



RETURN BIDS TO:

By email:

[nrcan.quebecbid-
soumissionquebec.nrcan@canada.ca](mailto:nrcan.quebecbid-soumissionquebec.nrcan@canada.ca)

Attention: France Bolduc

INVITATION TO TENDER (ITT)

Tender To: Natural Resources Canada

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

Issuing Office

Finance and Procurement Management Branch
Natural Resources Canada
1055 rue du PEPS
Quebec, QC
G1V 4C7

Title IPAC project: DX geothermal system with CO2	
Solicitation No. NRCan-5000041189	Date September 5, 2019
Client Reference No. 148984	
Solicitation Closes at 02:00 PM Eastern Daylight Savings Time (EDT) on September 20, 2019	
Address Enquiries to: france.bolduc@canada.ca	
No de telephone 418-648-5043	
Destination – of Goods, Services and Construction: Natural Resources Canada CanmetÉNERGY 1615 Blvd. Lionel-Boulet Varennes, QC J3X 1S6	
Security There is no security requirement associated with this requirement.	

Instructions: See Herein

Vendor/Firm Name and Address	
Telephone No.:	
Facsimile No.:	
Email address :	
Name and Title of person authorized to sign on behalf of Vendor/Firm (type or print)	
Signature _____	Date _____



INVITATION TO TENDER

IMPORTANT NOTICE TO BIDDERS

TENDER DOCUMENTS: Firms intending to submit tenders on this project should obtain tender documents through the website <https://www.achatsetventes-buyandsell.gc.ca/>

LISTING OF SUBCONTRACTORS

As per GI06 of R2410T you should provide using Annex C at Bid closing a list of Subcontractors that have 20% or more of the tendered price value.

COMPLIANCE WITH APPLICABLE LAWS

As per GI12 of General Instruction R2410T, since the construction service is in Quebec, the bidder must hold a valid license from the Régie du bâtiment du Québec (RBQ) on the closing date of this Invitation to tender.

MANDATORY TECHNICAL CRITERIA

Bid must comply with all of the mandatory requirements in the invitation to tender documents in order to be declared responsive, including the mandatory requirements set out in other sections of the invitation to tender documents.

OPTIONAL WORK - 4 storage wells

A fixed price is requested to carry out the works associated with 20 geothermal wells. If our budget allows it, we will have 4 storage wells built at the same time as the 20 geothermal wells. The details are well described in the specification at Annex A. The price evaluation to determine the lowest bidder will count the price for the 20 wells and the price for the 4 optional wells.

The lowest compliant bid shall be recommended for a contract award.

Example: 20 wells: \$ 100,000.00 + 4 additional wells: \$ 20,000.00 = \$ 120,000.00 → \$ 120,000.00 will be the price that will be used to evaluate the bid and determine the bid with the lowest evaluated price. But we could give the contract only for 20 wells if our budget does not allow us the 4 additional wells since they are optional work.



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R2410T GENERAL INSTRUCTIONS - CONSTRUCTION SERVICES (GI) (2019-05-30)

The following GI's are included by reference and are available at the following Web Site <https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>

- GI01 Integrity Provisions - Bid
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SPECIAL INSTRUCTIONS TO BIDDERS (SI)

SI01 BID DOCUMENTS

1. The following are the bid documents:

- a. Invitation to Tender - Page 1;
- b. Special Instructions to Bidders;
- c. General Instructions - Construction Services, R2410T (2019-05-30)
- d. Clauses & Conditions identified in "Contract Documents";
- e. Drawings and Specifications;
- f. Bid and Acceptance Form and related Appendix(s); and
- g. Any amendment issued prior to solicitation closing.

Submission of a bid constitutes acknowledgement that the Bidder has read and agrees to be bound by these documents.

2. General Instructions- Construction Services R2410T is incorporated by reference and is set out in the Standard Acquisition Clauses and Conditions (SACC) Manual, issued by Public Works and Government Services Canada (PWGSC). The SACC Manual is available on the PWGSC Web site: <https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>

**** In the complete text content: Delete:** "Public Works and Government Services Canada" and **Insert:** "Natural Resources Canada." **Delete:** "PWGSC" and **Insert:** "NRCan"

3. **Bids sent by fax will not be accepted**

SI02 ENQUIRIES DURING THE SOLICITATION PERIOD

1. Enquiries regarding this bid must be submitted in writing to the Contracting Officer named on the Invitation to Tender - Page 1 - France.bolduc@canada.ca as early as possible within the solicitation period. Except for the approval of alternative materials as described in GI13 of R2410T, enquiries should be received no later than **five (5)** calendar days prior to the date set for solicitation closing to allow sufficient time to provide a response. Enquiries received after that time may not result in an answer being provided.
2. To ensure consistency and quality of the information provided to Bidders, the Contracting Officer shall examine the content of the enquiry and shall decide whether or not to issue an amendment.
3. All enquiries and other communications related to this bid sent throughout the solicitation period are to be directed **ONLY** to the Contracting Officer named on the Invitation to Tender - Page 1. Failure to comply with this requirement may result in the bid being declared non-responsive.

SI03 OPTIONAL SITE VISIT

There will be a site visit on September 12, 2019 at 10:00am. Interested bidders are to meet at 1615 Blvd. Lionel-Boulet, Varennes.

SI04 REVISION OF BID

A bid may be revised by email, by letter or facsimile in accordance with GI08 of R2410T. The facsimile number for receipt of revisions is 418-648-2529.



SI05 BID RESULTS

1. A public bid opening will be held in the office designated on the Front Page "Invitation to Tender" for the receipt of bids shortly after the time set for solicitation closing.

Public bid opening at 1055 rue du PEPS, Quebec, QC G1V 4C7

2. Following solicitation closing, bid results may be obtained by calling at number 418 648-5043.

SI06 INSUFFICIENT FUNDING

In the event that the lowest compliant bid exceeds the amount of funding allocated for the Work, Canada in its sole discretion may

- a. cancel the solicitation; or
- b. obtain additional funding and award the Contract to the Bidder submitting the lowest compliant bid; and/or
- c. negotiate a reduction in the bid price and/or scope of work of not more than 15% with the Bidder submitting the lowest compliant bid. Should an agreement satisfactory to Canada not be reached, Canada shall exercise option (a) or (b).

SI07 BID VALIDITY PERIOD

1. Canada reserves the right to seek an extension to the bid validity period prescribed in BA04 of the Bid and Acceptance Form. Upon notification in writing from Canada, Bidders shall have the option to either accept or reject the proposed extension.
2. If the extension referred to in paragraph 1. of SI07 is accepted, in writing, by all those who submitted bids, then Canada shall continue immediately with the evaluation of the bids and its approvals processes.
3. If the extension referred to in paragraph 1. of SI07 is not accepted in writing by all those who submitted bids then Canada shall, at its sole discretion, either
 - a. continue to evaluate the bids of those who have accepted the proposed extension and seek the necessary approvals; or
 - b. cancel the invitation to tender.
4. The provisions expressed herein do not in any manner limit Canada's rights in law or under GI09 of R2410T.

SI08 WEB SITES

The connection to some of the Web sites in the solicitation documents is established by the use of hyperlinks. The following is a list of the addresses of the Web sites:

Buy and Sell <https://www.achatsetventes-buyandsell.gc.ca>

Canadian economic sanctions <http://www.international.gc.ca/sanctions/index.aspx?lang=eng>

Standard Acquisition Clauses and Conditions (SACC) Manual
<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>



PWGSC, Industrial Security Services <http://ssi-iss.tpsgc-pwgsc.gc.ca/index-eng.html>

PWGSC, Code of Conduct and Certifications
<http://www.tpsgc-pwgsc.gc.ca/app-acq/cndt-cndct/contexte-context-eng.html>

Construction and Consultant Services Contract Administration Forms Real Property Contracting
<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/formulaires-forms-eng.html>

Declaration Form
<http://www.tpsgc-pwgsc.gc.ca/ci-if/formulaire-form-eng.html>

SI09 FINANCIAL BID

The total amount of the bid excludes taxes

SI10 MANDATORY REQUIREMENTS

Bid must comply with all of the mandatory requirements in the invitation to tender documents in order to be declared responsive, including the mandatory requirements set out in other sections of the invitation to tender documents.

If Canada requests that the bidder submit information or documents within a time period specified in this clause or in a written request made to the bidder, failure to provide these documents or this information at Canada's request within the specified time period will result in the bid being deemed non-responsive.

The Bidder **MUST** complete Appendix 3 – Mandatory Evaluation Criteria.

The lowest compliant bid shall be recommended for a contract award.



SUPPLEMENTARY CONDITIONS (SC)

SC01 INSURANCE TERMS

1) Insurance Contracts

- (a) The Contractor must, at the Contractor's expense, obtain and maintain insurance contracts in accordance with the requirements of the Certificate of Insurance. Coverage must be placed with an Insurer licensed to carry out business in Canada.
- (b) Compliance with the insurance requirements does not release the Contractor from or reduce its liability under the Contract. The Contractor is responsible for deciding if additional insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any additional insurance coverage is at the Contractor's expense, and for its own benefit and protection.

2) Period of Insurance

- (a) The policies required in the Certificate of Insurance must be in force from the date of contract award and be maintained throughout the duration of the Contract.
- (b) The Contractor must be responsible to provide and maintain coverage for Products/Completed Operations hazards on its Commercial General Liability insurance policy, for a period of six (6) years beyond the date of the Certificate of Substantial Performance.

3) Proof of Insurance

- (a) Before commencement of the Work, and no later than fifteen (15) days after acceptance of its bid, the Contractor must deposit with Canada a Certificate of Insurance on the form attached herein.
- (b) Upon request by Canada, the Contractor must provide originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the Certificate of Insurance.

4) Insurance Proceeds

In the event of a claim, the Contractor must, without delay, do such things and execute such documents as are necessary to effect payment of the proceeds.

5) Deductible

The payment of monies up to the deductible amount made in satisfaction of a claim must be borne by the Contractor.

SC02 DEPARTMENTAL REPRESENTATIVE'S AUTHORITY

Contracting Authority is:

France Bolduc
Procurement Specialist
Natural Resources Canada
418-648-5043
france.bolduc@canada.ca



Technical Authority is: *(To be completed at contract award)*

Name
Title
Natural Resources Canada
Tel:
xxx.name@canada.ca

CS03 METHOD OF PAYMENT

As provided in the General Conditions [R2550D](#), CG5 – Terms of Payment (2016-01-28):

Progress payment

Where the duration of the Work is greater than thirty (30) days, the Contractor shall be entitled to receive progress payments. Each progress payment is subject to a 10% withholding of the value of the Work completed and the Material delivered described in the progress claim.

Single Payment

Where the duration of the Work is equal to or less than thirty (30) days, the Contractor shall, receive a single payment as full consideration for the Work performed

CS04 INVOICING INSTRUCTIONS

Invoices shall be submitted using one of the following methods:

<p><u>E-mail:</u></p> <p>nrcan.invoiceimaging-servicedimageriedesfactures.nrcan@canada.ca</p> <p>Note: Attach "PDF" file. No other formats will be accepted.</p>
OR
<p><u>Fax:</u></p> <p>Local NCR region: 613-947-0987 Toll-free: 1-877-947-0987</p> <p>Note: Use highest quality settings available.</p>

Please do not submit invoices using more than one method as this will not expedite payment.

Invoices and all documents relating to a contract must be submitted on the Contractor's own form and shall bear the following reference numbers: Contract number: _____ *(To be completed at contract award)*

Invoicing Instructions to suppliers: <http://www.nrcan.gc.ca/procurement/3485>



CONTRACT DOCUMENTS (CD)

1. The following are the contract documents:
 - a. Contract Page when signed by Canada;
 - b. Duly completed Bid and Acceptance Form and any Appendices attached thereto;
 - c. Drawings and Specifications;
 - d. General Conditions and clauses

GC1	General Provisions – Construction Services	R2810D	(2017-11-28);
GC2	Administration of the Contract-	R2820D	(2016-01-28);
GC3	Execution and Control of the Work	R2830D	(2018-06-21);
GC4	Protective Measures	R2840D	(2008-05-12);
GC5	Terms of Payment	R2550D	(2016-01-28);
GC6	Delays and Changes in the Work	R2865D	(2019-05-30);
GC7	Default, Suspension or Termination of Contract	R2870D	(2018-06-21);
GC8	Dispute Resolution	R2884D	(2016-01-28);
GC10	Insurance	R2900D	(2008-05-12);
	Allowable Costs for Contract Changes Under GC6.4.1	R2950D	(2015-02-25);
	Supplementary Conditions		
 - e. Any amendment issued or any allowable bid revision received before the date and time set for solicitation closing;
 - f. Any amendment incorporated by mutual agreement between Canada and the Contractor before acceptance of the bid; and
 - g. Any amendment or variation of the contract documents that is made in accordance with the General Conditions.
2. The documents identified by title, number and date above are incorporated by reference and are set out in the Standard Acquisition Clauses and Conditions (SACC) Manual, issued by Public Works and Government Services Canada (PWGSC). The SACC Manual is available on the PWGSC Web site:
<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R/>
3. The language of the contract documents is the language of the Bid and Acceptance Form submitted.



BID AND ACCEPTANCE FORM (BA)

BA01 IDENTIFICATION

IPAC project: DX geothermal system with CO₂

BA02 BUSINESS NAME AND ADDRESS OF BIDDER

Name: _____

Address: _____

Telephone: _____ Fax: _____ RBQ: _____

E-mail address: _____

BA03a THE OFFER – 20 wells

The Bidder offers to Canada to perform and complete the Work for the above named project (**cost for only 20 wells**) in accordance with the Bid Documents for the Total Bid Amount of _____ (amount in numbers) excluding applicable tax(es).

BA03b THE OFFER - 4 additional wells – OPTIONAL WORK

The Bidder offers to Canada to perform and complete the Work for the above named project (**cost for only 4 wells**) in accordance with the Bid Documents for the Total Bid Amount of \$ _____ (amount in numbers) excluding applicable tax(es).

TOTAL for evaluation purpose (SA03a + SA03b) = *\$ _____

** If there is a calculation error in the total, the price of SA03a and SA03b will be considered for the evaluation.*

BA04 BID VALIDITY PERIOD

The bid shall not be withdrawn for a period of sixty (60) days following the date of solicitation closing.

BA05 ACCEPTANCE AND CONTRACT

Upon acceptance of the Contractor's offer by Canada, a binding Contract shall be formed between Canada and the Contractor. The documents forming the Contract shall be the contract documents identified in Contract Documents (CD).

BA06 CONSTRUCTION TIME

The Contractor shall perform and complete the Work no later than December 15, 2019.

BA07 SIGNATURE

Name and title of person authorized to sign on behalf of Bidder (Type or print)

Signature

Date



APPENDIX 1 - INTEGRITY PROVISIONS

(Text copied from the Ineligibility and Suspension Policy <http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html> dated 2016-04-04)

List of names: All bidders, regardless of their status under the Policy, must submit the following information when participating in a procurement process or real property transaction:

- bidders that are corporate entities, including those bidding as joint ventures, must provide a complete list of the names of all current directors or, for a privately owned corporation, the names of the owners of the corporation;
- bidders bidding as sole proprietors, including sole proprietors bidding as joint ventures, must provide a complete list of the names of all owners; or
- bidders that are a partnership do not need to provide a list of names.

If the list of names has not been received in a procurement process or real property transaction by the time the evaluation of bids or offers is completed, or has not been received in a procurement process or real property transaction where no bid/offer will be submitted, the contracting authority will inform the bidder of a time within which to provide the information. Providing the required names is a mandatory requirement for award of a contract or real property agreement. Failure to provide the list of names within the time specified will render a bid or offer non-responsive, or the bidder otherwise disqualified for award of a contract or real property agreement.

Name of Bidder: _____

OR

Name of each member of the joint venture:

Member 1: _____ Member 3: _____

Member 3: _____ Member 4: _____

Directors Identification:

NAME	SURNAME	TITLE



APPENDIX 2 – CERTIFICATIONS ABORIGINAL DESIGNATION

Bidders must provide the required certifications and additional information to be awarded a contract.

The certifications provided by Bidders to Canada are subject to verification by Canada at all times. Unless specified otherwise, Canada will declare a bid non-responsive, or will declare a contractor in default if any certification made by the Bidder is found to be untrue, whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply and to cooperate with any request or requirement imposed by the Contracting Authority will render the bid non-responsive or constitute a default under the Contract.

ABORIGINAL DESIGNATION

Who is eligible?

- a. An Aboriginal business, which can be:
 - i. a band as defined by the Indian Act
 - ii. a sole proprietorship
 - iii. a limited company
 - iv. a co-operative
 - v. a partnership
 - vi. a not-for-profit organization

in which Aboriginal persons have at least 51 percent ownership and control,

OR

- b. A joint venture consisting of two or more Aboriginal businesses or an Aboriginal business and a non-Aboriginal business(es), provided that the Aboriginal business(es) has at least 51 percent ownership and control of the joint venture.

When an Aboriginal business has six or more full-time employees at the date of submitting the bid, at least thirty-three percent of them must be Aboriginal persons, and this ratio must be maintained throughout the duration of the contract.

The supplier must certify in its submitted bid that it is an Aboriginal business or a joint venture constituted as described above.

- Our Company is NOT an Aboriginal Firm
- Our Company is an Aboriginal Firm, as identified above.



APPENDIX 3 – MANDATORY EVALUATION CRITERIA

Bidders are advised to address these criteria in the following order and in sufficient depth in their proposals to enable a thorough assessment. NRCan’s assessment will be based solely on the information contained within the proposal. NRCan may confirm information or seek clarification from bidders.

All criteria for work experience shall be obtained in a legitimate work environment as opposed to an educational setting. Co-op terms are considered work experience provided they are related to the required services.

1. TECHNICAL CRITERIA

1.1 MANDATORY EVALUATION CRITERIA

The Mandatory Criteria listed below will be evaluated on a simple pass/fail basis. Proposals which fail to meet the mandatory criteria will be deemed non-responsive.

Criterion ID	Mandatory Criteria	Proposal Page #	Pass/Fail
M1	<p>Experience with design and installation of direct expansion geothermal system</p> <p>The bidder must demonstrate that he possesses and/or his subcontractors the experience with the design and installation of one (1) project of direct expansion geothermal system. A direct expansion system refers to a system where refrigerant is directly sent to the ground to ensure heat exchange.</p> <p>In order to demonstrate that their company possesses the required experience, bidder should provide the following information:</p> <ul style="list-style-type: none"> - Project Name - The city where the project took place and the date of completion - Installed capacity in cooling or heating - Number of boreholes and depth - Type of refrigerant used - Contact Name and Contact Information (references) <p>→ If the information provided is deemed insufficient for fulfilling project requirements in terms of the above-mentioned criteria, the bid will be considered inadmissible.</p> <ul style="list-style-type: none"> • It is requested to provide the experience using the Table A next page. <p>Note: The project must be completed within the last 5 years from the closing bid date. Note: References will only be contacted to confirm the information provided.</p>		



TABLE A – MANDATORY CRITERIA M1

Requirements	Project name, city Contact Name (role) Contact information	Period	Installed capacity for heating or cooling (specify)	Number of boreholes	Type of refrigerant
Example	Project "Y" City of XXX ABC Enterprise Mr. X misterx@abc.com 613-xxx-xxxx	June 2016 – July 2016 (incl.)	25 kW heating	10 boreholes of 50m	R410
Project no. 1					



ANNEX A - STATEMENT OF WORK / SPECIFICATIONS

1. INFORMATION ON THE PROJECT

- 1.1. Project title: IPAC – DX geothermal system with CO₂
- 1.2. Project location : 1615, Lionel-Boulet, Varennes (Quebec) J3X 1S6
- 1.3. Main NRCan project contact : (*To be completed at contract award*)
- 1.4. Project timeline : Completion by December 15th, 2019

2. SCOPE OF WORK

2.1. BASE SCOPE OF WORK

Installation of a 20 direct expansion boreholes geothermal field, as illustrated in figure 1, and in accordance with the instructions in sections 6.1, 6.3, 6.4 and 6.5, including, but not limited to:

- 2.1.1. Civil work, as described in the civil engineer's plan;
- 2.1.2. Drilling of the borefield;
- 2.1.3. Supply and installation in the boreholes, of U-tubes in stainless steel, including elbows and U fittings;
- 2.1.4. Connexion of U-tubes, in 5 reverse-return circuits, from the boreholefield to the mechanical room;
- 2.1.5. Supply and injection of a pre-mixed high conductivity grout using appropriate method;
- 2.1.6. Pressure and vacuum testing ;
- 2.1.7. Compaction and site reinstatement as indicated in the civil engineer's plan;
- 2.1.8. Obtaining from the competent authorities the necessary permits and authorizations to carry out the work.

2.2. OPTIONAL WORK

Installation of 4 thermal energy storage boreholes in addition to the 20 direct expansion geothermal boreholes, as illustrated in figure 6, in accordance with the instructions in section 6.2, 6.3, 6.4 and 6.5, including but not limited to:

- 2.2.1. Civil work, as described in the civil engineer's plan;
- 2.2.2. Drilling of the borefield;
- 2.2.3. Supply and installation in the boreholes, of U-tubes in high density polyethylene (HDPE) including elbows and fittings;
- 2.2.4. Connexion of the U-tubes from the borefield to the mechanical room;
- 2.2.5. Supply and injection of geothermal grout with thermal conductivity higher than 1 W/m.K;
- 2.2.6. Pressure testing;
- 2.2.7. Compaction and site reinstatement as indicated in the civil engineer's plan;

3. APPLICABLE STANDARDS

The following list indicates the standards applicable to the project but is not limited to :

- 3.1. Standard ANSI/CSA/IGSHPA C448 SERIES-16, *Design and installation of ground source heat pump systems for commercial and residential buildings.*



- 3.2. CSA B52-05(R2009), B52 Package, Mechanical Refrigeration Code.
- 3.3. ASME B31.5-10, Refrigeration Piping and Heat Transfer Components.
- 3.4. ASME B36.19 Stainless Steel Pipe.
- 3.5. ASME B31.3, Process Piping, Chapter IX High Pressure Piping (Chapter IX).
- 3.6. ASTM A269 / A269M - 15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- 3.7. ASTM A511 / A511M – 16, Standard Specification for Seamless Stainless Steel Mechanical Tubing and Hollow Bar
- 3.8. ANSI/ASME B31.1-2007, Power Piping.
- 3.9. ANSI/ASME B31.3-2006, Process Piping.
- 3.10. ANSI/ASME, Boiler and Pressure Vessel Code-2007 :
 - 3.10.1. BPVC 2007 Section I: Power Boilers.
 - 3.10.2. BPVC 2007 Section V: Non Destructive Examination.
 - 3.10.3. BPVC 2007 Section IX: Welding and Brazing Qualifications.
- 3.11. AWS C1.1M/C1.1-2000(R2006), Recommended Practices for Resistance Welding.
- 3.12. AWS Z49.1-2005, Safety in Welding, Cutting and Allied Process.
- 3.13. AWS W1-2000, Welding Inspection Handbook.
- 3.14. CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- 3.15. CSA B51-03 (R2007), Boiler, Pressure Vessel and Pressure Piping Code.
- 3.16. CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
- 3.17. CSA W178.1-2008, Certification of Welding Inspection Organizations.
- 3.18. CSA W178.2-2008, Certification of Welding Inspectors.
- 3.19. Environment Quality Act
- 3.20. Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- 3.21. An Act Respecting Occupational Health and Safety, R.S.Q., c.S-2.1 (current edition) - Updated 2005.
- 3.22. Safety Code for the construction industry, S-2.1, r.4.
- 3.23. Canadian Standards Association (CSA).
- 3.24. Workplace Hazardous Materials Information System (WHMIS, SIMDUT)/ Health Canada
 - 3.24.1. Safety data sheets (SDSs)
 - 3.24.2. Material safety data sheets (MSDSs)

4. SHOP DRAWINGS

Submit the shop drawings for approval for all materials, including the following elements: Material for the tubes, including welding and fusion method.

5. MATERIALS

All materials must be fabricated in compliance with CSA C448 standard.

5.1. TUBING and PIPING - BASE SCOPE OF WORK



5.1.1. High-quality, fully annealed (Type 304/304L, 316/316L) stainless steel tubing and piping, EN ISO 1127 or equivalent. Hardness not to exceed 90 HRB or 200 HV. Tubing to be free of scratches, suitable for bending or flaring.

Note: Dual-certified grades such as 304/304L, 316/316L, meet the minimum chemistry and the mechanical properties of both alloy grades.:

5.1.2. Pipes of OD 3/4", SCH40

5.1.3. Tubes of OD 3/8", wall thickness of 0.035";

5.1.4. The horizontal pipes connecting the boreholes to the mechanical room, can have a corrosion protective coating.

5.2. GROUT- BASE SCOPE of WORK

High conductivity sand and bentonite mixed grout: the thermal conductivity must be higher than 1 W/m.K. The thermal conductivity of the grout used must be demonstrated (recipe from the grout manufacturer, test certificate, etc.) and approved by the Departmental Representative.

5.3. INSULTAION – BASE SCOPE of WORK

Rigid insulation for underground use.

5.4. TUBING – OPTIONAL WORK

5.4.1. High density polyethylene (HDPE) tubes

5.4.2. Diameter of 3/4", SDR 11

5.4.3. U-fitting for HDPE 3/4" pipes, 2.375 in. wide, as sold by Centannial Plastics inc. , Bullet™ U-BEND HDPE 4710 product or equivalent

5.5. GROUT- OPTIONAL WORK

High conductivity sand and bentonite mixed grout: the thermal conductivity must be higher than 1 W/m.K. The thermal conductivity of the grout used must be demonstrated (recipe from the grout manufacturer, test certificate, etc.) and approved by the Departmental Representative.

5.6. INSULTAION – OPTIONAL WORK

Rigid insulation for underground use.

6. EXECUTION

All work must be completed in accordance with the CSA C448 Standard.

6.1. BASE SCOPE of WORK

6.1.1. Generalities

1. The location of the boreholefield is shown in the civil engineer's plan;
2. In each borehole are installed 2 stainless steel U-tubes as illustrated in figure 2 in section 8;
3. The boreholes configuration and piping arrangement are illustrated in figures 1 to 5, in section 8.

6.1.2. Drilling

1. Drill 20 boreholes of 2 ¾ in. to 3 in.(max) diameter, of a maximum effective depth of 165 feet (does not include the trench's depth) as illustrated in figure 2;
2. Plan for the water table management in compliance with the provincial and municipal regulation in force; the water table level at the site can be found in a geotechnical report that will be provided to the contractor;



3. Soils and rocks extracted from boreholes must be disposed of in compliance with the provincial and municipal regulations in force.

6.1.3. U-fittings for stainless steel tubes

1. U-tubes fittings must be prefabricated at the factory and pressure tested to confirm their tightness prior to installation in the boreholes;
2. Welds must be minimized in boreholes and circuits; In boreholes, welds are allowed at junctions with the U, only;
3. Welds for stainless steel piping must prevent leaks and ensure long-term (25 years) corrosion resistance;
4. As specified in CSA C448, stainless steel tubing must be provided with cathodic protection against corrosion.

6.1.4. Supports for stainless steel tubes

1. Supports for the tubes will be provided by the contractor. They must be installed every 10 feet of pipes over the entire length of the borehole as illustrated in figure 3. The contractor will provide the screws and ty raps.
2. An equivalent support can be proposed, but must be accepted by the Departemental Representative.

6.1.5. Grout injection

The injection of the grout is done from the bottom up.

6.1.6. Sleeves

Steel sleeves must be left in boreholes after installation.

6.1.7. Pressure and vacuum testing

1. Pressure tests must be carried out before and after the installation of the tubes in the boreholes;
2. Perform pressure and vacuum tests in compliance with CSA C448 standard on each U-tubes and each circuit:
 - At the factory, before the delivery on the geothermal site, all stainless tubes must be purged with nitrogen to evacuate the totality of humid air. The tubes must be sealed after the purge, with welded caps or service valves or the equivalent and with a positive nitrogen pressure.
 - Proceed with vacuum tests: bring the vacuum pressure down to 14 Pa absolute and hold for twenty-four (24) hours, for purge of air, moisture and other contaminants.
 - The pressure tests shall be carried out with nitrogen at a pressure of 13,000 kPa, without any loss of pressure for a period of 2 hours. Add nitrogen as needed to correct pressure loss due to mechanical and thermal expansion. The test is completed once the pressure is kept constant for at least 24 hours.
 - U-tubes and circuits should be pressurized prior to grouting, and pressure should be maintained for at least 24 hours after grouting.
 - The 5 pairs of pipes from the mechanical room to the well field (5 circuits) shall be pressurized before, and the pressure maintained for a period of at least 24 hours after backfilling is completed.
 - U-tubes and circuits failing the pressure test shall be replaced or repaired until they pass the test.
 - After testing and repairing leaks, the system must be filled with dry nitrogen up to a pressure of 200 kPa, and the tubes and pipes must be sealed with service valves or welded caps.



6.1.8. Connection to the mechanical room

1. Horizontal piping installed in a trench at a depth of 1.4 m to 1 m, in accordance with the civil engineering plan.
2. The tubes must come out of the ground at the edge of the mechanical room and have a sufficient length to allow for the final connection to the heat pump
3. The final connections between the geothermal piping and the heat pump in the mechanical room will be done later.
4. The connections between the boreholes and the mechanical room must be in a reverse-return configuration in a total of 5 distinct circuits;
 - Geothermal boreholes #1 to #12 are grouped by three to form 4 circuits as illustrated in figure 1. Figure 4 shows the connection details for 3 typical boreholes towards a supply header and a return header. Figure 5 shows a header's mechanical drawing that is applicable to all 8 headers. The 8 headers must be assembled and tested at the factory. The minimum length of 80 inches for the 3/8" diameter tubes is to facilitate the welding at the site;
 - Geothermal boreholes #13 to #20 are all combined on the same circuit (circuit #5) as illustrated in figure 1. The supply and return piping form two octagones which sides can be banded with 45° elbows (but weld of socket-weld);

6.1.9. Pipes identification

1. Each pipe must be identified at the point where it exits the ground near the mechanical room to facilitate final connection with the heat pump.
2. The identification must include the circuit number and the direction of supply or return.

6.1.10. Insulation

1. All horizontal stainless steel pipes, between the mechanical room and the geothermal boreholes, must be insulated with a suitable insulation that will not degrade in the ground, with a minimum thickness of 1cm. The insulation will have to:
 - Not be biodegradable over the life of the system (25 years);
 - Be non-compressible;
 - Be suitable for underground use; and
 - Not be negatively affected by water or temperatures below 0°C.
2. Rigid insulation with a thickness of 2 " will have to be installed in accordance with the civil engineer's plan

6.2. OPTIONAL WORK

6.2.1. Generalities

1. The location of the 4 thermal energy storage boreholes (boreholes #21 to #24) at the center of the geothermal field is illustrated in figure 6 in section 8.
2. In each of borehole is installed a single 3/4in. U-tube in HDPE;
3. The configuration of the boreholes and the arrangement of the piping are illustrated in figure 7 in section 8.

6.2.2. Drilling

1. Drill 4 boreholes of 2 3/4 in. to 3 in.(max) diameter, of a maximum effective depth of 165 feet (does not include the trench's depth) as illustrated in figure 7;



2. Plan for the water table management in compliance with the provincial and municipal regulation in force; the water table level at the site can be found in a geotechnical report that will be provided to the contractor;
3. Soils and rocks extracted from boreholes must be disposed of in compliance with the provincial and municipal regulations in force.

6.2.3. U-tubes fittings

U-tubes fittings must be prefabricated at the factory and pressure tested to confirm their tightness prior to installation in the boreholes;

6.2.4. Spacers

Spacers must be installed every 10 feet of pipes over the entire length of the borehole.

6.2.5. Grout injection

The injection of the grout is done from the bottom up.

6.2.6. Sleeves

Steel sleeves must be left in boreholes after installation.

6.2.7. Pressure testing

1. Pressure tests must be carried out before and after the installation of the tubes in the boreholes;
2. Perform pressure tests in compliance with CSA C448 standard on each U-tubes and each circuit
3. U-tubes and circuits failing the pressure test shall be replaced or repaired until they pass the test.

6.2.8. Connection to the mechanical room

1. Horizontal piping installed in a trench at a depth of 1.4 m to 1 m, in accordance with the civil engineering plan.
2. The tubes must come out of the ground at the edge of the mechanical room and have a sufficient length to allow for the final connection to the heat pump
3. The final connections between the HDPE piping and the heat pump in the mechanical room will be done later.
4. The HDPE U-tubes are filled with 50% propylene glycol, capped and sealed (for future use).

6.2.9. Pipes identification

1. Each pipe must be identified at the point where it exits the ground near the mechanical room to facilitate final connection with the heat pump.
2. The identification must include the borehole number and the direction of supply or return.

6.2.10. Insulation

1. Rigid insulation with a thickness of 2 " will have to be installed in accordance with the civil engineer's plan

6.3. HEALTH AND SAFETY – BASE SCOPE of WORK and OPTIONAL WORK

6.3.1. Safety assessment

1. Perform site specific safety hazard assessment related to project.
2. The Contractor has to plan and organize the Works so as to favor the elimination at the source of the dangers or the collective protection and so reduce to the least the use of personal protective equipments.



3. An equipment, a tool or a means of protection which cannot be settled or used without compromising the Health and Safety of the workers, the public and the users / occupants of places is considered for being inadequate for the Work to be made.

6.3.2.Meetings

1. Schedule and administer Health and Safety meeting with Departmental Representative prior the beginning of the Works, and insure its management.

6.3.3.General requirements

1. Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
2. Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
3. Appropriate action planning at all stages of the project is required, and should be submitted to the Project Authority for approval.
 - In particular, the contractor must mark the work area and ensure its safety.

6.3.4.Responsibility

1. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
2. Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
3. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

6.3.5.Compliance requirements

1. Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.

6.3.6.Unforeseen hazards

1. When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Safety Officer and/or Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of the Province of Quebec having jurisdiction and advise Departmental Representative verbally and in writing.

6.3.7.Posting of documents

1. Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of the Province of Quebec having jurisdiction, and in consultation with Departmental Representative.
2. Take all the necessary measures to assure an effective communication of the information regarding health and regarding safety on the construction site. From their arrival to the construction site, all the workers must be informed about the peculiarities of the program of prevention, about their obligations and about their rights. The Entrepreneur has to insist on the right(law) of the workers to refuse to execute a work if they believe that this work can compromise their health, their safety, their physical integrity or those of the other persons present on the construction site. He has to keep on the construction site and update a register with the transmitted information and the signature of all the workers who received this information.



3. The information and the following documents must be posted in an easily accessible place for the workers:

- Notice of Project of the construction site;
- Identification of the project manager;
- Corporate policy regarding SST;
- Program of specific prevention in the construction site;
- Emergency Plan;
- Identification sheets of all the controlled products used in the construction site;
- Reports of the meetings of the site committee of construction;
- Names of the representatives to the site committee of construction;
- Name of the first-aid workers;
- Reports of intervention and correction emitted by the CNESST.

6.3.8. Correction in case of non-compliance

1. Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
2. Provide Departmental Representative with written report of action taken to correct noncompliance of health and safety issues identified.
3. Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

6.3.9. Work stoppage

1. Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

6.4. CONSTRUCTION WASTE MANAGEMENT FOLLOWING BASE SCOPE OF WORK AND OPTIONAL WORK

6.4.1. Criteria of waste management:

1. The Contractor makes a commitment to make a responsible management for waste of construction / demolition in all the stages of the works until their elimination.
2. The Contractor is responsible for taking into account criteria of the environmental protection, applicable laws in the way he is going to arrange waste.
3. The Contractor has to favor the actions of management of the residual materials according to the following order: the reduction to the source, the re-use, the recycling, the valuation and the elimination (3RV-E)
4. The Contractor has to make sure that the recyclable, recoverable materials, valuable and the waste of construction is sorted out well to the source and that they are forwarded to a sorting office of the residual materials shape and to use the burying as a last resort.
5. The Contractor makes sure to prevent the contamination of the scrap materials intended to be got back and recycled, according to the acceptance conditions of the appointed installations.
6. The Contractor makes any time sure to protect well the materials of the bad weather so that they do not become waste.
7. The transport by a verified carrier and the delivery of the not recoverable waste following the works towards an installation of authorized elimination stays the responsibility of the Contractor.



-
8. All the residual materials of construction which must be evacuated / eliminated become property of the Contractor.

6.5. WORK SCHEDULE AND CONDITIONS FOR BASE SCOPE of WORK and OPTIONAL WORK

- 6.5.1. Work must be performed within the normal office working hours. If it is necessary to perform some work outside the normal office working hours, the project manager must be advised such that a commissioner will be assigned on work surveillance.
- 6.5.2. The contractor shall provide all energy source for the execution of the work.
- 6.5.3. The contractor will be able to use a chemical sanitary installation that will be installed on the site.

7. ADDITIONAL DOCUMENTATION

- 7.1. Civil engineering plan (Off pagination – 1 page)
- 7.2. Geotechnical Report (Off pagination – 64 pages)

8. DRAWINGS

Figure 1 : Configuration of 20 Boreholes Geothermal Field

Figure 2 : Configuration of Boreholes #1 to #20 and Double U-tube Arrangement

Figure 3 : Double U-tube Support

Figure 4 : Typical Piping Diagram Between Circuit Header and Boreholes for Circuits #1 to #4

Figure 5 : Headers for Circuits #1 to #4

Figure 6 : Position and Arrangement of the 4 Optional Energy Storage Boreholes (Boreholes #21 to #24)

Figure 7 : Configuration of Optional Boreholes and Single U-tube



Figure 1: Configuration of 20 Boreholes Geothermal field

Boreholes Circuiting

Circuits #1 : boreholes #1, #2, #3

Circuits #2 : boreholes #4, #5, #6

Circuits #3 : boreholes #7, #8, #9

Circuits #4 : boreholes #10, #11, #12

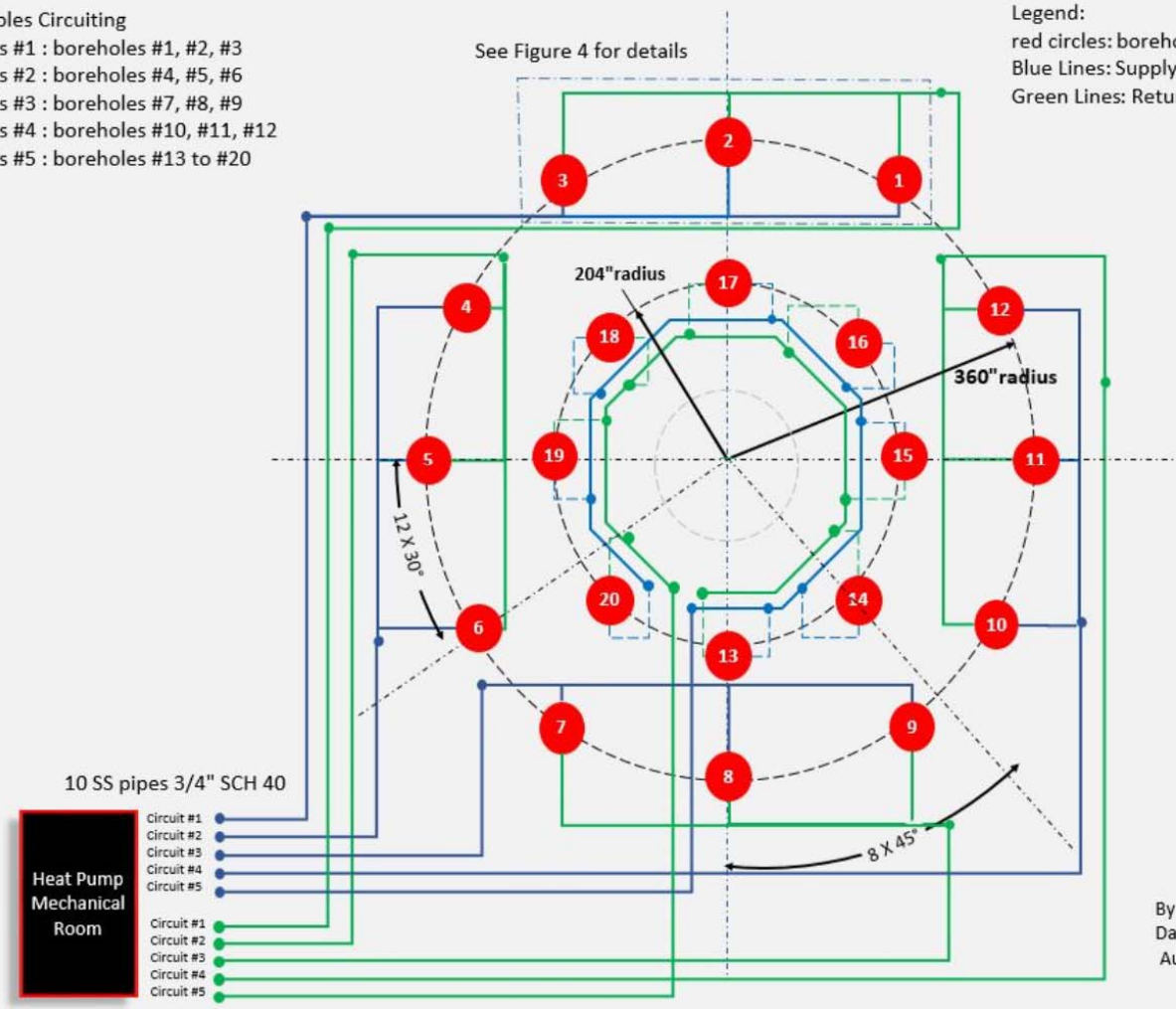
Circuits #5 : boreholes #13 to #20

Legend:

red circles: boreholes

Blue Lines: Supply

Green Lines: Return



By:
Daniel Giguère
August 15 2019

Figure 2: Configuration of Boreholes #1 à #20 and Double U-Tube Arrangement
Cut A-A

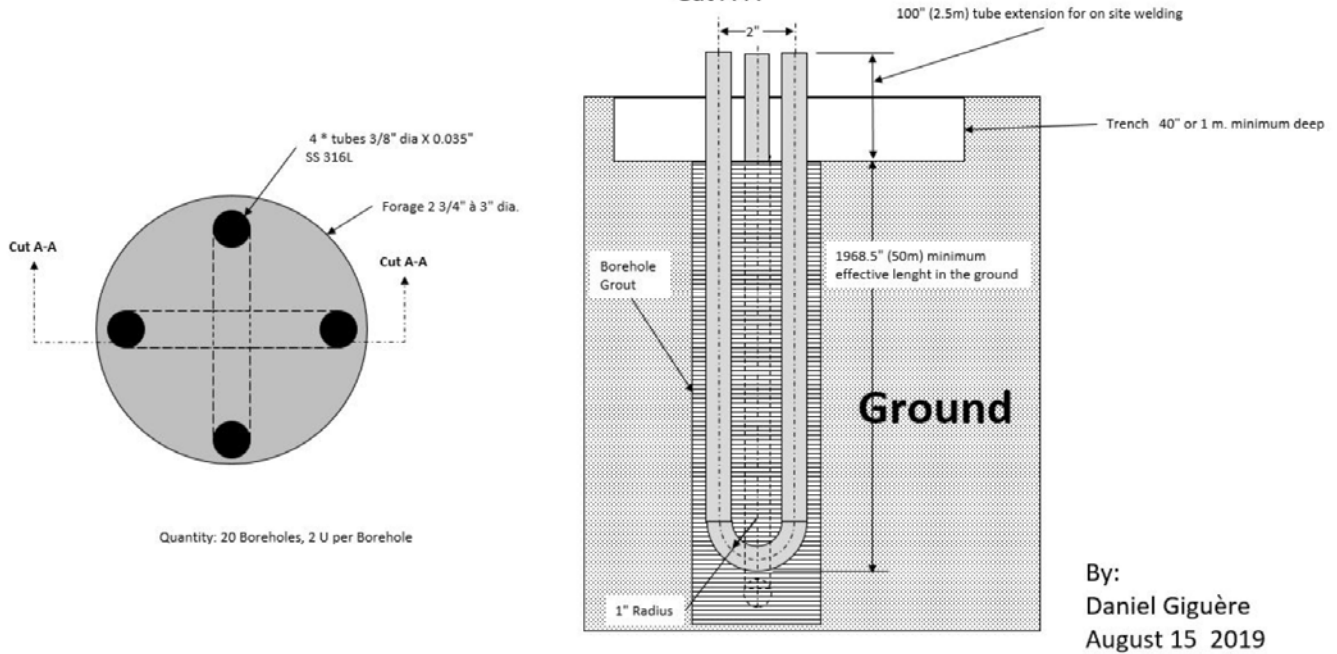


Figure 3: Double U tube support

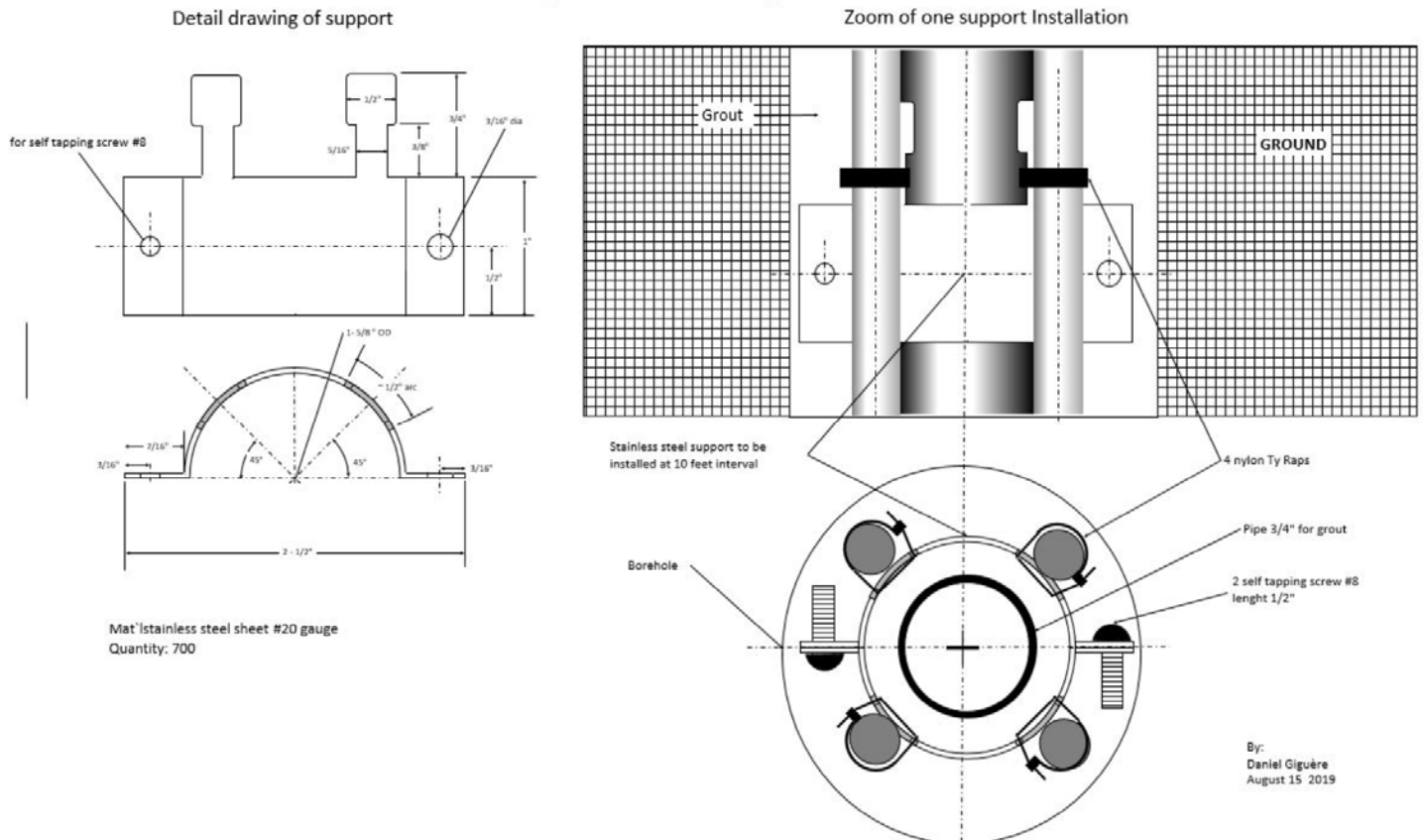




Figure 4: Typical Piping Diagram Between Circuit Header and Boreholes for Circuits #1 to #4

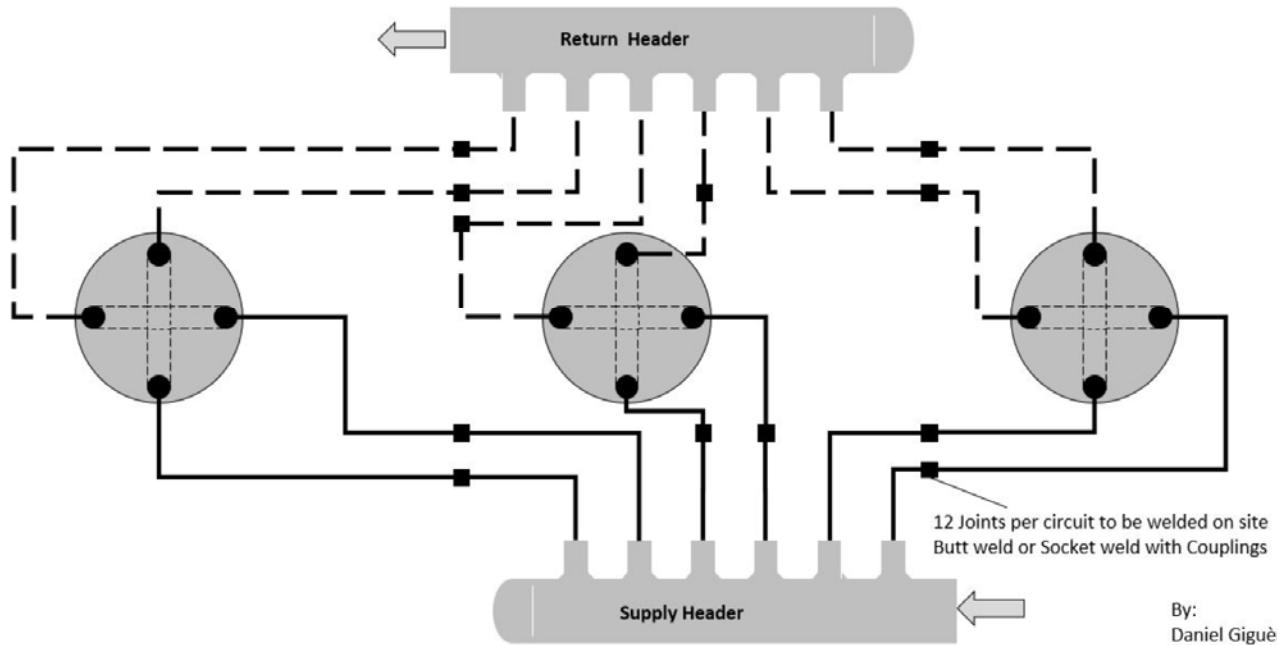
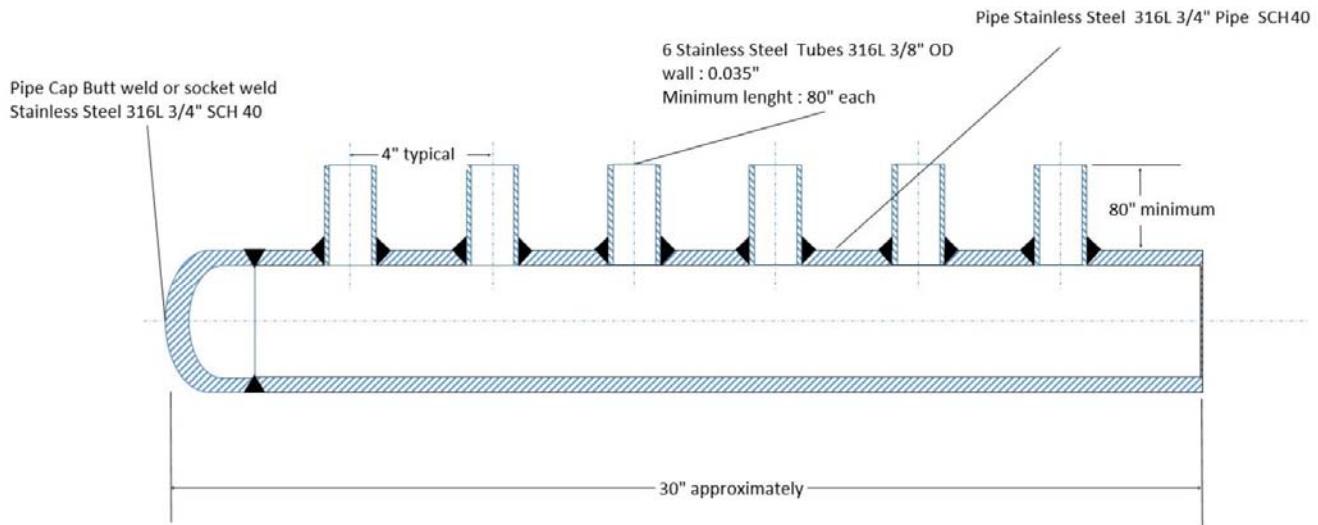


Figure 5: Headers for Circuits #1 to #4



Quantity: 8 Identical Headers manufactured at the factory for Circuit #1 to #4

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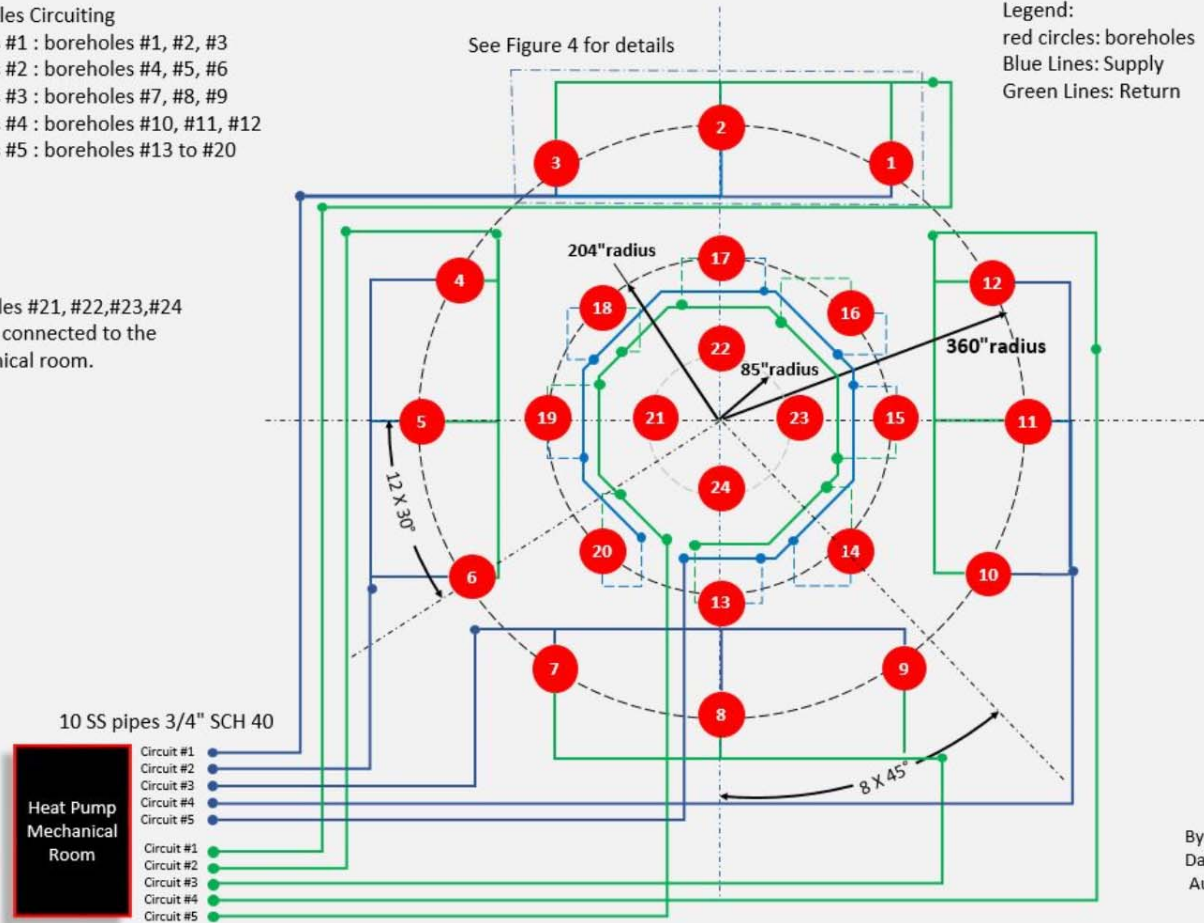
OPTIONAL WORK

Figure 6: Position and Arrangement of the 4 Optional Energy Storage Borehole s(Boreholes#21to 24)

- Boreholes Circuiting
- Circuits #1 : boreholes #1, #2, #3
 - Circuits #2 : boreholes #4, #5, #6
 - Circuits #3 : boreholes #7, #8, #9
 - Circuits #4 : boreholes #10, #11, #12
 - Circuits #5 : boreholes #13 to #20

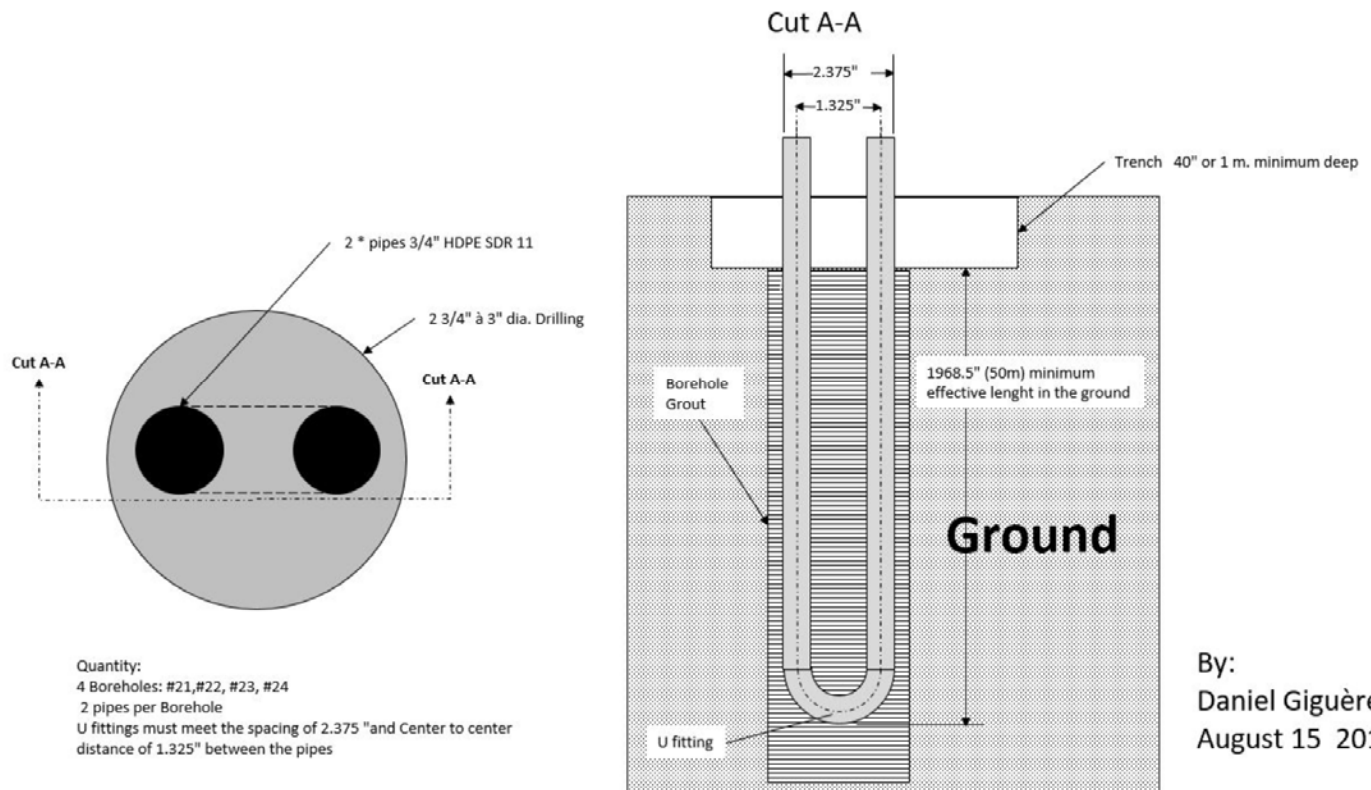
Legend:
 red circles: boreholes
 Blue Lines: Supply
 Green Lines: Return

Note:
 Boreholes #21, #22, #23, #24
 are not connected to the
 mechanical room.



By:
 Daniel Giguère
 August 15 2019

Figure 7: Configuration of Optionnal Boreholes and Single U-Tubes



By:
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August 15 2019

END



ANNEX B - CERTIFICATE OF INSURANCE (Not required at solicitation closing)

Description and Location of Work	Project No. NRCan-5000041189
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Name of Insurer, Broker or Agent	Address (No., Street)	City	Province	Postal Code
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Name of Insured (Contractor)	Address (No., Street)	City	Province	Postal Code
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Additional Insured
Her Majesty the Queen in Right of Canada as represented by the Minister of Natural Resources Canada

Type of Insurance	Insurer Name and Policy Number	Inception Date D / M / Y	Expiry Date D / M / Y	Limits of Liability		
				Per Occurrence	Annual General Aggregate	Completed Operations Aggregate
Commercial General Liability Umbrella/Excess Liability				\$	\$	\$
Builder's Risk / Installation Floater				\$		
Pollution Liability				\$ <input type="checkbox"/> Per Incident <input type="checkbox"/> Per Occurrence		Aggregate \$

I certify that the above policies were issued by insurers in the course of their Insurance business in Canada, are currently in force and include the applicable insurance coverage's stated of this Certificate of Insurance, including advance notice of cancellation / reduction in coverage.

<input type="text"/>	<input type="text"/>
Name of person authorized to sign on behalf of Insurer(s) (Officer, Agent, Broker)	Telephone number
<input type="text"/>	<input type="text"/>
Signature	Date D / M / Y



General

The insurance policies required on page 1 of the Certificate of Insurance must be in force and must include the insurance coverage listed under the corresponding type of insurance on this page.

The policies must insure the Contractor and must include Her Majesty the Queen in Right of Canada as represented by the Minister of Natural Resources Canada as an additional Insured.

The insurance policies must be endorsed to provide Canada with not less than thirty (30) days' notice in writing in advance of a cancellation of insurance or any reduction in coverage.

Without increasing the limit of liability, the policies must protect all insured parties to the full extent of coverage provided. Further, the policies must apply to each Insured in the same manner and to the same extent as if a separate policy had been issued to each.

Commercial General Liability

The insurance coverage provided must not be substantially less than that provided by the latest edition of IBC Form 2100. The policy must either include or be endorsed to include coverage for the following exposures or hazards if the Work is subject thereto:

- (a) Blasting.
- (b) Pile driving and caisson work.
- (c) Underpinning.
- (d) Removal or weakening of support of any structure or land whether such support be natural or otherwise if the work is performed by the insured contractor.

The policy must have the following minimum limits:

- (a) **\$1,000,000** Each Occurrence Limit;
- (b) **\$2,000,000** General Aggregate Limit per policy year if the policy contains a General Aggregate; and
- (c) **\$1,000,000** Products/Completed Operations Aggregate Limit.

Umbrella or excess liability insurance may be used to achieve the required limits.

Builder's Risk / Installation Floater

The insurance coverage provided must not be less than that provided by the latest edition of IBC Forms 4042 and 4047. The policy must permit use and occupancy of any of the projects, or any part thereof, where such use and occupancy is for the purposes for which a project is intended upon completion.

The policy may exclude or be endorsed to exclude coverage for loss or damage caused by asbestos, fungi or spores, cyber and terrorism.

The policy must have a limit that is **not less than the sum of the contract value** plus the declared value (if any) set forth in the contract documents of all material and equipment supplied by Canada at the site of the project to be incorporated into and form part of the finished Work. If the value of the Work is changed, the policy must be changed to reflect the revised contract value.

The policy must provide that the proceeds thereof are payable to Canada or as Canada may direct in accordance with GC10.2, "Insurance Proceeds" (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R/R2900D/2>).

Contractors Pollution Liability

The policy must have a limit usual for a contract of this nature, but not less than **\$1,000,000** per incident or occurrence and in the aggregate.



ANNEX C - LISTING OF SUBCONTRACTORS

- 1) In accordance with GI06 - Listing of Subcontractors and Suppliers of R2410T- General Instructions - Construction Services - Bid Security Requirements, the Bidder should provide a list of Subcontractors with his Bid.
- 2) The Bidder should submit the list of Subcontractors and for any portion of the Work valued at 20% or greater of the submitted Bid Price.

	Subcontractor	Division	Estimated value of work
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			