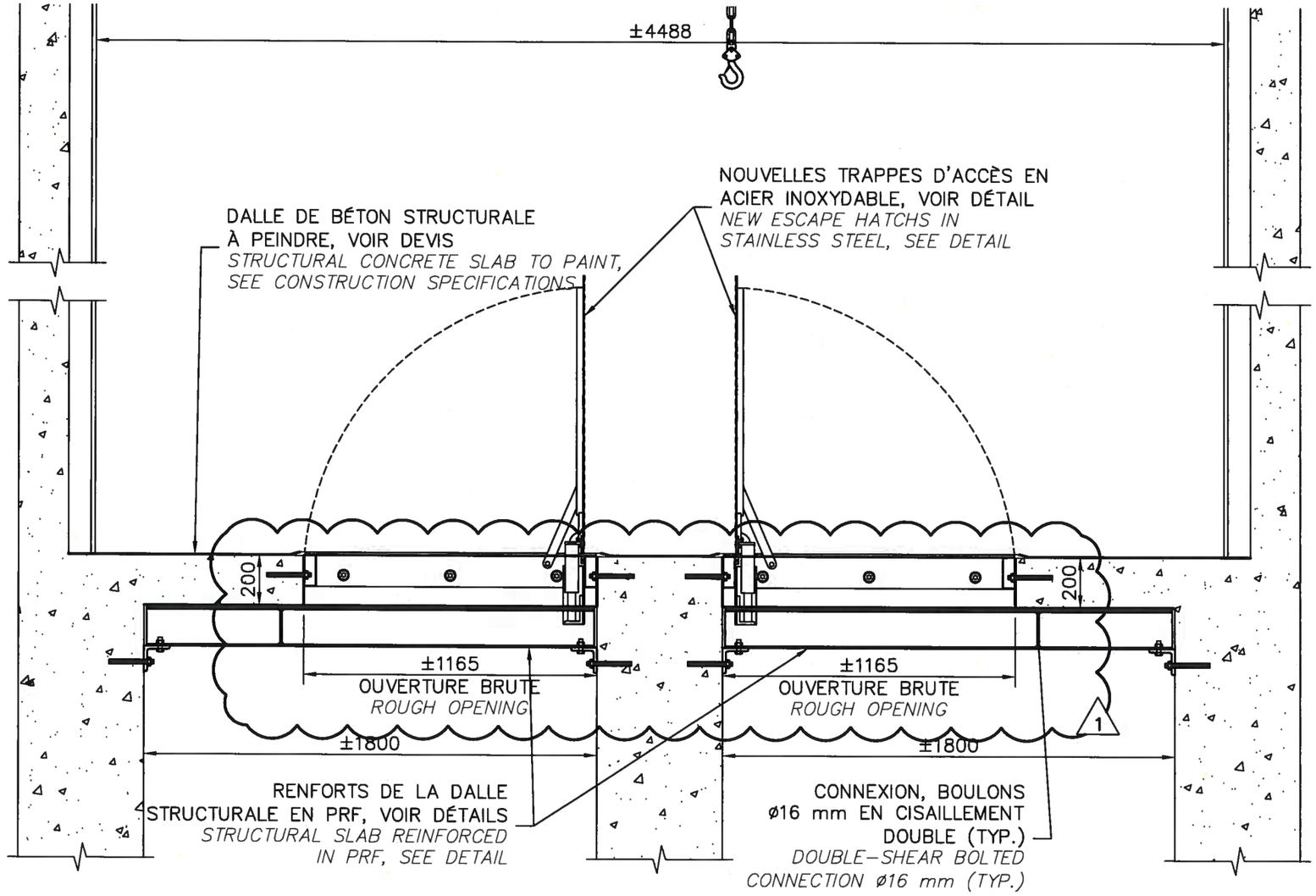

COUPE / SECTION 1 2 2

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1: 20

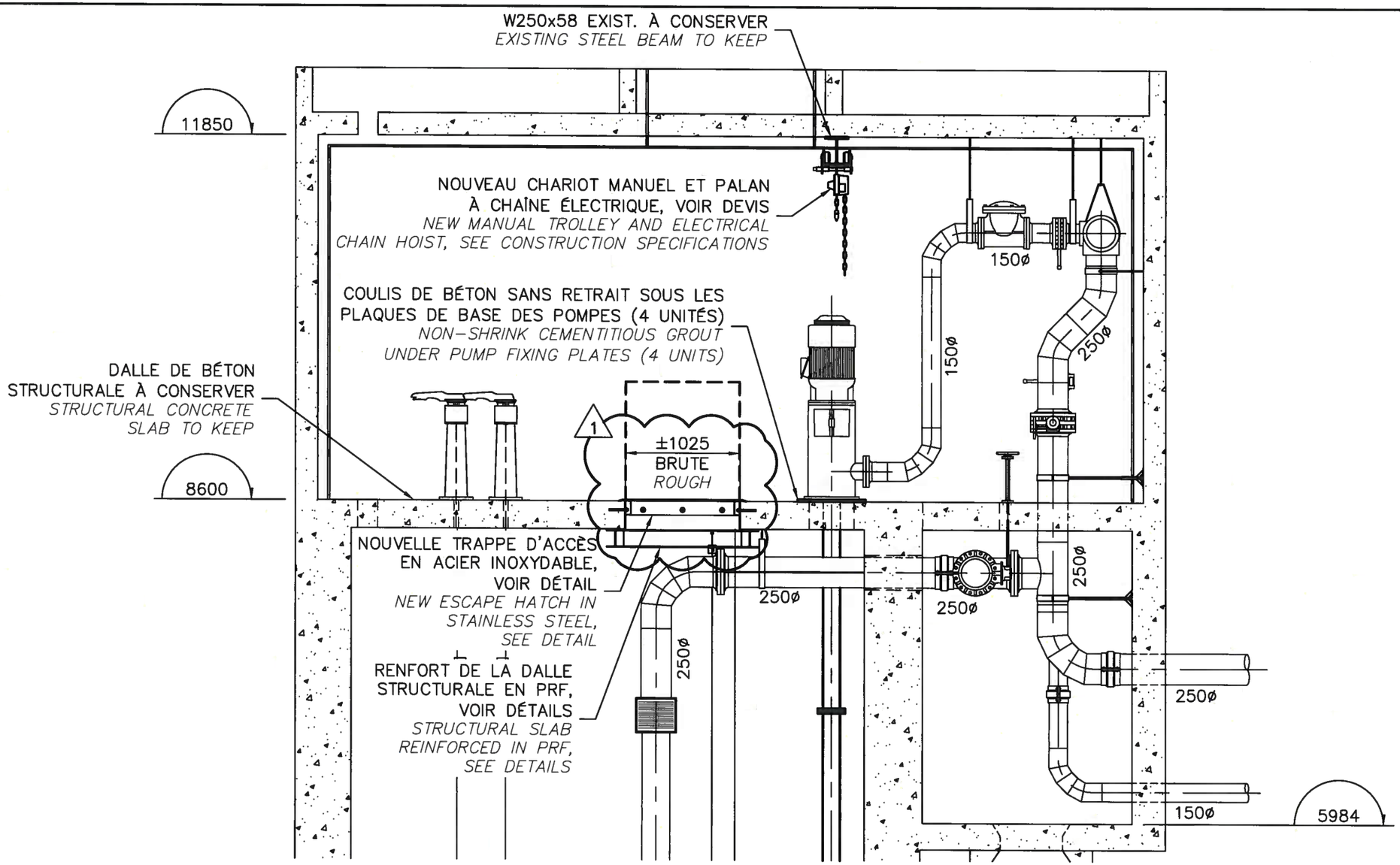
INGÉNIEUR
Michaël Rioux
5008872
QUÉBEC
28/09/2016

CLIENT			
Travaux publics et Services gouvernementaux Canada	Public Works and Government Services Canada	SAINTE-FLAVIE INSTITUT MAURICE LAMONTAGNE	TETRA TECH 464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1 Téléphone: 418 723-8151 Télécopieur: 418 723-7822 Projet: 205017TB
Direction générale des biens immobiliers / Real Property branch		TITRE: STRUCTURE ADDENDA #1	PROJET R.071686.001 / ECHELLE INDIQUÉE / REVISION 0
Région du Québec / Quebec region			DATE 2016-09-28

No.	REVISION	PAR	DATE

DESSINE PAR	APPROUVE PAR	NUMERO DE DESSIN	FEUILLE
G.L. techn.	M.R. ing.	RM16014C/S02	5 DE 6

FORMAT BH Impérial 17"x11"



COUPE SECTION A 2 2

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1: 40

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Travaux publics et Services gouvernementaux Canada	Public Works and Government Services Canada	SAINTE-FLAVIE INSTITUT MAURICE LAMONTAGNE	TETRA TECH 464, boul. St-Germain Ouest, Rimouski (Québec) G5L 3P1 Téléphone: 418 723-8151 Télécopieur: 418 723-7822 Projet: 28501TTB
Direction générale des biens immobiliers	Real Property branch	TITRE: STRUCTURE ADDENDA #1	
Région du Québec	Quebec region		

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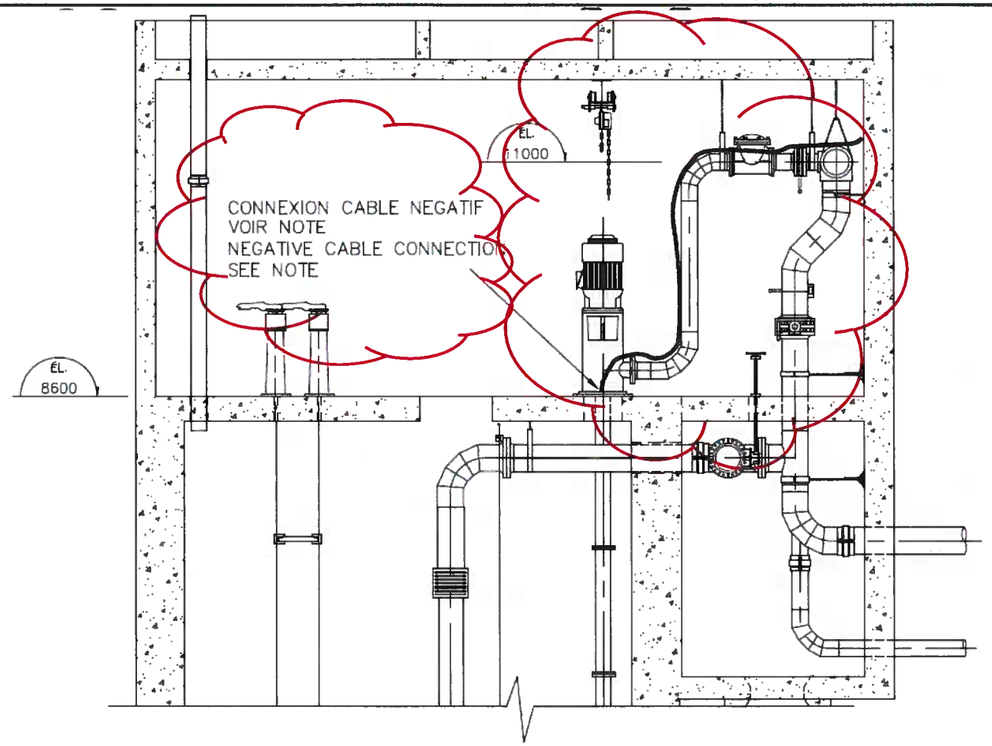
DESSINE PAR	APPROUVE PAR	NUMERO DE DESSIN	FEUILLE
G.L. techn.	M.R. ing.	RM16014C/S02	6 DE 6

PROJET	ECHELLE	REVISION
R.071686.001	INDIQUÉE	0
DATE 2016-09-28		



NOTE: LA CONNEXION DU CABLE NEGATIF AU CONDUIT DE POMPE DANS LE PUIT SERA DETEERMINEE PAR L'ENTREPRENEUR EN FONCTION DU MODELE DE LA POMPE CHOISIE

NOTE: THE NEGATIVE CABLE CONNECTION TO PUMP CONCUCT IN THE PIT WILL BE DETERMINED BY CONTRACTOR DEPENDING OF THE PUMP CHOISED

VUE PARTIELLE
PARTIAL VIEW

George Calavre
36150
INGÉNIEUR - ENGINEER
QUÉBEC

CLIENT
Travaux publics et Services gouvernementaux Canada
Public Works and Government Services Canada
Direction générale des biens immobiliers
Real Property branch
Région du Québec
Quebec region

No.	REVISION	PAR	DATE

SAINTE-FLAVIE
INSTITUT MAURICE LAMONTAGNE

TITRE
STRUCTURE
Addenda-1

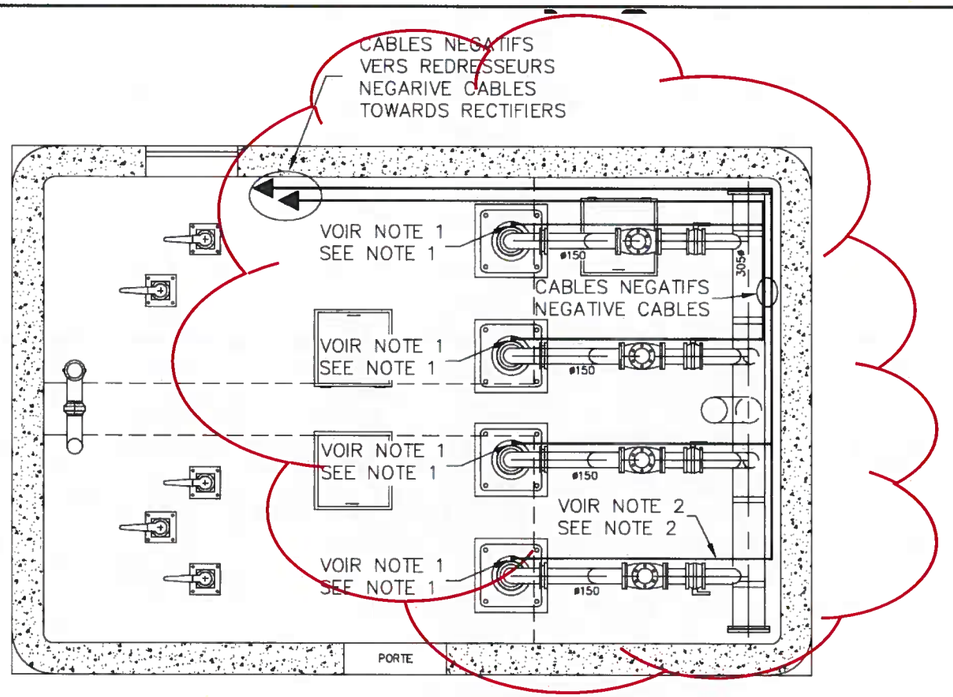
Dessiné : RB | Approuvé : GC

SMQ
SERVICES MÉTALLURGIQUES DU QUÉBEC LTÉE
765 RUE DE L'ÉGLISE
SAINT-ROMUALD (Qc) CANADA G6W 5M6
TÉL: 418 210-3600

PROJET	ÉCHELLE	RÉVISION
R.071686.001	INDIQUÉE	0
DATE 2016-09-28		

No Dessin : 16-117-01/A1

FEUILLE 1 DE 1



NOTE 1: CONNEXION DUCABLE NEGATIF AU CONDUIT DE POMPE
NOTE 1: NEGATIVE CABLE CONNECTION TO PUMP CONDUCT

NOTE 2: ATTACHER LE CABLE NEGATIF AU CONDUIT DE POMPE
NOTE 2: ATTACH THE NEGATIVE CABLE TO PUMO MCONDUCT

VUE EN PLAN
PLAN VIEW

George Calavre
36150
QUÉBEC

CLIENT
Travaux publics et Services gouvernementaux Canada
Public Works and Government Services Canada
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INSTITUT MAURICE LAMONTAGNE

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SMQ
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765 RUE DE L'ÉGLISE
SAINT-ROMUALD (Qc) CANADA G6W 5M6
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PROJET	ÉCHELLE	RÉVISION
R.071686.001	INDIQUÉE	0
DATE 2018-09-25		FEUILLE 1 DE 1