



GOVERNMENT OF NUNAVUT

TENDER

**QGH Laboratory Air Conditioning Supply &
Install**

Iqaluit, Nunavut

**Project No.
CGSHQ-11014**

**Tender Reference No.
CGSHQ-11014-02**

**GOVERNMENT OF NUNAVUT
REQUEST FOR TENDERS
CONSTRUCTION or SERVICES CONTRACT**

Tender Reference Number (Please refer to number when making inquiries)		CGSHQ-11014-02
BID FORM PAGE 1 of 1	NO. OF ATTACHMENTS 8	

TENDER ADDRESSED TO: Deputy Minister Community & Government Services Purchasing, Logistics & Contract Support P. O. Box 1000 - Station 1600 Iqaluit, NU X0A 0H0 or DELIVERED TO: 3rd Floor, W. G. Brown Building Iqaluit, NU X0A 0H0 In care of: Contracts Coordinator Facsimile Number: (867) 975-5450	TENDERS MUST BE RECEIVED PRIOR TO (TIME): Local Time: 16:00 hrs (4:00 P.M.) Date: (Month/Day/Year) January 26, 2012
	CONTACT FOR INQUIRIES: Name: Maggie Nowdlak Title: Contracts Coordinator Telephone: (867) 975-5443 Fax: (867) 975-5450

FACSIMILE TENDERS WILL BE ACCEPTED

QGH Laboratory Air Conditioning Supply & Install

The Contractor must complete this work on or before: March 28, 2012

Work under this contract consists of but is not necessarily limited to the description provided in the Scope of Work and attached Appendices. The tender and all attachments form the general intent of the contract.

This tender and contract document consists of the following:

1. Instructions to Bidders - Fax Tenders - 2 pages
2. Bid Form/Contract Signature Page - 1 page
3. Appendix A - General Conditions - 2 pages
4. Appendix B - NNI Incentives Form - 1 page (Bidder to Complete and Submit with Bid Form)
5. Appendix C - Contractor's Obligation to Provide Inuit Labour - 3 pages
6. Appendix D - Employment Report
7. Appendix E - Scope of Work - 49 pages
8. Drawings/Floor Plans - 1 page

A site meeting will take place at 1PM, Thursday January 19th, 2012. Contact Maggie Nowdlak for details and to confirm attendance.

CONTRACTOR - OFFER

Name of Contractor	Contractor Address
Contact Person (Name and Title)	
Phone () - Fax () -	
I, the Contractor, acknowledge receipt of Addendum # ____ to # ____.	

The Contractor hereby covenants and agrees to execute and complete the work described herein, on or before the 28th day of March, 2012 in a workmanlike manner, in accordance with the terms and conditions outlined in all attached appendices and/or other attachments, for the total bid price (as applicable) of:

_____/100 Dollars \$ _____

Contractor Authorized Signature Title Date

GOVERNMENT OF NUNAVUT (OWNER) ACCEPTANCE

For the Purpose of this contract the Owner (GN) may be represented by the Consultant:

Government of Nunavut Authorized Signature Title Date

INSTRUCTIONS TO BIDDERS
FACSIMILE TENDERS

Tender Reference Number (Refer to number when making inquiries)	CGSHQ-11014-02 Page 1 of 2
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1. FACSIMILE TENDERS WILL BE ACCEPTED for this tender request in accordance with the following conditions:
 - a) Tenders must be received on or before the exact time and date that the Government of Nunavut (GN) has set for the reception of tenders indicated on the Bid Form.
 - b) Tenders must be received at the facsimile number identified on the Bid Form, except when the bidder chooses to submit the tender in a sealed envelope in accordance with 1(f) below.
 - c) Multi-page facsimile tenders shall not be considered received until the transmission has been completed, which must occur prior to the stated closing time and date.
 - d) The bidder has the obligation to confirm with the GN that the facsimile transmission has been received. The GN shall not be held liable for any claim, demand or other actions for any reason should a facsimile transmission be interrupted, not received in its entirety, received after the stated closing time and date, received by any other facsimile unit than that stated herein.
 - e) While the GN will undertake to handle your facsimile tender in a secure manner, it is impossible to guarantee complete confidentiality of information received by facsimile.
 - f) Bidders may choose to submit their tender in a sealed envelope identified on the outside of the sealed envelope or package as a tender stating: TENDER REFERENCE NUMBER OR TITLE, CLOSING DATE AND BIDDER'S NAME. Any bidder submitting a sealed tender lacking this information on the outside of the delivery envelope does so at his/her peril.
2. All tenders are irrevocable for a period of thirty (30) days from the closing date and time.
3. The lowest or any tender will not necessarily be accepted. The GN reserves the right to cancel this tender, in whole or in part at any time and to reissue same thereafter, for any reason whatsoever, without incurring any liability and no bidder will have any claim against the GN as a consequence.
4. All tenders are to be on the forms provided herein and signed by a duly authorized representative of the bidder. Failure to comply may result in the tender being rejected as non-responsive, at the sole discretion of the GN.
5. Tenders shall be opened as soon as practicable after the tender closing time.
6. One of the priorities of the GN is to ensure that materials, equipment and other services of Inuit and Nunavut business and that labour of Nunavut residents and /or Inuit are used to the fullest extent practicable, and the Nunavummi Nangminiqatunik Ikajuuti (NNI) Policy apply to this request for tenders. Additional bid incentive is available to registered Inuit or Nunavut businesses resident in the community/communities where the work is to be performed. Bidders must comply with the requirements of the NNI Policy and complete and submit the NNI Appendix that forms part of this Request for Tenders.
7. Bidders are hereby reminded of the requirements to maximize the use of Nunavut, Inuit and/or Local subcontractors and suppliers available to the fullest extent practical on this project. Further to this clause, and pursuant to the 2003 First Comprehensive Review of the NNI Policy, the GN hereby requires Bidders to invite Nunavut, Inuit and/or Local companies to bid on subcontracts.

INSTRUCTIONS TO BIDDERS
FACSIMILE TENDERS

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8. Addenda issued prior to the tender closing time shall become part of the Request for Tenders. Bidders are to acknowledge receipt of addenda on the Bid Form.
9. Verbal responses to any inquiry cannot be relied upon and are not to be construed as an implied term of this tender or any resultant contract.
10. The GN reserves the right to negotiate price, scope of work, or both, with the lowest adjusted bidder in order to achieve a reduced scope of work and price up to 15%.
11. The contractor (successful bidder) and all sub-contractors shall use licensed local Hotels or Bed and Breakfast establishments to provide accommodation and/or meals for all workers not resident in the community in which work is being undertaken.
12. The tender will be evaluated and the contract based on the unit price multiplied by the estimate of work rather than the total bid price if the amount of work is explicitly stated as an estimate. Where there is any discrepancy between the unit price and the total based on the estimated amount of work, the unit price shall govern.
13. The Government will pay the Goods and Services Tax (GST); however, do not include the GST in your bid amounts shown on the tender form and appendices.

APPENDIX A
GENERAL CONDITIONS
CONSTRUCTION or SERVICES CONTRACT

Tender Reference Number

CGSHQ-11014-02

(Please refer to number when making inquiries)

Page 1 of 2

1 GENERAL

- a. No Bid or Contract security is required for this Contract.
- b. Time is of the essence of this Contract.
- c. This Contract will be interpreted and governed in accordance with the laws of Nunavut and the laws of Canada as they apply in Nunavut.
- d. The Contractor waives all rights of recourse against the Owner for damages to the Contractor's property or property of others for which the Contractor is responsible and the Contractor's Insurers of such property shall have no right of subrogation against the Owner.
- e. The Contract comprises the entire agreement between the parties and supersedes all communications, negotiations and agreements, either written or oral, relating to the work that were made prior to the date of the Contract.
- f. No implied terms or obligations of any kind by or on behalf of the Owner shall arise from anything in the Contract and the express covenants and agreements therein contained and made by the Owner are the only covenants and agreements upon which any rights against the Owner are to be founded.
- g. This Contract shall enure to the benefit of and be binding on the respective administrators, successors and assigns of each of the parties hereto.
- h. It is a condition of this Agreement that payment hereunder is subject to Section 46 of the Financial Administration Act (Nunavut) as amended or reenacted in successor legislation during the term of this Contract. Section 46 currently provides as follows: " It is a condition of every Contract made by or on behalf of the government requiring an expenditure, that an expenditure pursuant to the Contract will be incurred only if there is a sufficient uncommitted balance in the appropriated item for the fiscal year in which the expenditure is required under the Contract."
- i. It is intended that all provisions of this Contract shall be fully binding and effective between the parties, but in the event that any particular provision or provisions or a part of one is found to be void, voidable, or unenforceable for any reason whatever, then the particular provision or provisions shall be deemed severed from the remainder of this Contract and all other provisions remain in full force.
- j. The Contractor is an independent Contractor with the Owner and nothing in this Contract shall be construed or deemed to create the relationship of employee and employer or of principal and agent between the Owner and the Contractor.

2 CONTRACTOR'S OBLIGATIONS

- a. be familiar with the Contract documents and make allowance in their Tender for all existing conditions that will affect the execution of the work.
- b. furnish all tools, equipment, labour, supervision, materials and other supplies and services necessary for and incidental to the execution and completion of the Work unless specified to the contrary.

(CONTRACTOR'S OBLIGATIONS CONTINUED)

- c. not assign this Contract or subcontract the work, without the prior written consent of the Owner. If, with the Owner's consent, the Work or any part of the Work is done by a subcontractor, the contractor shall be fully responsible to the Owner for the acts and omissions of the subcontractor and all its servants, agents and employees.

Where the Contractor is not already using Inuit or Nunavut or Local firms as subcontractors and wishes to subcontract the work, the Contractor shall invite only Nunavut, Inuit or Local firms to bid on the subcontract. Local is defined in the NNI Policy and includes Inuit firms as well as Nunavut firms.
- d. bind any subcontractor to the terms of this Contract.
- e. comply with all codes, laws and regulations in effect at the place of work and the Contractor shall arrange and pay for all permits, licenses and fees required in connection with the Work.
- f. where specified, provide shop drawings acceptable to the Owner, and,
- g. maintain one copy of all Contract documents at the site.
- h. provide the Owner with all color and materials samples required by the specifications for approval.
- i. provide a work schedule when requested by the Owner; conform to the schedule; and provide sufficient labour and material to conform to that schedule.
- j. permit the Owner full and free access to the site and work at all times and provide full information concerning the Work upon request.
- k. promptly replace faulty materials and rectify faulty workmanship at his expense.
- l. keep proper books of account with respect to the Work and produce them for examination of the Owner upon request within a three-year period from Substantial Completion.
- m. provide written cost quotation for any changes to the Work specified by the Owner and undertake such changes upon request.
- n. submit any progress claims, accompanied by all necessary supporting documentation for Owner consideration. Any accepted progress claim shall be subject to a holdback of ten percent of the value of the progress claim.
- o. upon completion of the Work, furnish an invoice for the Work accompanied by a Statutory Declaration that all obligations have been met, and by the Employment Report and other related documents which confirm the total amount of Inuit, Local and Nunavut content is used in the Work.
- p. guarantee and warrant the Work for a period of twelve months from the date of Substantial Completion of the Work or for such longer period as might otherwise stated in the Contract.
- q. indemnify and hold harmless the Owner, the owner's employees and agents, from any and all claims, demands, actions and costs arising out of the performance of the Contract for which the Contractor, the Contractor's employees or agents are legally responsible.

cont'd next page...

APPENDIX A
GENERAL CONDITIONS
CONSTRUCTION or SERVICES CONTRACT

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(CONTRACTOR'S OBLIGATIONS CONTINUED)

- r. maintain the following Insurance coverage for the duration of the Contract:
- Comprehensive General Liability Insurance with a limit of not less than two million dollars inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof.
 - Automobile Liability Insurance in respect of the Contractor's owned and leased licensed vehicles with limits of not less than one million dollars inclusive per occurrence for bodily injury, death and damage to property.
 - Course of Construction insurance on an " All Risks" basis for physical loss or damage to materials, equipment, machinery, structures, property, fittings, fixtures and supplies that will form part of the finished Work. The Contractor shall be responsible for the deductible to a maximum of \$50,000.
- The amount of deductible on any insurance provided by the Contractor shall be borne by the Contractor in its entirety. All required insurance shall be endorsed to provide the Owner with thirty (30) day advance written notice of material change, cancellation or termination. The Contractor shall complete and submit the "Contractor's Certificate of Insurance" form available from the Owner prior to execution of the Contract.
- s. pay and be solely responsible for payments of all statutory deductions or contributions including, but not limited to, pension plans, unemployment insurance, income tax, Worker's Compensation and the Nunavut payroll tax.
- t. immediately notify the Owner in writing should he consider a decision by the Owner to be in error and/or at variance with this contract. Such notification however, shall not relieve the Contractor from confirming with the instructions of the Owner, or completing the Work.

3. GOVERNMENT OF NUNAVUT'S RIGHTS AND OBLIGATIONS

- a. If the work is not being properly done, or if the Contractor fails to comply with a written request from the Owner within 24 hours, the Owner may:
- suspend progress of the Work at any time;
 - correct the defective Work itself;
 - deduct the difference in cost between the Work completed and the work required by the Contract;
 - deduct the cost to rectify the deficiency from any amount owing to the Contractor, on this or any other Contract;
 - hold back, in whole or in part, any amount due to the Contractor until the deficiency has been rectified to the Owner's satisfaction.
- b. Terminate the contract at any time, without penalty or damages, upon giving written notice to this effect to the Contractor, if in the opinion of the GN:
- the contractor is unable to deliver the service required;
 - the Contractor's performance of the work is faulty;
 - the Contractor becomes insolvent or commits an act of bankruptcy;
 - the Contractor defaults or fails to observe the terms and conditions of the contract in any material respect;
 - any actual or potential labour dispute delays or threatens to delay timely performance of the contract;

(GN'S RIGHTS AND OBLIGATIONS CONTINUED)

- and the Contract shall terminate on the date stated in the written notice. The contractor shall then invoice the GN for work performed to the date of termination.
- c. make written changes in the Work by adding to, or deleting from or revising the Work so long as the changes do not fundamentally alter the contract.
- d. make payment to the Contractor within thirty (30) days after receipt of invoices, except that the Owner shall pay Nunavut Contractors within
- e. upon completion and acceptance of Work pay the Contractor the agreed Contract sum less any assessments made under the Contract.

Nunavummi Nangminiqaqtunik Ikajuuti (NNI Policy) Incentives Form

The Government of Nunavut (GN) has implemented the Nunavummi Nangminiqaqtunik Ikajuuti (NNI Policy) to promote Inuit, Nunavut, and Local Business and labour. All Tenderers/Proposers wishing to obtain a bid adjustment as outlined in this policy, MUST indicate the value of any Inuit, Nunavut and/or Local inputs to the Contract. This will include the Tenderers/Proponents "own forces" and may also include any other Nunavut or Inuit owned Sub-contractor or supplier and labour.

The following information is required as part of the TENDER/PROPOSAL and must include all applicable cost elements for the Tenderer/Proposer and all sub-contractors and suppliers. Cost inputs that are Inuit, Nunavut or Local, as defined by the NNI Policy will receive an adjustment. The GN reserves the right to request clarification or additional information of the amounts claimed below and failure to provide such information may result in the bidder not receiving the adjustment. The maximum adjustment for cost inputs is 21%.

**SUBMIT ALL APPENDIX B FORMS AS PART OF YOUR TENDER BID/PROPOSAL
USE ACTUAL BID PRICING ON THIS FORM, THE GN WILL CALCULATE BID ADJUSTMENTS.**

<p>COST COMPONENTS \$ BREAKDOWN</p> <p>Give a breakdown of your total bid by applicable cost components. List yourself as "Own Forces" or put the full business name of the company providing the goods or services under Company Name.</p> <p>Name of Contractor:</p>	<p>- Note: Inuit firms are those on the NTI Inuit Firms Registry, and Nunavut Businesses are those approved by the GN for the NNI Registry of Nunavut Businesses. Registered Nunavut Businesses and Inuit Firms are "Local" if they are registered for the community where the work will be carried out.</p> <p>- Company status will be verified by the GN and preference and bid adjustments will be in accordance with the business's status and the NNI adjustment factors</p> <p>- The Payroll \$ to Inuit Labour compared to the Total Payroll must meet the minimum % Inuit Labour Requirement.</p>
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Note: Photocopy, complete and attach COST COMPONENT and PAYROLL TABLES for each subcontractor.

COMPONENT	COMPANY NAME	\$ COST for COMPONENT	Check appropriate column(s) below for named companies. Bid adjustments will be calculated by the GN based on the companies actual registered status with the GN and with NTL.				Total % (GN to complete)
			Nunavut Status 7%	Inuit Status 7%	Local Status 7%	Other Status 0%	
Total Payroll (Show breakdown in Payroll Table below)							
Material Supplier 1			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Material Supplier 2			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Equipment			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Accommodation			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transportation			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Expenses (include profit and overhead)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
TOTAL BID (Bid amount should equal amount shown on tender/bid form).		\$	TOTAL ADJUSTED BID (GN use only)				\$

Complete the Payroll Table below

Provide a cost breakdown for the total Payroll Component amount on the Payroll Table. **Note:** The Total Payroll amount is the sum of the Inuit, Nunavut and Other Labour amounts and must not be greater than the amount identified above. The total Inuit Labour amount is the sum of Local Inuit Labour and Inuit Labour excluding local. The dollar amount for Total Inuit Labour compared to the Total Payroll amount must meet the minimum % Inuit Labour Requirement specified in Appendix C.

Total Payroll \$ from table above	\$ Other Labour	\$ Local Nunavut Labour	\$ Nunavut Labour (excl. Local)	\$ Local Inuit Labour	\$ Inuit Labour (excl. Local & Nunavut)	\$ Total Inuit Labour
\$		\$	\$	\$	\$	\$
<i>Adjustment %'s</i>	(0%)	(14)%	(7%)	(21%)	(7%)	

CONTRACTOR'S OBLIGATION TO PROVIDE INUIT CONTENT

1. GENERAL

This contract pertains to work in Nunavut and the Nunavummi Nangminiqatunik Ikajuuti (NNI) Policy applies to this tender; a copy of the NNI Policy is available from the Department of Public Works and Services. This contract contains provisions regarding the minimum prescribed level of Inuit Labour that must be met or exceeded in the performance of the work. The requirements set out in this Appendix to meet the minimum prescribed levels of Inuit Labour is a fundamental term of the contract. The minimum prescribed level of Inuit Labour shall be complied with.

If the amount of Inuit Labour identified by the bidder on Appendix "B" of the tender is less than the tender requirement, this would result in an obvious qualification to the tender submission by the bidder that would ordinarily cause the tender to be considered non-responsive.

For an Inuit Labour level achieved which differs from the level prescribed, a bonus or penalty will be assessed in accordance with the NNI Policy, specifically Articles 12.3 and 12.4 of the Policy. A bonus would be for exceeding the minimum prescribed Inuit Labour level, and a penalty would be for not meeting the minimum prescribed Inuit Labour level.

Inuit Labour and Inuit Goods and Services (as well as Nunavut Local Labour and Goods and Services) identified on the tender forms shall receive a bid adjustment in accordance with the NNI Policy.

2. DEFINITIONS

- .1 "Inuit (singular Inuk)" means a person described in Article 1.1.1 of the Nunavut Land Claims Agreement (NLCA) and who has enrolled himself or herself on the Inuit Enrolment List under Article 35 of the NLCA.
- .2 "Inuit firm" means an entity which complies with the legal requirements to carry on business in the Nunavut Settlement Area, and that is, prior to tender closing, included on Nunavut Tunngavik Inc. (NTI)'s Inuit Firms Registry.
- .3 "Labour" means the total Labour used on the job in any capacity and including, for example, tradespeople, administrative staff and professional staff whether in a head office or in a site office and attributable to this project. "Inuit Labour" refers to the status of employees and may be directly provided by the general contractor or indirectly through a sub-contractor, and not necessarily through an Inuit Firm.
- .4 "Goods and Services" means the entire dollar value of the Work including Labour. For further clarification "Inuit Goods and Services" includes all labour of Inuit Firms attributable to and paid from the Contract.

- .5 "Inuit Content" is defined as the dollar value of the goods and services required by the Contract supplied by any Inuit Firm or Inuit sole proprietorship and Inuit Labour. Inuit Content may include:
- i. goods and services supplied by an Inuit Firm or Inuit supplier acting as the General Contractor. These are referred to as "own forces";
 - ii. goods and services supplied by an Inuit Firm or Inuit supplier so long as these goods and services are required for the completion of the Contract and are paid for by the Contract.
 - iii. Inuit Labour by an Inuit Firm or a non-Inuit Firm.

3. REQUIREMENTS

- .1 The Contractor shall maximize the value of Inuit Labour and Inuit Goods and Services, and shall meet or exceed the Inuit Labour minimum identified in this Appendix when bidding. In the performance of the work, the contractor shall meet or exceed the amounts tendered on Appendix B.
- .2 The Contractor shall submit reports at the completion of the work, or as specified, that indicate the amount of Inuit Labour and Inuit Goods and Services used. No payment shall be due or payable to the Contractor if the Contractor fails to supply these reports to the Owner.

4. FAILURE TO ACHIEVE INUIT CONTENT REQUIREMENTS

In addition to the bonus or penalty prescribed by the Nunavummi Nangminiqagtunik Ikajuuti (NNI Policy) for exceeding or not meeting the minimum prescribed Inuit Labour level set out in this Appendix; the following damages may apply for failure to meet Inuit Labour and/or Inuit Goods and Services requirements:

- .1 For failure to meet the levels of Inuit Labour and Inuit Goods and Services tendered by the Contractor on Appendix B of the tender, the contractor will be in breach of contract and general conditions concerning contract breach may apply.
- .2 Additionally, if the Contractor fails to meet the prescribed minimum Inuit Labour set out in this appendix, then for future tenders where there are similar prescribed minimum levels for Inuit Labour, the Owner may deem the Contractor to be "not responsible" (as defined in the Government Contract Regulations).
- .3 The Owner may terminate this contract prior to completion, if the Contractor has not demonstrated compliance with the requirement to attain the prescribed minimum levels of Inuit Labour set out in this Appendix.

5. INDEMNIFICATION

- .1 The Contractor shall indemnify the Owner against any claim brought by any person because of any failure by the Contractor to achieve the prescribed levels of Inuit Labour prescribed by this contract.

6. WAIVER OF INUIT CONTENT REQUIREMENTS

- .1 The prescribed level of Inuit Labour shall only be reduced when sufficient Inuit Labour is not available and the Contractor has requested and received prior approval by the Owner in writing to reduce the prescribed levels.

7. REQUIRED MINIMUM LEVELS OF INUIT LABOUR

- .1 For the purpose of this contract, the prescribed minimum level of Inuit Labour to be provided by Inuit workers shall 30 % expressed as a percentage by dollar value for the total labour value for the contract. Inuit Labour is the dollar value of Inuit Labour provided by Inuit and Non-Inuit firms for this contract.

**APPENDIX D
EMPLOYMENT REPORT**

Project No.:	Contract No.:
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Project Name: QGH Laboratory Air Conditioning Supply & Install	
Project Location: Iqaluit, Nunavut	
General Contractor:	Project Officer:
Report Submitted By (General/Subcontractor):	Reporting Period: From: _____ To: _____

This Employment Report is submitted with (*CHECK ONE*)

<input type="checkbox"/> Progress Claim Date: _____	<input type="checkbox"/> Certificate of Substantial Completion Date: _____	<input type="checkbox"/> Final Certificate of Completion Date: _____
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Employee's Name	**Inuit		Employee's Address	Date Hired	Date Terminated	Hours of Work This Period	Hours of Work to Date	Gross Income this Period	Gross Income to Date	*Class
	Yes	No								

Contractor's/Subcontractor's Name and Title (<i>PRINT</i>)	Contractor's/Subcontractor's Signature	Date

- * Class
 1. Superintendent 2. Carpenter 3. Carpenter Apprentice 4. Labourer 5. Mechanical 6. Mechanical Apprentice 7. Electrician
 8. Electrical Apprentice 9. Drywall/Painter 10. Drywall/Painter Apprentice 11. Other (Specify)

** Beneficiary of the Nunavut Land Claims Agreement

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November 28, 2011

1 General

1.1 RELATED SECTIONS

- .1 Section 23 05 01 - Installation of Pipework

1.2 REFERENCES

- .1 ASTM D 2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Pipe and Fittings.
- .2 CSA B181.2, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
- .3 CSA B181.12, Recommended Practice for the Installation of PVC Drain, Waste and Vent Pipe and Pipe Fittings.

2 Products

2.1 PIPING AND FITTINGS

- .1 For above ground:
 - .1 Certified PVC to CSA B181.2-96 listed for use in noncombustible construction, ULC listed to CAN4-S102.2, flame spread rating maximum 15.
 - .1 Acceptable material: IPEX System 15 PVC-DWV.

2.2 JOINTS

- .1 Solvent cement:
 - .1 General: low VOC suitable for PVC pipe.
 - .2 Approvals: ASTM D-2564, SCAQMD Rule 1168/316A, Uniform Plumbing Code seal.
 - .3 Color: gray
 - .4 Resin: PVC
 - .5 Max VOC Emissions: 510G/L per SCAQMD Rule 1168, Method 316A.
 - .6 Acceptable material: IPS Weld-On 2711.
- .2 Primer:
 - .1 General: low VOC suitable for PVC pipe.
 - .2 Approvals: ASTM D-F-656, SCAQMD Rule 1168/316A, Uniform Plumbing Code seal.
 - .3 Color: purple
 - .4 Max VOC Emissions: 650G/L per SCAQMD Rule 1168, Method 316A.
 - .5 Acceptable material: IPS Weld-On P-70.

3 Execution

3.1 INSTALLATION

- .1 In accordance with Section 23 05 01 - Installation of Pipework and the National Plumbing Code of Canada, supplemented as specified herein.
- .2 Install piping parallel and close to walls to conserve headroom and space, and grade as indicated as per NPC.
- .3 Install PVC drain, waste and vent pipe and pipe fittings in accordance with CSA B181.12 and to the manufacturers listings..
- .4 Provide specified fire stopping systems for piping thru fire rated walls and floors where required.
- .5 Listed PVC DWV piping and fittings acceptable throughout building with the following exceptions:
 - .1 Use in Vertical Shafts as defined by NBCC not acceptable.
 - .2 All non-accessible utilidors.

November 28, 2011

**3.2 PERFORMANCE
VERIFICATION**

.1 Cleanouts: Prove freedom of access.

END OF SECTION

November 28, 2011

1 General

1.1 INTENT & SCOPE OF WORK

- .1 Provide a complete, fully tested and operational split A/C system to meet requirements specified herein and in accordance with local codes and ordinances. Include all costs to obtain all permits and pay for all fees and charges including inspection charges by authorities that issue the permits. Coordinate all related inspections, fee and permits including:
 - .1 Plumbing.
 - .2 Building HVAC.
 - .2 Contract documents of Divisions 22, 23, 25 and 26 and the mechanical drawings are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions.
 - .3 Follow manufacturers detailed installation instructions, details and procedures for equipment, supplemented by the requirements of these documents.
 - .4 Install equipment and systems generally in locations and routes shown with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of Engineer at no extra cost.
 - .5 The work is to include the following:
 - .1 3 split system indoor units in the Lab including seismic restraint.
 - .2 1 split system outdoor unit in the crawl space including seismic restraint.
 - .3 A concrete base for the unit in the crawl space.
 - .4 The refrigeration piping system between the units, including insulation.
 - .5 The condensate drainage system for the indoor units.
 - .6 The electrical power for all A/C units including breakers, etc.
 - .7 The controls and control wiring for the A/C units.
 - .8 All cutting, patching, caulking, and the installation of the required enclosures around the services to the indoor A/C units to the satisfaction of the Engineer.
 - .6 The lab is to be kept functioning during construction. Coordinate with lab personnel to minimize the disruption caused by the construction. Some of the work such as coring the holes through the floor may have to be done after working hours. All work within the Laboratory itself is to be done on the weekend. It is to commence no earlier than Friday evening and to be completed prior to normal hospital hours on Monday morning. Minor work in the Laboratory may be coordinated with Laboratory personnel and is at the discretion of the Laboratory personnel. The work in the crawl space may be done during normal hospital hours as long as there is no impact on the operation of the hospital.
 - .7 Some of the existing lab equipment may have to be protected from construction dust, etc.
 - .8 The coring of the holes through the floor is to be done from the crawl space up through the floor to minimize dust and water in the lab.
-
- ### 1.2 TRIAL USAGE
- .1 Engineer may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
 - .2 Trial usage to apply to following equipment and systems:

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- 1.3 PROTECTION OF OPENINGS**
- .1 Provide as specified in this Division.
 - .2 General requirements: protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- 1.4 PAINTING**
- .1 Prime and touch up marred finished paintwork to match original.
 - .2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.
- 1.5 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS**
- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
 - .2 Where specified elsewhere in mechanical divisions, manufacturers to provide demonstrations and instructions.
 - .3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
 - .4 Operating personnel shall be contacted at the beginning of the project and encouraged to come on site at least once a week for the duration of the project. During these periods, they shall be given full explanation of the various systems as the project progresses.
 - .5 Two days prior to interim inspection, operating personnel shall be given instruction for a period of two hours. Instruction to be provided during regular work hours.
 - .6 Maintain log of all site visits. Maintenance personnel to login/out and be witnessed by Contractor. Submit log to Engineer.
- 1.6 O&M MANUALS**
- .1 Provide operation and maintenance data for incorporation into existing maintenance manuals.
 - .2 Operation data to include:
 - .1 Control schematics for the system including environmental controls.
 - .2 Description of the system and its controls.
 - .3 Operation instruction for the system and each component.
 - .4 Description of actions to be taken in event of equipment failure.
 - .3 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance test results.
 - .5 Equipment data to include:
 - .1 Complete reviewed shop drawings of all mechanical equipment including details of suppliers.
 - .6 Record Drawings:
 - .1 Provide reduced photocopy of mechanical as built drawings. Drawings to be reduced to approx 279mmx432mm and to be reduced scale. Blueline copies are not acceptable.
- 1.7 SHOP DRAWINGS AND PRODUCT DATA**
- .1 Submit 6 copies of shop drawings and product data.

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- 1.8 CLEANING .1 Cleaning activities as required.
- 1.9 RECORD DRAWINGS .1 Site records as follows:
 - .1 Engineer will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Use different colour waterproof ink for each service.
 - .3 Make available for reference purposes and inspection at all times.
- 1.10 WASTE MANAGEMENT AND DISPOSAL .1 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
 - .2 Remove from site and dispose of packaging materials.
- 1.11 HEALTH AND SAFETY .1 Do construction occupational health and safety as required by the Authorities Having Jurisdiction.
 - .2 Ensure that there are no concerns with infection control in the hospital environment.
- 1.12 FIRESTOPPING .1 Sleeves as specified Section 23 05 01 - Installation of Pipework.
 - .2 Firestopping as required and supplemented as specified herein.
 - .3 Firestopping and smoke seal systems are based on the Hilti intumescent sealant system when installed in accordance with ULC certification and the manufacturers instructions.
 - .4 Provide the following fire stopping systems for pipework:
 - .1 Metallic uninsulated unheated pipes not subject to movement:
 - .1 Sleeves not required.
 - .2 Fire stop piping with listed intumescent sealant to manufactured listings.
 - .2 Metallic insulated pipes not subject to movement:
 - .1 Sleeve penetration and secure to wall. Pipe insulation to be continuous thru sleeve.
 - .2 Pack void with approved fire stop insulation or backing to ULC listing of sealant. Fire seal sleeve to wall with listed intumescent sealant to manufactured listings. Fire seal insulation to sleeve with minimum thickness listed intumescent sealant as per ULC listing of sealant.
 - .3 Plastic uninsulated pipes 50dia or less:
 - .1 Sleeves not required.
 - .2 Fire and smoke seal piping in place with listed intumescent sealant to manufactured and ULC listings.
 - .5 All piping/duct penetrations thru 45min rated assemblies without separations to be cold smoke sealed/fire sealed with listed intumescent sealant or approved cold smoke sealed at fire penetrations to sealant ULC listing.
 - .6 Intumescent sealant:
 - .1 ULC/FM listed intumescent sealant, water based, containing no halogen, solvents or asbestos, suitable as fire and smoke sealant.
 - .2 Testing: to ULC S-115.

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- .3 Density: 1.5g/cm3.
- .4 Working time: approx 20-30min.
- .5 Curing time: approx 14-21 days.
- .6 Intumescent activation: approx 121 degC.
- .7 Temperature resistance: -40degC to 100degC.
- .8 Application temperature: 2degC to 38degC.
- .9 Flame spread: 0 to ASTM E84-96.
- .10 Smoke developed: 5 to ASTM E84-96
- .11 Acceptable material: Hilti FS-One/3M.
- .7 Intumescent Fire Stop Collars:
 - .1 ULC/FM listed with galvanized metal collar, intumescent fire sealant for use with PVC and ABS sched 40 drainage piping.
 - .2 Testing: to ULC S-115 at 50 Pa pressure differential.
 - .3 Density: 1.5g/cm3.
 - .4 Intumescent activation: approx 121 degC.
 - .5 Flame spread: 0 to ASTM E84-96.
 - .6 Smoke developed: 5 to ASTM E84-96
 - .7 Acceptable material: Hilti CP 642/643/3M

2 Products

2.1 NOT USED

- .1 Not Used.

3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 03 - Mechanical Start-Up.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

3.4 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape unless other wise noted.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Install exposed piping, equipment, rectangular clean outs and similar items parallel or perpendicular to building lines.
- .6 Install concealed pipework to minimize furring space, maximize headroom, conserve space. Run exposed piping parallel to walls.
- .7 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .8 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .9 Group piping wherever possible and as indicated.
- .10 Ream pipes, remove scale and other foreign material before assembly.
- .11 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .12 Provide for thermal expansion as required and where indicated.

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- 3.5 SLEEVES**
- .1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
 - .2 Material: min 16ga formed steel or galvanized sched 10 pipe.
 - .3 Construction: provide sleeves with annular fin continuously welded at midpoint or offset.
 - .1 Where sleeve extends above finished floor. Secure fin in floor.
 - .2 Where sleeve set in wall. Sleeve offset to one side of wall or adjust annular fin to center sleeve thru wall. Secure fin to wall.
 - .4 Sizes: 6 mm minimum, 13mm maximum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
 - .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CAN/CGSB-1.181-99.
- 3.6 ESCUTCHEONS**
- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
 - .2 Simulated chrome finish plastic one piece or split type without set screws.
 - .3 Outside diameter to cover opening or sleeve.
 - .4 Inside diameter to fit around finished pipe.
- 3.7 PREPARATION FOR FIRESTOPPING**
- .1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to be prepared as required.
 - .2 Uninsulated unheated pipes not subject to movement: No special preparation.
 - .3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
 - .4 Insulated pipes: Ensure integrity of insulation and vapour barriers.

END OF SECTION

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1 General

1.1 GENERAL

- .1 This section covers startup of systems common to all sections of Divisions 22, 23 and 25.

1.2 START-UP OF MECHANICAL SYSTEMS (GENERAL)

- .1 Conduct operating startup to confirm that equipment and systems meet specified requirements after mechanical installations are completed and pressure tested and all systems operational. Conduct startup as soon as conditions permit. Make changes, repairs, adjustments and replacements required as tests may indicate prior to final operating tests.
- .2 Startup only after completion of all pressure testing and substantially complete installation of systems.
- .3 During start up advise Engineer in writing of any system deficiencies that are evident and request direction.
- .4 Make start up for a minimum of one day under maximum available operating load conditions.
- .5 During startup provide the following operations and maintenance procedures:
 - .1 Lubricate bearings, adjust and/or replace and set direct and V belt drives for proper alignment and tension.
 - .2 Calibrate and adjust thermostats, thermometers, gauges, linkage and dampers. Control valves shall operate freely.
 - .3 Operate and test motors and speed switches for correct wiring and sequences. Check overload heaters in motor starters.
- .6 Drainage systems:
 - .1 Ensure all traps primed.

1.3 SYSTEM TESTS

- .1 Conduct specified system tests in presence of Engineer to confirm that equipment and systems meet specified requirements. Conduct system tests during Interim inspection and only after system startup completed with the exception that system tests may take place during the final day of the Building Startup.
- .2 Where directed by the Engineer make changes, repairs, adjustments and replacements within the scope of these documents as required to allow completion of the system tests.
- .3 Provide all tools and equipment necessary to complete specified tests. Patch and make good any damage created during tests at no additional cost.
- .4 Provide tradespersons as required to complete specified tests for the duration of the one day testing period.

2 Products

2.1 NOT USED

- .1 Not Used.

3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

- .1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
- .2 American Society for Testing and Materials (ASTM)
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
- .5 Underwriter's Laboratories of Canada (ULC)

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP58.

2 Products

2.1 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.
- .3 Support from structural members. Where structural bearing does not exist, provide supplementary structural members.

2.2 UPPER ATTACHMENTS

- .1 Steel joist:
 - .1 Cold piping 50 dia. and under: galvanized steel washer plate with double locking nuts.
- .2 Steel channel, joist or angle (bottom):
 - .1 Malleable iron C clamp to MSS SP-58-1993, type 23, galvanized. ULC listed.
- .3 Steel channel, joist or angle (top):
 - .1 Malleable iron top of beam C clamp to MSS SP-58-1993, type 19, galvanized. ULC listed.
- .4 Concrete:
 - .1 Insert type expanding anchor with 10dia internal threaded rod connection, galvanized steel, CSTB approved. ULC listed.
- .5 Wall Hangers:
 - .1 Carbon steel, plain, medium duty suitable for loads to 675kg, suitable for loading from top or bottom, width as required. Complying with MSS-SP-69(Type 32).
 - .2 Bottom loads: provide carbon steel washer plate, size to suit rod size.
- .6 Wood Joist/Beams or Wood Deck:
 - .1 All piping 50 dia & under and all plastic DWV piping; black malleable iron, galvanized, ceiling flange, rod or pipe threaded.

2.3 MIDDLE ATTACHMENT	.1	Electro-galvanized carbon steel threaded rod material to MSS SP58.
2.4 PIPE ATTACHEMENT	.1	Cold steel, cast iron and PVC/ABS piping, all hot steel piping less than 75dia and all copper piping where insulation shields and inserts provided: plain steel, adjustable clevis to MSS-SP-69 (Type 1), ULC listed, rated to 343degC, extended vertical risers as required for insulation.
	.2	Hot steel piping 100dia and larger: cast iron roll, carbon steel yoke, roll rod and hex nuts, complying to MSS-SP-69(Type 43).
	.3	All cold and hot copper piping where insulation shields and inserts not provided: adjustable clevis to MSS IEEE 58-1978, type 1, Copper plated.
	.4	U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563 where indicated.
	.5	Trapeze hangers: continuous slot formed hot dipped or electro-galvanized channel, 12Ga minimum with proprietary mounted fasteners and electro galvanized pipe clamps.
2.5 RISER CLAMPS	.1	Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.
	.2	Copper pipe: carbon steel copper plated to MSS SP58, type 42.
	.3	Bolts: to ASTM A307.
	.4	Nuts: to ASTM A563.
2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES	.1	Provide templates to ensure accurate location of anchor bolts.
2.7 HOUSE-KEEPING PADS	.1	For base-mounted equipment: Concrete, at least 100 mm high, 50 mm larger all around than equipment and with chamfered edges.
2.8 OTHER EQUIPMENT SUPPORTS	.1	Submit structural calculations with shop drawings.
2.9 FLEXIBLE TUBING PIPING SYSTEMS	.1	Continuous slot formed hot dipped galvanized channel, 12-14Ga with proprietary mounted fasteners and standard pipe clamps.
	.2	Polypropylene single pipe hanger.
	.1	Acceptable material: Kitec 88300 thru 88303.
2.10 WALL CLAMPS	.1	Continuous slot formed hot dipped galvanized channel, 12-14Ga with proprietary mounted fasteners and standard pipe clamps.
3 Execution		
3.1 INSTALLATION	.1	Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
	.2	Use approved constant support type hangers where required.
	.3	Use variable support spring hangers where required.
3.2 HANGER SPACING	.1	Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent.
	.1	Plumbing piping: most stringent requirements of Canadian Plumbing Code.
	.2	Copper piping: up to NPS 1/2: every 1.5 m.
	.3	Within 300 mm of each elbow.
	.2	Hanger Schedule:
		Maximum Maximum

Pipe Size	Rod Diameter	Spacing Steel	Spacing Copper
(up to) 32 dia.	10 mm	2.1 m	1.8 m
38 dia.	10 mm	2.7 m	2.4 m
50 dia.	10 mm	3.0 m	2.7 m

- 3.3 HANGER INSTALLATION**
- .1 Install hanger so that rod is vertical under operating conditions.
 - .2 Adjust hangers to equalize load.
 - .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
 - .4 Use of trapeze hangers is acceptable for parallel piping runs.
- 3.4 HORIZONTAL MOVEMENT**
- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
 - .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.
- 3.5 RISER CLAMPS**
- .1 Provide riser clamps at all floor penetrations and the base of all piping risers. Exception branch HW & DW piping 25 dia. or smaller.
 - .2 Isolate riser clamps at all floor penetrations where noted and detailed.
- 3.6 FINAL ADJUSTMENT**
- .1 Adjust hangers and supports: to equalize load and maintain required grade.

END OF SECTION

1 General

- 1.1 RELATED SECTIONS** .1 Section 23 05 29 - Hangers And Supports For HVAC Piping And Equipment.
- 1.2 REFERENCES** .1 Canadian Standards Association (CSA)
.2 SMACNA Seismic Restraint Manual-Guidelines for Mechanical Systems, First Edition, 1991.
.3 ASHRAE RP-812 Guide to Seismic Restraint, 1999.
.4 IMC-2000 International Mechanical Code.
- 1.3 DEFINITIONS** .1 The Qikiqtani General Hospital is designated as a Post Disaster Building as defined by the NBCC 2005. The seismic restraint systems shall be provided for the new split A/C system where both life safety and continued building operation are of equal concern. It is necessary that the building and all systems remain operative during and after an earthquake.
.2 SRS: acronym for Seismic Restraint System.
- 1.4 SYSTEM DESCRIPTION** .1 This section covers provision of SRS for **the new** A/C system and equipment.
.2 Installation of SRS to be fully compatible with and to not affect performance of:
.1 Noise and vibration controls specified elsewhere in this project specification.
.2 Structural and, mechanical, electrical design of project.
.3 The intent of the SRS systems is both life safety and building operation. It is the intent of the systems to maintain all equipment in operational state after a significant seismic event. During a seismic event, the SRS is to prevent systems and equipment from causing personal injury and from moving from normal position while sustaining full operation.
- 1.5 SUBMITTALS** .1 Submit 6 sets of shop drawings and product data.
.2 Provide for all SRS elements.
.2 Shop drawings to be prepared by professional firm specializing in the design and supply of SRS systems.
.3 Submittals to include:
.1 Full details of SRS systems.
.2 Working drawings of any proposed alternates or deviations from the detailed and specified SRS.
.3 Details of fasteners and attachments to structure, anchorage loadings, attachment methods.
.4 Details of installation procedures and instructions.
.5 Design calculations including restraint sizing.
.6 Report on existing systems to remain and their suitability for restraint including any deficiencies or upgrades required.
.4 All submittals to be sealed by a Professional Engineer specializing in design of SRS and registered in Nunavut.
- 1.6 CLOSEOUT SUBMITTALS** .1 Provide maintenance data including monitoring requirements for incorporation into maintenance manuals.

1.7 DESIGN OF RESTRAINT SYSTEMS .1 Detailed design of piping, duct and other mechanical equipment is to be completed by Professional Engineer specializing in design of SRS and registered in Nunavut. Any details of restraint systems provided indicate the recommended system of SRS with final sizing of anchors and restraints elements to be provided by SRS Design Engineer. All piping and duct restraint systems to be designed to SMACNA Seismic Restraint Manual-Guidelines for Mechanical Systems, First Edition, 1991 and ASHRAE RP-812 Guide to Seismic Restraint, 1999.

2 Products

2.1 SRS MANUFACTURER .1 SRS to be from one manufacturer regularly engaged in production of same.

2.2 MECHANICAL ANCHORS .1 Approved SRS type anchors. Minimum 13mm dia.
.2 Acceptable material: Hilti

2.3 THREADED ANCHORS .1 Minimum Type ASTM A 325-94. Minimum 13mm dia.

2.4 CABLES .1 Galvanized, size as required.

2.5 SLACK CABLE RESTRAINT SYSTEM (SCS) .1 Use elastomer materials or similar to avoid high impact loads and provide gentle and steady cushioning action.
.2 SCS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
.3 Hanger rods to withstand compressive loading and buckling.

3 Execution

3.1 GENERAL .1 SRS to provide gentle and steady cushioning action and avoid high impact loads and.
.2 SRS to restrain seismic forces in all directions.
.3 Fasteners and attachment points to resist same load as seismic restraints.
.4 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.
.5 Seismic control measures not to interfere with integrity of firestopping.

3.2 INSPECTION AND CERTIFICATION .1 Do not cover any seismic restraint systems until reviewed by the Engineer.

3.3 COMMISSIONING DOCUMENTATION .1 Upon completion and acceptance of certification, hand over to Engineer complete set of construction documents, revised to show "as-built" conditions.

3.4 STATIC EQUIPMENT .1 Floor-Mounted Equipment(General):
.1 Anchor equipment to equipment supports at all times using SRS rated fasteners.
.2 Anchor equipment supports to structure or housekeeping pad thru manufactured supplied mounts using approved SRS anchors.
.3 Bolts size and locations as indicated or to manufactured recommendations.

- 3.5 VIBRATION ISOLATED EQUIPMENT**
- .1 Floor mounted equipment, systems (General):
 - .1 All isolators to be provided with integral snubbers/seismic restraints. Reference technical sections.
 - .2 All isolators to be secured to anchored concrete housekeeping pad or thru pad to bldg structure. Anchor size as per manufactured recommendations and as indicated with a minimum 13dia. Oversize housekeeping pads as required to allow installation of SRS anchors to manufactured requirements.
 - .2 Suspended equipment, systems:
 - .1 All isolators to be provided with integral snubbers/seismic restraints. Reference technical sections.
 - .2 All suspended equipment to be braced as follows:
 - .1 Slack cable restraint system unless otherwise approved by Contractor.
- 3.6 SLACK CABLE RESTRAINT SYSTEMS**
- .1 To requirements of SMACNA Seismic Restraint Manual-1991.
 - .2 Seismic Hazard Level: the seismic hazard level as defined by SMACNA as determined by SRS Engineer.
 - .3 Connect to suspended equipment so that axial projection of wire passes through centre of gravity of equipment.
 - .4 Use appropriate grommets, shackles, other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Use elastomer materials or similar to avoid high impact loads and provide gentle and steady cushioning action
 - .5 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.
 - .1 Tighten cable to reduce slack to 40 mm under thumb pressure. Cable not to support weight during normal operation.
 - .6 Hanger rods to withstand compressive loading and buckling.

END OF SECTION

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1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
- .2 National Fire Protection Association (NFPA)

2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate: size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM & EQUIPMENT NAMEPLATES

- .1 Colours:
 - .1 Black letters, white background
- .2 Construction:
 - .1 3 mm thick, laminated plastic or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size #	Dimensions (mm x mm)	Max No. of Lines	Letter Height (mm)
1	10 x 50	2	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	2	8
5	20 x 200	2	8
6	20 x 100	2	5
7	25 x 125	1	12
8	25 x 125	2	8
 - .1 Use average of 40 letters/numbers (maximum) per nameplate.
 - .2 Minimum sizes as follows:
 - .1 Equipment in mechanical rooms/crawlspace/hidden spaces: Sizes 2 or 6.
 - .2 Equipment in finished architectural spaces: Sizes 1/3.
 - .3 Access doors: Sizes 1/3.
- .4 Equipment names as noted on design schedules and drawings.

2.3 IDENTIFICATION OF PIPING SYSTEMS

- .1 To CAN/CGSB 24.3 Identification of Piping Systems and requirements of ANSI/NFPA 13 and CAN/CSA B139 except where specified otherwise.
- .2 Identify medium by background colour marking, pictogram (as necessary), lettered legend; direction of flow by arrows.
- .3 Sizes:
 - .1 Legend: block capitals to following table:

Outside Dia. of Pipe or Insulation (mm)	Size of Letters (mm)
19 or less	8
25 to 65	19
75 to 130	50
Over 150	90

- .2 Colour bands:
 - .1 At valves and fittings: 500 mm long.
 - .2 Elsewhere: 1000 mm long.
- .3 Arrows:
 - .1 Outside diameter of pipe/insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .2 Outside diameter of pipe/insulation less than 75 mm: 100 mm long x 50 mm high.
 - .3 Use double headed arrows where flow is reversible.
- .4 Material:
 - .1 Legend markers, arrow colour bands: plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150 deg.C and intermittent temperature of 200 deg.C. Apply to prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping one (1) pipe diameter.
 - .2 Waterproof and heat resistant plastic marker tags: for pipes and tubing 20 mm nominal and smaller.
- .5 Colours:
 - .1 Where not covered by table below, submit legend and classification colours to Engineer for approval.
- .6 Legend:
 - .1 Pipe and valve identification.

Description	Legend	Background Colour
Sanitary sewer	SAN	Green
Refrigeration Liquid	REF L	Grey
Refrigeration Gas	REF G	Grey

- .2 Legend and arrows:
 - .1 Black or white to contrast with primary colour.
- .7 **In fan room, boiler room, shops, labs and any other areas with exposed piping, paint entire pipe the background colour noted.**

2.4 LANGUAGE

- .1 Identification to be in English.
- .2 Use one nameplate, label, etc. for each language.

2.5 HAZARDOUS GOODS

- .1 Provide pictograms where required to Workplace Hazardous Materials Information System (WHMIS) regulations.

3 Execution

3.1 NAMEPLATES

- .1 Equipment: provide nameplates for all mechanical equipment. Identify to design schedules and drawings and include:
 - .1 Equipment description.
 - .2 Equipment Tag.
- .2 Secure nameplates using adhesive backing of lamicoid and minimum two mechanical fasteners of either metal screws or pop rivets.

3.2 LOCATION OF IDENTIFICATION ON PIPING SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 Identification to be easily and accurately readable from usual operating areas and from access points.
- .9 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of colour or legends caused by dust and dirt and risk of physical damage.
- .10 Piping Identification Schedule
 - .1 Apply colour banding and identification to all exposed and concealed piping except exposed piping in finished architectural spaces.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3, ANSI/NFPA 13 and CSA B139 except as specified otherwise.
- .2 Provide ULC and CSA registration plates as required by respective agency.
- .3 Piping identification:
 - .1 Secure piping labels and flow arrows using waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150 deg.C and intermittent temperature of 200 deg.C. Apply to prepared surfaces only. Overlap banding tape minimum 13mm on both ends of label to secure in place.
 - .2 Wrap color coded banding tape around pipe or pipe covering with ends overlapping one (1) pipe diameter.

END OF SECTION

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1 General

1.1 RELATED SECTIONS

.1 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .2 American Society for Testing and Materials (ASTM International)
- .3 Canadian General Standards Board (CGSB)
- .4 Thermal Insulation Association of Canada (TIAC)
- .5 Underwriters Laboratories of Canada (ULC)
- .6 Model National Energy Code for Buildings, MNECB-1997.
- .7 ASHRAE 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.3 QUALIFICATIONS

.1 Installer to be specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
- .2 Protect from weather and construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions recommended by manufacturer.

1.5 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in hung ceilings non-accessible chases, furred spaces and crawlspaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
 - .3 "Runouts" - refers to piping to individual terminal units or fixtures not exceeding 3.6m in length.
 - .4 "HW" - refers to hydronic systems including heating water (HW) and glycol systems (GL).

2 Products

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102:
- .2 All components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with ASTM E 84-01, Test Method for Surface Burning Characteristics of Building Materials and CAN/ULC-S102.

2.2 TYPE A-6 INSULATION

- 1 TIAC Code A-6: flexible unicellular, preformed tubular elastomer to CAN/CGSB-51.40-95.
- .2 Thermal Conductivity "k" shall not exceed 0.04 W/m. deg.C at 24 deg.C mean temperature when tested in accordance with ASTM C 335-95.
- .3 Service temperature: -4degC to 100degC.
- .4 Maximum thickness: 25mm.

2.3 CEMENT

.1 Thermal insulating and finish to CAN/CGSB-51.12-95 low VOC to the current content limits of SCAQMD Rule #1168.

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- 2.4 INSULATION SECUREMENTS**
- .1 Tape: ULC listed, self-adhesive, aluminum, plain, 50 mm wide minimum.
 - .2 Contact adhesive: Quick setting, asbestos free, low VOC to the current content limits of SCAQMD Rule #1168.
 - .3 Tie wire: 1.5 mm diameter stainless steel.
 - .4 Bands: Aluminum, 19 mm wide, 0.5 mm thick.
- 2.5 JACKETS**
- .1 Polyvinyl Chloride (PVC):
 - .1 One piece premoulded PVC jacketing to AC774.1K82 with 25 flame and 50 smoke rating to ASTM E 84-01.
 - .2 Gloss finish, UV resistant, premoulded for fitting applications, jacket for straight pipe runs.
 - .3 Temperature rating: max insulation surface temperature 60degC.
 - .4 Secure with PVC tape with manufactured supplied rivets. Tape only is not acceptable.
 - .5 Acceptable material: Knauf Proto LoSmoke Fitting and Covers.
- 3 Execution**
- 3.1 PRE- INSTALLATION REQUIREMENT**
- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
 - .2 Surfaces to be clean, dry, free from foreign material.
- 3.2 INSTALLATION (GENERAL)**
- .1 Install in accordance with TIAC National Standards and the requirements of ANSI/NFPA 90A-1999 and ANSI/NFPA 90B-1999.
 - .2 Install all insulation systems including minimum insulation thicknesses to the most stringent requirements of ASHRAE 90.1--2001, Energy Standard for Buildings Except Low-Rise Residential Buildings and the Canadian National Energy Code for Buildings-1997 unless otherwise noted in the insulation schedule.
 - .3 Apply materials in accordance with manufacturers instructions and this specification.
- 3.3 INSTALLATION OF ELASTOMERIC INSULATION**
- .1 Insulation to remain dry at all times. Overlaps to manufacturers instructions. Ensure tight joints.
 - .2 Provide vapour retarder as recommended by manufacturer.
- 3.4 PIPING**
- .1 Insulate piping for full length as per insulation schedule except as noted.
 - .2 Where insulation not provided at valves, fitting and trim delete insulation and finish away from studs and nuts to permit use of tools without damage to insulation.
 - .3 Elastomeric Insulation: to remain dry, overlap to manufacturer's instructions. Joints tight and sealed properly.
- 3.5 PROTECTION OF INSULATION DURING CONSTRUCTION**
- .1 Insulation is to be protected from moisture damage during all stages of construction.
 - .2 Where insulation is damaged due to moisture damage either prior to installation, during or subsequent to installation up to and including final inspection replace damaged insulation to the satisfaction of the Engineer.

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3.6 PIPING INSULATION SCHEDULES

.1 Schedule:

Application	Insulation Type	Thickness Jacket (mm)
Refrigerant (Interior-Concealed)	A6	N/A
Liquid (Interior-Concealed)	A6	N/A
Refrigerant (Interior-Exposed)	A6	PVC
Liquid (Interior-Exposed)	A6	PVC

3.7 FINISHES

.1 PVC:

- .1 Provide where specified.
- .2 Provide min 25mm overlap.
- .3 Secure using flexible PVC tape and manufactured. approved rivets. Do not stretch final 50mm of tape.

END OF SECTION

1 General

1.1 RELATED SECTIONS

- .1 Section 23 05 01 - Installation of Pipework.

1.2 REFERENCES

- .1 EPS 1/RA/1-96, Environmental Code of Practice for the Reduction of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
- .2 ANSI/ASHRAE 17-1986(R1990), Method of Testing for Capacity Rating of Thermostatic Refrigerant Expansion Valves.
- .3 ANSI/ARI 495-85, Refrigerant Liquid Receivers.
- .4 ANSI/ARI 710-86, Driers, Liquid Line.
- .5 ANSI/ASME B16.26-1988, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .6 ANSI/ASME B16.29-1994, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- .7 ANSI/ASME B31.5-1992, Refrigeration Piping.
- .8 ANSI/ASME B16.34-1988, Valves-Flanged, Threaded and Welding End.
- .9 ASTM B 88M-93a, Specification for Seamless Copper Water Tube.
- .10 ASTM B 280-93a, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .11 ANSI/AWS A5.8-92, Specification for Brazing Filler Material.
- .12 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .13 AN/CSA-B52-95, Mechanical Refrigeration Code.
- .14 ANSI/ASME Boiler and Pressure Vessel Code, 1989.

1.3 QUALIFICATIONS

- .1 Process refrigeration manufacturer shall be regularly engaged in production of specified equipment, and one who issues catalog information with correction factors where published ratings are based on parameters different from those specified.
- .2 Installation shall be performed by certified refrigeration mechanics/technician.

1.4 QUALITY CONTROL

- .1 Factory leak test air-cooled condenser coils at minimum gauge pressure of 3.1 MPa.

1.5 DELIVERY & STORAGE

- .1 Ship equipment factory dehydrated and sealed with dry nitrogen with tracer and charge of lubricating oil.

1.6 WARRANTY

- .1 Contractor hereby warrants the refrigerant piping system for loss of refrigerant for two years.

2 Products

2.1 TUBING & FITTINGS

- .1 For halogenetic refrigerants, use factory cleaned and sealed seamless ACR copper.
- .2 Conform to ANSI/ASME B31.5-1992, ASTM B 88M-93a and ASTM B 280-93a requirements.
- .3 Relief valve discharge pipe on outdoor installations shall be copper tube type "L" with brazed joints.
- .4 Fittings:
 - .1 Conform to ANSI/ASME B16.26-1988 and ANSI/ASME B16.29-1994.
 - .2 Long radius type for elbows and return bends.

- .3 Wrought copper or forged brass solder type, except that flared fittings may be used for soft annealed copper tubing.
 - .4 Brazing materials shall conform to ANSI/AWS A5.8-92 and be SIL-FOS-15 phosphor-copper-silver alloy for copper piping jointed by copper fittings; 95-5 solder for connections to equipment or accessories.
 - .5 Flexible connections: 10 mm nominal or less shall be made using coiled soft copper tubing. For larger sizes, use seamless flexible bronze hose with bronze wire braid covering. Use factory sealed neoprene jacket unit where freezing may occur.
- 2.2 PIPE SLEEVES**
- .1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.
- 2.3 VALVES (GENERAL)**
- .1 Meet ANSI/ASME B16.34-1988 for valve construction.
 - .2 Service valves:
 - .1 Forged brass Class 500 up to 3.5 MPa packless and cast bronze Class 375 up to 2.5 MPa.
 - .2 Moisture proof seal type for below freezing applications.
 - .3 Back seated and ball check for inspection and replacement under pressure.
 - .4 Removable seal cap and gauge port for control capillary connections for compressors.
 - .5 Stop valves:
 - .1 22 mm nominal od or less shall be diaphragm packless type with integral mounting bracket, forged brass bodies and bonnets, globe and angle, non-directional type.
 - .2 28 mm nominal od or larger shall be heavy globe or angle body, positive sealing, self-aligning, heavy nylon disc.
 - .3 Purge, drain, charging: Angle or globe type with flare or brazing type outlet connection shall have stem for socket wrench and removable seal cap.
- 2.4 SERVICE VALVES**
- .1 Service valves:
 - .1 Forged brass Class 500 up to 3.5 MPa packless and cast bronze Class 375 up to 2.5 MPa.
 - .2 Moisture proof seal type for below freezing applications.
 - .3 Back seated and ball check for inspection and replacement under pressure.
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 - .5 Stop valves:
 - .1 22 mm nominal od or less shall be diaphragm packless type with integral mounting bracket, forged brass bodies and bonnets, globe and angle, non-directional type.
 - .2 28 mm nominal od or larger shall be heavy globe or angle body, positive sealing, self-aligning, heavy nylon disc.
 - .2 Purge, drain, charging: Angle or globe type with flare or brazing type outlet connection shall have stem for socket wrench and removable seal cap.
- 2.5 RELIEF VALVES**
- .1 Safety relief type with fusible plug or rupture disc in forged brass body.
 - .2 Reseating type with forged brass body.
 - .3 Duplex valves as indicated or by code regulations arranged so that only one valve can be rendered inoperative at a time.

- 2.6 CHECK VALVES**
- .1 Spring operated, guided piston type with forged brass body in flare connection sizes up to 22 mm nominal od.
 - .2 Guided piston type, spring operated with bolted bonnet or cover plate in sweat connections 28 mm nominal od and above.
- 2.7 SOLENOID VALVES**
- .1 With field replaceable coil, serviceable without removing valve from line. For pumpdowns, use manual lift stem. Rate coils according to temperature service.
 - .2 Provide upstream of thermostatic expansion valves and strainers.
- 2.8 EXPANSION VALVES**
- .1 To ANSI/ASHRAE 17-1986(R1990), as indicated:
 - .2 Thermostatic type with external equalizer, adjustable superheat setting, capacity and bulb charge to suit operating conditions.
- 2.9 BACK PRESSURE VALVES**
- .1 Direct acting or with external pilot sensing, convertible in field to internal sensing with manual opening stem for pump down. Install with solenoid valve in pilot line for stop valve operation. Provide manual pneumatic electric self contained temperature sensing activator adjustable pressure setting.
- 2.10 SIGHT GLASS**
- .1 Moisture indicating, double sight glass:
 - .2 Upstream from expansion valve.
- 3 Execution**
- 3.1 GENERAL**
- .1 In accordance with Section 23 05 01 - Installation of Pipework, supplemented as specified herein
 - .2 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.
- 3.2 BRAZING PROCEDURES**
- .1 Bleed inert gas into pipe during brazing.
 - .2 Remove valve internal parts, solenoid valve coils, sight glass.
 - .3 Do not apply heat near expansion valve and bulb.
- 3.3 INSTALLATION (PIPING)**
- .1 Purge refrigerant lines and fittings.
 - .2 When multiple runs are installed, spread pipes 150 mm minimum to allow for expansion and contraction.
 - .3 Install straight, parallel and close to walls and ceilings, with specified pitch.
 - .4 Keep elbows and fittings to minimum.
 - .5 Correlate equipment provided with Engineer and propose changes to line sizing required, before proceeding with installation.
 - .6 Grade horizontal pipe carrying gases 1:240 down in direction of flow.
 - .7 Locate double risers in hot gas or suction piping as indicated.
 - .8 Locate trap every 4.5 m of vertical rise in any suction riser 9 m or more in length.
 - .9 Install piping to prevent condensate or oil from flowing back into compressor or evaporator. Locate suction accumulator in suction line between evaporator and compressor.
 - .10 Connect branch suction lines from top of suction main using wye-fitting. Install ancillaries and accessories such as back pressure compensating regulators and back pressure regulators horizontal.
 - .11 To avoid interference with services to compressor, do not obstruct view of oil level bulls-eye or run piping.
 - .12 Enclose tubing exposed to mechanical injury in rigid or flexible conduit.
 - .13 Keep piping joints sealed except when fabricating.
 - .14 Limit breakable joints to equipment connections not normally brazed.

- Limit flared joints to 10 mm nominal od for field assembly and 16 mm nominal od for factory assembly.
- .15 Directly connect vibration isolators to compressor and firmly anchor other end.
- 3.4 PRESSURE AND LEAK TESTING**
- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.
- .3 Test Procedure:
- .1 Use refrigerant gas as tracer with dry nitrogen to develop pressure.
- .2 Compressors with refrigerant holding charge shall remain isolated from system. Protect accessories when performing test.
- .3 Build 35 kPa initial refrigerant pressure in high and low side and add dry nitrogen to field test pressure.
- .4 Test for leaks with electronic halide detector.
- .5 Repair leaks and retest.
- 3.5 CLEANING**
- .1 Pressurize system with 35 kPa of refrigerant approved by Engineer and hold charge for 2 h.
- .2 Reclaim refrigerant by pumping down through filtration system.
- 3.6 DEHYDRATION**
- .1 Carry out work in presence of Engineer.
- .2 Evacuate using two stage vacuum pump with gas ballast on second stage capable of pulling vacuum of 0.05 mm. Fill pump with fresh dehydrated oil.
- .3 Do not use refrigerants compressors to pull vacuum.
- .4 Maintain ambient temperature of 13°C or higher throughout refrigeration system for at least 12 h before and during dehydration.
- .5 Connect high vacuum hose or seamless copper tubing jumper lines to both high and low pressure sides. Line size not less than 6 mm nominal od for units up to 70 L internal volume and 10 mm nominal or 12 mm nominal od for larger units.
- .6 Install thermo couple vacuum gauge with mm scale to measure system pressure. Locate manual isolating valve between pump and gauge and take readings only with system isolated from pump.
- .7 When compressor/condensing unit has refrigerant holding charge intact, service valves shall remain closed during evacuation. Evacuate any equipment received with dry air, wrong refrigerant, or lost holding charge.
- .8 Triple evacuate field installed system as follows: twice to 1.5 mm and hold for 4 h. Break vacuum to a gauge pressure of 14 kPa each time with refrigerant. For final evacuation, continue pumping through minimum 12 h after reaching 0.5 mm. After completion of final evacuation, isolate pump from system and make graphic record of rate of any increase in vacuum reading which may take place inside following hours. Continue readings until vacuum has stabilized. Provide Engineer with 3 copies of graphic record. Charge through filter drier.
- 3.7 CHARGING**
- .1 Give initial charge through high side charging valve with pressure gauge and new filter-drier installed in connection to charging valve.
- .2 Charge only amount of refrigerant necessary for proper operation of refrigeration system. When amount has been charged, close liquid charging valve. With system in operation, observe sight glass near receiver outlet to recheck.
- .3 When refrigerant container must be changed during charging process,

- .4 re-purge charging line.
- .4 Low side charging shall be permitted only for charging small amounts in gaseous state.
- .5 Provide 2 days notice of leak testing, dehydration and charging.
- .6 Prime oil separator with operating charge of compressor oil.

- 3.8 STARTUP AND ADJUSTMENT**
 - .1 Provide necessary instruments, gauges and testing equipment required. Adjust controls, to obtain design requirements and manufacturer's ratings.
 - .2 Ensure that insulation of refrigerant piping and accessories completed.
 - .3 Test and record cooling apparatus entering and leaving air temperatures, dry bulb and wet bulb.
 - .4 Test and record voltage and running amperes and compare to motor nameplate data, and starter heater rating against design requirements. Check each phase which must be accurate to nearest 100 VA.
 - .5 Ensure that refrigerant temperatures are accurate to within 0.5°C of design requirements.
 - .6 In co-operation with control manufacturer's representative set and adjust automatic control system to achieve required sequence of operations.
 - .7 Bring equipment into operation, trial run and make up any loss of oil and refrigerant.

- 3.9 INSTRUCTIONS**
 - .1 Post instructions in frame with glass cover in accordance with CSA B52.

- 3.10 PIPE SIZING & ROUTING**
 - .1 Refrigeration supplier to provide for sizing and routing of all piping. Size piping for minimum pressure drops. Maximum temperature drop to be 1degC for suction, hot gas and liquid lines.
 - .2 Arrange piping loops in evaporator suction lines to prevent liquid refrigerant from draining into compressor during shutdown and prevent oil in active evaporator from draining into idle evaporator.
 - .3 Arrange piping to return oil to compressor. Under minimum load conditions gas velocity to never be less than manufacturers recommendations through horizontal and vertical lines.

- 3.11 INSTALLATION (GENERAL)**
 - .1 Provide clearance around all equipment and components for observation of operation, inspection, service and maintenance without removal of any equipment, components or piping.
 - .2 Install systems and related controls in accordance with reviewed shop drawings.
 - .3 Drains:
 - .1 Install drains to permit removal of condensate and allow cleaning of coils and equipment.
 - .4 Locate vibration and noise isolation as required. .
 - .5 Thermal expansion valves:
 - .1 Mount thermal expansion valve bulb on suction line at evaporator outlet. Suction line to be horizontal, pitched for drainage from bulb location. If suction line rises after bulb, precede rise with P-trap.
 - .2 Connect external equalizer to suction line immediately downstream of thermal expansion valve bulb, midway on pipe diameter, to sense refrigerant liquid and gas.
 - .6 Accessories:
 - .1 Install as indicated and as specified.
 - .2 Standard:
 - .1 Ball check isolating valves at receiver sight glass.
 - .2 Charging valve for high and low side filter drier, solenoid valve and thermostatic expansion valve.

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- .3 Special accessories:
 - .1 Oil separator with automatic oil return to crankcase, through filter, automatic stop valve with bypass valve, external float valve.
 - .2 Purge valve to be installed at high point of condenser only for units operated at vacuum suction pressure.
 - .3 Dehydrator assemblies: install with three valves.
 - .4 Liquid suction heat interchangers: as indicated shell and finned coil interchangers pitched at approximately 15° angle with oil returned to suction line through metering needle valve, solenoid valve and sight glass.

END OF SECTION

1 General

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 52.1-92, Gravimetric and Dust Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C547-00, Specification for Mineral Fibre Pipe Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-115.10-M90, Disposable Air Filters For Removal of Particulate Matter from Ventilating Systems.
 - .2 CAN/CGSB-115.15-M91, High Efficiency, Rigid Type Air Filters for Removal of Particulate Matter from Ventilating Systems.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B52-99, Mechanical Refrigeration Code.
 - .2 CAN/CSA-C656-M92(R1998), Performance Standard for Single Package Central Air-Conditioners and Heat Pumps.
- .5 Environment Canada, (EC)/Environmental Protection Services (EPS)
 - .1 EPS 1/RA/2-1996, Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.
 - .2 Environment Canada-1994, Ozone-Depleting Substances Alternatives and Suppliers List.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit 6 copies of shop drawings and product data.
- .2 Indicate major components and accessories including sound power levels of units.
- .3 Type of refrigerant used.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into existing maintenance manual.

1.4 WARRANTY

- .1 For refrigeration compressors, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 5 years.
- .2 Contractor hereby warrants refrigeration compressors in accordance with GC 24, but for 5 years.

2 Products

2.1 MULTI ZONE VARIABLE FLOW SPLIT SYSTEM UP TO 20 INDOOR UNITS

- .1 General:
 - .1 VRF (variable refrigerant flow) multi split air conditioning system. The system will utilize air cooled condensing unit supplying a maximum of twenty two indoor fan coil units from the largest outdoor model. The system will be capable of heating or cooling.
 - .2 Refrigerant: R410A.
- .2 Outdoor Unit:
 - .1 Constructed from steel plate and painted with acrylic paint Munsel 5Y8/1 finish.
 - .2 The outdoor unit will have two air cooled heat exchange coils constructed from copper tubing with aluminum fins. The coils will be set in a 'V' formation with air being drawn in through two sides of the unit and discharged out of the top of the unit. The S Series systems will have a single fan mounted on top of the two coils. The coils will be capable of being dividing into

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- 20,30,50,70,80,100 % sections to enable the outdoor unit capacity to match the capacity required by the indoor units.
- .3 The outdoor unit will have one inverter controlled hermetic scroll compressor capable of controlling the compressor frequency in 1Hz increments.
- .4 Extra sub-cooling will be provided by a Heat Interchange Circuit (HIC), which allows better refrigerant distribution and control with electronic expansion valves.
- .5 The refrigeration process of the outdoor unit will be maintained by pressure and temperature sensors controlling solenoid valves, check valves and bypass valves. The heating or cooling mode of the outdoor unit will be controlled by a 4 way valve which will reverse the cycle of the refrigerant to change the mode of the outdoor unit. Condensate shall be removed from the S-Series by means of a drain pipe connector located on the bottom of unit.
- .6 The outdoor unit will have one liquid discharge pipe which will supply high pressure liquid to the indoor units or to the condensing unit, depending on the mode of operation. Refrigerant return to the outdoor unit will be via one suction pipe.
- .7 The system will be capable of total pipe runs of up to 300m.
- .8 Design conditions:
 - .1 Outdoor air: cooling 35degC(db), heating 8.3degC(db).
 - .2 Indoor cooling: 26.7degC(db), 19.4degC(wb).
 - .3 Indoor heating: 21degC(db).
- .9 Power: 208V, 1 phase power supply and have a starting current of no more than 10 amps. Control will be via a 30vdc signal generated by the outdoor unit. This signal will be sent to the indoor units via a 16 AWG 2 core non polar screened cable.
- .10 Schedule:

CU #	Capacity		Pipe Sizing		Power Input (kW)
	Heat (kW)	Cool (kW)	Liquid (mm)	Gas (mm)	
CU-1.1	15.8	14.1	6.32	12.7	4.97

CU #	Weight (kg)	SoundMax (db-A)	Indoor Units (Qty)
CU-1.1	130	49/51	-
- .3 Indoor Units:
 - .1 General:
 - .1 Total capacity of the indoor units to be between 50 and 130% of the capacity of the outdoor unit.
 - .2 Each indoor unit will have a heat exchanger which shall be constructed from copper tubing with aluminum fins. The flow of refrigerant through the heat exchanger will be controlled by a linear expansion valve. This valve will be controlled by two pipe thermistors and a return air thermistor and shall be capable of controlling the variable capacity of the indoor unit between 25% and 100%.
 - .3 Each indoor unit will require a 208-230 vac power supply. Control will be via the 30vdc M-net data control signal from the outdoor unit.
 - .2 Wall mounted units:
 - .1 Manufactured from ABS plastic and be painted either Munsel 2.60Y 8.66/0.69 or Munsel 0.70Y 8.59/0.97 finish.
 - .2 Air will discharged by a tangential line flow fan through

an outlet in the bottom front edge of the unit. The outlet will have electronically adjustable vanes to enable variable air discharge through the horizontal to vertical downward planes. The outlet shall also include manually adjustable guide vanes to alter the airflow pattern in the horizontal directional plane.

.3 Air will be returned to the unit through grilles mounted in the front face of the unit above the outlet. The return air will filtered by synthetic fibre washable filters mounted behind the return air grilles.

.4 The unit will have adjustable air flow volumes with between two to four stages.

.5 Power: 208V/1ph.

.3 Schedule:

IU #	Capacity		Power Input (kW)	Noise (dB-A)		Airflow (L/s)	
	Heat (kW)	Cool (kW)		Low	High	Low	High
IU 1.1	4	3.5	0.07	32	42	133	192
IU-1.2	5.9	5.3	0.09	39	45	233	300
IU-1.3	5.9	5.3	0.09	39	45	233	300

.4 Controls:

.1 General: it will be possible to use a range of different controllers to control the indoor fan coil units. These controllers will be capable of being connected on any part of the non polar 16 AWG two core screened control cable from the outdoor unit. Provide wall mounted thermostats to be wired to the controls for individual control of the indoor units.

.2 Central control unit:

.1 Wall mounted and hard wired to the outdoor unit. It will be manufactured in ABS plastic with an LCD display and will be the manufacturers standard colour. The controller will require an additional power pack which will be housed in a galvanized steel box.

.2 The controller will be capable of individually controlling the following functions and displaying following information individually on fifty indoor fan coil units:

- .1 On/off.
- .2 Operating mode.
- .3 Set point.
- .4 Fan speed.
- .5 Louvre position.
- .6 Timer settings.
- .7 Test run.
- .8 Fault diagnosis (display only).

.3 The controller will be capable to be used as stand alone accessed either locally or remotely via a control PC utilizing standard Internet Explorer IE5 or IE6 software.

.4 Networking: the control units can be networked together using the standard 10 base T Ethernet cabling structure.

.5 Error messages: each controller to have the ability to automatically send e-mail error under Alarm Condition.

.6 A modular software approach to allow additional features to all G50 controllers for future upgrades; example, Remote time scheduling, Energy consumption

data, load shedding, Trend Logging and remote I/O capability, peak power shedding.

- .5 Acceptable material:
 - .1 CU-1.1: Mitsubishi Electric City Multi S Series Model PUMY-P48NHMU-(BS).
 - .2 IU 1.1: Mitsubishi Electric City Multi Series Model: PKFY-P12NGMU-E.
 - .3 IU-1.2: Mitsubishi Electric City Multi Series Model: PKFY-P18NFMU-E.
 - .4 IU-1.3: Mitsubishi Electric City Multi Series Model: PKFY-P18NFMU-E.

3 Execution

3.1 INSTALLATION

- .1 Install as indicated, to manufacturer's recommendations, and in accordance with EPS 1/RA/2.
- .2 The installation of all air conditioning equipment, installation of all refrigerant pipework and full commissioning shall be performed by a specialist refrigerant installer who shall be authorized to install the specified Mitsubishi Electric VRF equipment. The installation of all internal and external units, refrigerant pipework, inter-connecting wiring, commissioning and testing shall be carried out by an approved refrigerant systems installers.
- .3 A condensate line shall be installed to each fan coil unit. This shall be installed and insulated all as per the standard specification. Minimum size of condensate pipes to be 25mm copper or plastic, insulated by gravity from each fan coil/cassette, drains to run 1:80 min falls as indicated on drawings.

3.2 STARTUP

- .1 Provide services to set and adjust equipment for operation as specified.
- .2 Provide startup logs. These shall be completed fully and included with the maintenance data prior to hand over. In addition, copy pages shall be returned to Mitsubishi Electric Sales Canada in order that the installation is logged and warranty honored.

3.3 CONTROL WIRING

- .1 Control wiring to the requirements of Section 25 05 60 - EMCS: Field Installation. All control wiring to be identified.
- .2 Provide for all interconnecting control wiring between the indoor and outdoor units and control wiring between remote controllers, centralized control and relevant components. This work shall be co-ordinated with the Division 25 EMCS and Electrical contractors for the routing and trunking of the cables.
- .3 All control wiring are to be carried out in 2 core 16 AWG shielded cabling.
- .4 Control wiring shall not be run next to power wiring. A minimum space of 100mm between both control and power cables shall apply.

END OF SECTION

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1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.3 No.1-M87(R2001), Overhead Systems
- .2 American National Standards Institute (ANSI)
 - .1 ASME B16.22-2001, Wrought Copper and Copper Alloy Solder Joint Pressures Fittings.
 - .2 ANSI C2-2002 Electrical Safety Code.
 - .3 ANSI/NFPA 70-1996SB Electrical Code.

1.2 DESCRIPTION OF SYSTEM

- .1 Electrical:
 - .1 Conduit and installation methods of hard wiring between field control devices and field panels specified in Division 26.
- .2 Complete design, installation, commissioning of new control system.

2 Products

2.1 SPECIAL SUPPORTS

- .1 Structural grade steel, primed and painted after construction and before installation.

2.2 WIRING

- .1 To all requirements of Division 26.

2.3 CONDUIT

- .1 To all requirements of Division 26.

3 Execution

3.1 INSTALLATION

- .1 Install all equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 SUPPORTS

- .1 Install all special supports as required and as indicated.

3.3 ELECTRICAL GENERAL

- .1 Do complete installation in accordance with requirements of:
 - .1 Division 26, this specification.
 - .2 Electrical safety Code of Territory having jurisdiction.
 - .3 ANSI/NFPA 70-1996SB.
 - .4 ANSI C2-2002.
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, all high voltage above 70 V contacts and mark to prevent accidental injury.
- .3 Conform to all manufacturer's recommendations for storage, handling and installation.
- .4 Check all factory connections and joints. Tighten where necessary to ensure continuity.
- .5 Install electrical equipment between 1000 and 2000 mm above finished floor wherever possible and adjacent to related equipment.
- .6 Shield and mark all live parts "LIVE 120 VOLTS" or other appropriate voltage.
- .7 Holes through exterior wall and roofs: flash and make weatherproof.

3.4 CONDUIT SYSTEM

- .1 As per Division 26.

3.5 WIRING

- .1 As per Division 26.

END OF SECTION

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1 General

1.1 GENERAL

- .1 This Section covers items common to Sections of Divisions 26. This section supplements requirements of Division 1.
- .2 For the proper execution of work, cooperate with other trades and contracts as needed.
- .3 To avoid installation conflicts, thoroughly examine the complete set of contract documents. Resolve conflicts with Consultant prior to installation.
- .4 Prior to installation of feeders to equipment requiring electrical connections, examine the manufacturer's shop drawings, wiring diagrams, product data and installation instructions. Verify that the electrical characteristics detailed in the contract documents are consistent with the electrical characteristics of the actual equipment being installed.
- .5 Examine the entire set of contract documents to avoid conflicts with other systems. Determine exact route and installation of electrical wiring and equipment with conditions of construction.
- .6 Should the electrical documents indicate a condition conflicting with the governing codes or regulations, refrain from installing that portion of the work until clarified by Engineer.
- .7 Definitions:
 - .1 Provide - To furnish and install complete and ready for intended use.
 - .2 Furnish - Supply and deliver to project site, ready for unpacking, assembly and installation.
 - .3 Install - Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operation at the project site to complete items of work furnished.
- .8 All correspondence and documents shall be submitted in English.
- .9 The entire bid package is considered related to all disciplines and shall be examined prior to bid and followed throughout construction and thereafter.
- .10 Equivalent or equal products: Where either of these terms are used to reference acceptable material, proof of equality in the form of manufacturer's representative supplied letter, to certify that the product meets or exceeds each and every specification item is required. Manufacturer catalog pages are not acceptable substitute for the above-indicated letter and will be returned as insufficient for review.

1.2 SCOPE OF WORK

- .1 The contractor's work under this division includes:
 - .1 Providing power from an emergency powered panelboard to a new cooling system consisting of three indoor units and an outdoor unit shown on mechanical drawings and specified in division 23 specifications.
 - .2 Providing control wiring from each indoor unit to a local thermostat shown on mechanical drawings and specified in division 23 specifications.
 - .3 Providing control wiring between each indoor unit and the outdoor unit.
- .2 Indoor units are 208 V single phase 60 Hz with less than 3 A of full load current. Circuit breaker to be 15 A two pole. The supply wiring to be two # 10 AWG and one # 12 AWG copper RW(90)-XLPE in 21 mm EMT. The connection shall be as required for the unit supplied either through direct connect via a 30 A local disconnect or where the unit is cord and

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- .3 plug connected through a 6-20R receptacle.
Outdoor unit is 208 V single phase 60 Hz with 24 A of full load current. Circuit breaker to be 30 A two pole. The supply wiring to be two # 8 AWG and one # 10 AWG copper RW(90)-XLPE in 21 mm EMT. The connection shall be direct connect via a 30 A local disconnect. The raceway between local disconnect and the unit to be liquid-tight flexible metal conduit.
- .4 Control wiring between indoor unit and its associated thermostat to be two-conductor # 16 AWG copper shielded industrial control cable in 16 mm EMT.
- .5 Control wiring between each indoor unit and the outdoor unit to be two-conductor # 16 AWG copper shielded industrial control cable in 16 mm EMT.
- .6 It is the contractor's responsibility to:
 - .1 Request and perform a pre-bid comprehensive site visit;
 - .2 Develop comprehensive familiarity, with the conditions of the work and location of the components of the work, as required whatsoever;
 - .3 Investigate the available sources of power, select the emergency panelboard that could be used for this work, perform load measurements as necessary whatsoever to ensure availability of not only physical space in the panelboard but also actual capacity for the new loads;
 - .4 Repeat the selection, measurement and verification of suitability as indicated above as many times as necessary to identify the proper source of power; and
 - .5 Perform the work as specified in the contract documents including not only this specification but also the rest of the documents.
- .7 Division 26's documents are limited to this specification with no drawings or verified up-to-date information of the power sources available or the like whatsoever.

1.3 CODES AND STANDARDS

- .1 Unless otherwise indicated, all references to standards and codes throughout this specification is to the latest applicable edition at the time of bid closing.
- .2 Do complete installation in accordance with CSA C22.1. In case of a conflict between the code requirements and the contract documents, request clarification prior to proceeding with the work.
- .3 Abbreviations for electrical terms: to CSA Z85.
- .4 Coordinate with other disciplines and provide plenum rated equipment and devices and plenum rated raceway, wiring and installation methods in all plenum spaces.
- .5 Material and installations shall comply with the requirements of the following codes and standards, codes and standards mentioned in other sections of this specification, as well as other applicable codes and standards to the satisfaction of the Authorities Having Jurisdiction (AHJ):
 - .1 National Building Code of Canada (NBCC);
 - .2 National Fire Code of Canada (NFCC);
 - .3 Canadian Electrical Code (CEC);
 - .4 Canadian Standards Association (CSA); and
 - .5 Underwriters Laboratories of Canada (ULC).
 - .6 CAN/CSA-Z317.13 - Infection control during construction, renovation and maintenance of health care facilities.

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- 1.4 QUALITY ASSURANCE**
- .1 Conform to the requirements of CEC with amendments by local Authorities Having Jurisdiction (AHJ).
 - .2 Conform to the requirements of the NBC with amendments by local AHJ.
 - .3 Obtain and pay for the electrical permits and inspection from local AHJ.
 - .4 Instruct operating personnel in the operation, care and maintenance of systems, system equipment and components.
- 1.5 VOLTAGE RATINGS**
- .1 Operating voltages: to CAN3-C235.
 - .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by the above indicated standard. Equipment to operate in extreme operating conditions established in above-indicated standard without damage to equipment.
- 1.6 PERMITS, FEES AND INSPECTION**
- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
 - .2 Pay associated fees.
 - .3 Consultant will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at cost plus.
 - .4 Notify Engineer of changes required by Electrical Inspection Department prior to making such changes.
 - .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Consultant.
 - .6 Obtain Alberta Department of Labour, Electrical Protection Branch Permit and submit a copy followed by the certificate of acceptance from the inspection branch to the Engineer.
- 1.7 MATERIALS AND EQUIPMENT**
- .1 Equipment and material to be certified by a SCC (Standard Council of Canada) accredited Certification body. Where there is no alternative to supplying equipment, which is not certified as indicated, obtain special approval from Electrical Inspection Department.
 - .2 Equipment and material to be in compliance with the current applicable federal and territorial laws, regulations and acts.
 - .3 Provide material and equipment that is acceptable to to AHJ as suitable for the use indicated. For example provide wet label equipment in wet locations.
 - .4 Provide incidentals not specifically mentioned herein or noted on drawings, but needed to complete the system, in a safe and satisfactory working condition.
 - .5 Install electrical equipment complete and per manufacturer's instructions. Obtain installation instructions from manufacturer and thoroughly examine the instructions prior to rough in.
 - .6 All finishes and colour identifications to match the existing standards of the hospital. Request from the tendering authority all such information and bid accordingly. This applies to wires, conduit, boxes, devices, equipment and the like.
 - .7 Manufacturer and SCC labels to be visible and legible, after equipment is installed.
- 1.8 EQUIPMENT IDENTIFICATION**
- .1 Identify electrical equipment with nameplates as follows:
 - .2 Nameplates: Lamicaid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.
NAMEPLATE SIZES
Size 2 12 x 70 mm 2 lines 6 mm high letters Type B
 - .3 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.

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- .4 Wording on nameplates to indicate supply source and circuit number, voltage and phase characteristics and load.
 - .5 Allow for average of twenty-five (25) letters per nameplate and label.
 - .6 Identification to be English.
 - .7 Use one nameplate for each language.
- 1.9 WIRING IDENTIFICATION**
- .1 Identify each conductor at each end where they are spliced or terminated in a junction box, panelboard, fitting or device.
 - .2 Identify conductors that pass through a pullbox in that box.
 - .3 Identify wiring with permanent indelible identifying markings as indicated hereinafter.
 - .4 Identification tag to indicate the panel designator and circuit number or wire number on each conductor. Information shall be printed in permanent legible form.
 - .5 Tag neutral conductor with the circuit number that it serves.
 - .6 Maintain phase sequence and colour coding throughout for all systems.
 - .7 Colour code the wiring per CSA C22.1 as follows: Per article 1.6 (6). In the absence of such standards for 120/208 volt system phase wires - Red, Black and Blue with white neutral green bond.
- 1.10 FIRE STOPPING**
- .1 Provide fire stopping per NBC section 3 and other applicable codes and standards.
 - .2 Requirements:
 - .1 Conform to the following requirements to maintain the continuity of fire separations whether or not shown on the drawings.
 - .2 Fire separations may not be pierced by electrical or similar services except in accordance with the local building code.
 - .3 Where a fire separation is required to be of non-combustible construction and terminates at the exterior wall, the underside of floor, ceiling or roof structure, and at floors, the opening shall be fire stopped with non-combustible material as required by applicable codes.
 - .4 Combustible members, fasteners and similar items shall not be used to anchor fixtures to fire separations.
 - .5 Openings for non-combustible pipes and ducts through a fire separation shall be fire stopped around the pipe and duct with ULC labeled and approved fire stopping sealant, insulation or other material approved by local authorities having jurisdiction to maintain the integrity of fire separation.
 - .6 Maintain existing fire separations as such, and seal penetrations to retain the separation's integrity.
 - .7 Refer to technical sections for specific requirements for sealing penetrations and joints of smoke and fire separations.
 - .3 Fire Test Response Characteristics:
 - .1 For assemblies or materials having fire resistance rating, provide material and construction identical to those tested in assembly indicated according to CAN/ULC-S101 as verified by an independent testing and inspecting agency acceptable to authorities having jurisdiction for fire resistance ratings of specific assemblies.
 - .2 Fire resistance rated assemblies and materials shall bear a label and proof of acceptance as indicated by design designations from ULC list of equipment and materials or Warnock Hersey/Intertek directory of listed products. Where no design designation is provided, use only time assigned to materials listed in Appendix D of the Building Code.
 - .3 Fire resistance rated assemblies and materials bearing an

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Underwriters Laboratories Inc. (UL) or Warnock Hersey/Intertek (WHI) label will be acceptable for use on this project provided that the label indicates acceptance under Underwriters Laboratories of Canada (ULC) and having either a cUL, cULUS, cWHI or cWHIUS marking.

- .4 Materials that only have a UL, ULUS, WHI or WHIUS marking are not acceptable.
- .4 Foam Sealant: Listed and approved for the application per CAN/ULC-S115 "Fire Tests of Fire Stop Systems". For use around conduit and other penetrations to prevent passage of smoke, fire, toxic gas or water; To maintain seal before, during and after fire; In and around conduit for thermal break at penetration of barrier between heated and unheated spaces. To be Chase Technology Corp., Fire Foam, Thomas & Betts or approved.
- .5 Seal around conduit penetrations through non-rated walls with caulking material matching the wall finish colour.
- 1.11 LOAD BALANCE**
 - .1 Measure phase current to panelboards affected by this work with normal loads (lighting, HVAC, etc.) operating at time of acceptance. Adjust branch circuit connections as required to obtain balance of current between phases to within 15% of average and record changes.
 - .2 Submit, at completion of work, report listing phase and neutral currents on the panelboards operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- 1.12 FIELD QUALITY CONTROL**
 - .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Territorial Act respecting manpower vocational training and qualification. Employees registered in a Territorial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
 - .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Territory that the work is being contracted.
 - .3 Conduct and pay for all testing unless otherwise indicated.
 - .4 Furnish letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - .5 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 300 V with a 500 V instrument.
 - .2 Check resistance to ground before energizing.
 - .3 Electronic instruments shall not be subjected to a megger test. Damaged electronic instrument(s) caused by megger test(s) shall be replaced at contractor's expense.
 - .4 Consider ambient temperature and weather conditions, and apply proper correction factors to the measured insulation resistance values.
 - .6 Provide instruments, meters, equipment and personnel required to conduct tests.
 - .7 Complete all deficient items noted on reports provided by the local authority having jurisdiction.
 - .8 Submit test results to the Owner.

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- 1.13 RECORD DRAWINGS**
- .1 Provide 1 set of marked up electrical site record drawings. Provide sets of white prints of the construction drawings and use for record drawings. Mark thereon all changes as work progresses and as changes occur. This shall include changes to all electrical systems as constructed, including any revisions from addenda or change orders. Ensure that items marked correspond to the drawing title.
 - .2 Use different colour waterproof ink for each service on a per drawing basis.
 - .3 Make mark-ups available for reference purposes and inspection at all times.
 - .4 Present finalized record drawings to the Owner's representative at time of substantial completion site review.
 - .5 Submit the final record marked up hard copies to the Owner's representative at the time of final completion.
 - .7 Provide new typewritten panel directories for all panelboards affected by the scope of this work. Copy the existing information from the existing directories and add new circuits descriptions. Include a copy in the panelboard directory holder and a copy in the O&M manuals.
 - .8 A \$3,000 hold back will be applied towards final record marked up until all deficiencies are rectified to Owner's satisfaction.
- 1.14 OPERATION AND MAINTENANCE DATA**
- .1 Include in Operation and Maintenance Data:
 - .1 Wiring and schematic diagrams indicating all connections, terminals and wire numbers.
 - .3 Names and address of all suppliers for items must be included in the Maintenance Manuals.
 - .5 All manufacturer's operating and maintenance information prepared for any installed equipment.
 - .6 Shop drawings of all installed equipment.
 - .7 Results of all tests performed.
 - .8 One set of full size prints of record marked up drawings.
 - .2 Provide the Owner with 3 copies of operation and maintenance data, or as called for in the contract Documents, made up as follows:
 - .1 Punched and bound in vinyl 1/2" binder for 8.5" x 11" size paper.
 - .2 Enclose title sheet, labeled "Operating and Maintenance Data Manual", project name, date and list of contents.
 - .3 Include the following information on a trade scope specific basis plus data specified:
 - .1 Maintenance instructions for finished surfaces, materials and equipment.
 - .2 Copy of hardware and paint schedules.
 - .3 Name, addresses and phone numbers of subcontractors and suppliers.
 - .4 Guarantees, warranties and bonds indicating:
 - .1 Name and address of project.
 - .2 Warranty/Guarantee/Bond commencement date and duration.
 - .3 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
 - .4 Signature and seal of Trade Contractor.
 - .5 Additional material/equipment used in project listed under various sections showing name of manufacturer and source of supply.
 - .4 Neatly type lists and notes. Use clear drawings diagrams or

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- .5 manufacturers' literature.
- .5 Submit operation and maintenance manuals before or with request for final field review.
- .6 A \$2,000 hold back will be applied towards final record marked up until all deficiencies are rectified to Owner's satisfaction.

1.15 CLEANING

- .1 Thoroughly clean the interior and the exterior of the panelboards affected by this work.
- .2 Vacuum construction dust, dirt and debris out of all electrical equipment and device enclosures including but not limited to the above-mentioned list.
- .3 Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

2 Products

2.1 NOT USED

- .1 Not Used.

3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

- .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

2 Products

2.1 BUILDING WIRES

- .1 Conductors: Copper, stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- .3 Bonding conductors: green, stranded copper type RW90-XLPE.

2.2 CONTROL CABLES

- .1 Conductors: Two conductor, PVC insulated, PVC jacketed, copper, overall shield, minimum size to be #16 AWG.
- .2 Insulation: 105°C Flame retardant PVC.
- .3 Jacket to be UL listed, moisture resistant, sequentially marked, nylon ripcord for jacket removal.
- .4 Conductors to be black/white number coded, rated for 300V at 105°C.
- .5 Standard of Acceptance: Nexans Instrumentation Cable Type PLTC or equal.

3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring in conduit system in accordance with Section 26 05 34.
- .2 Install bonding wire throughout.

3.2 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

END OF SECTION

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1 General

1.1 ESPECIALLY RELATED SECTION

.1 Section 26 05 48 - Seismic Restraints for Electrical Systems.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended and set in poured concrete walls and ceilings.

3 Execution

3.1 INSTALLATION

- .1 Secure equipment to hollow masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps:
 - .1 One-hole malleable iron steel straps to secure surface conduits and cables 53 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 53 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems:
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except where allowed by applicable codes, with permission of other trade and approval of Consultant.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .14 Where screw fastenings are used on metal decking, screws are to be set in lower flutes only.

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END OF SECTION

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit, steel.
 - .3 CSA C22.2 No. 83, Electric Metallic Tubing.

1.2 LOCATION OF CONDUIT

- .1 Determine best routing for conduit on site, ensuring requirements of the code and this specification are met.

2 Products

2.1 CONDUITS

- .1 Electrical metallic tubing (EMT); with couplings.
- .2 Flexible steel conduit and liquid-tight flexible metal conduit.

2.2 CONDUIT FASTENINGS

- .1 One hole malleable iron straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m OC.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 27 mm and larger conduits.
- .3 Watertight connectors and couplings for surface mounted EMT. Set-screws are only acceptable for recessed installation where the conduit does not extend beyond the room where originated, the room is heated and not sprinklered.
- .4 Conduit Moisture Sealant: Sealant to be moisture barrier type, non-toxic, non-shrink, non-hardening, putty type hand applied material providing effective barrier under submerged conditions.

2.4 PULL STRING

- .1 Minimum 6 mm stranded nylon (polypropylene) pull rope, tensile strength 5 kN. Leave pull rope in conduit after cables have been installed.

2.5 THREAD LUBRICANT

- .1 Crouse-Hinds STL lubricant for use on all conduit threads.

3 Execution

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use electrical metallic tubing (EMT) except in cast concrete and where subject to mechanical injury.
- .4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend conduit using approved conduit bending machine or hickey.

- .7 Running threads are not permitted.
- .8 Treat all male ends with thread lubricant, Crouse-Hinds type STL or approved equal prior to being made up.
- .9 Install pull string in empty conduits.
- .10 Remove and replace blocked, crushed, deformed or otherwise injured or damaged conduit sections. Do not use liquids to clean out conduits.
- .11 Where cables or conduits pass through floors and fire rated walls, pack space between wiring and sleeve full with fire rated caulking compound if approved, or other approved fire rated fire stop assembly suitable for the application and to the code requirements.
- .12 Where cables or conduits pass through non-rated walls, pack space between wiring and sleeve full with caulking compound suitable for the application and paint to match the wall finish.
- .13 Dry conduits out before installing wire.
- .14 Provide plastic bushing at the end of raceway, per CEC rule 12-906, to protect conductors from abrasion where they issue from raceways. This applies to all raceway and all wiring regardless of voltage or application. EMT connector without insulated throat or bushing installed between the conduit and box meets the 12-906 requirement for conductors smaller than #8 AWG.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels. Channels to have 25% spare capacity.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.
- .4 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .5 Do not use supports or equipment installed for other trades for conduit or cable support.

END OF SECTION

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1 General

- 1.1 SCOPE** .1 Scope of the work under this section is to provide professional design and build seismic restraints accordingly for electrical systems as indicated hereinafter, as well as site certification of such work.
- 1.2 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES** .1 Submit product data in accordance with Section 26 05 01 - Common Work Results - Electrical.
.2 Provide shop and placement drawings for all electrical equipment and equipment assemblies including runs of conduit and racks showing the methods of attachment to the particular structure for each piece of equipment and assembly and provide anchorage/attachment details.
- 1.3 DEFINITIONS** .1 Post Disaster Buildings: buildings essential to provide services in the event of a disaster. In other words, buildings in which life safety and continued building operations are of equal concern. It is necessary that the building remain operational during or after a seismic event.
.2 The QGH has been determined to be a post disaster building as defined by the National Building Code of Canada.
.3 SRS: Seismic Restraint System.
- 1.4 SYSTEMS** .1 This section applies to the following systems:
.1 Safety switches, starters and the like.
.2 Conduit, conduit banks and boxes.
- 1.5 DESIGN OF RESTRAINTS** .1 Detailed design of restraints is to be completed by a Professional Engineer specializing in design of SRS and who is registered to practice in the Nunavut Territory.
- 1.6 SITE CERTIFICATION** .1 Site certification for systems described in article 1.4 is to be provided at no additional cost to the owner. Provide for site certification of installation by Professional Engineer specializing in design of SRS and who is registered to practice in the Nunavut Territory. For measures of cost savings, the same seismic engineer that is used by the Division 23 contractor could be shared with Division 26.
- 1.7 DESIGN AND INSTALLATION COORDINATION** .1 Coordinate the design and installation of the seismic restraints for electrical equipment, devices and components installed in public spaces, areas subject to general occupant view, and other areas with the Owner and install to Owner's satisfaction.

2 Products

- 2.1 MATERIALS** .1 Where provided, SRS components are to be provided from one manufacturer regularly engaged in the production of SRS components.
.2 Security Bridles: Minimum #16 AWG stranded stainless steel aircraft cable.
.3 Mechanical Anchors: Approved SRS anchors, minimum 13mm dia.
.4 Threaded Anchors: Minimum Type ASTM A 325-00. Minimum 13mm diameter.

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3 Execution

3.1 INSTALLATION

- .1 Provide seismic restraint and anchorage for all equipment and services as indicated.
- .2 Free-standing equipment shall be fastened to the basic structure using anchorage/attachments to overcome seismic overturning forces.
- .3 Provide Seismic restraint for all cables and raceways exceeding 50 mm in any cross-sectional dimension and which are supported more than 300 mm vertically from the basic structure.
- .4 Provide transverse and axial restraints within 4.0 m of a vertical bend.
- .5 Trapeze hangers for cables and raceways shall be restrained utilizing minimum 10 mm diameter slack cable restraints, which shall be provided at maximum transverse spacing of 12.5 m and longitudinal restraints at 25 m maximum spacing, or as otherwise limited by anchor/slack cable performance. Adjacent spacing of restraints on a run shall vary by 10% to 30% to avoid coincident resonances.
- .6 Transverse bracing for one raceway section may also act as longitudinal bracing for the raceway connected perpendicular to it, provided the bracing is installed within 610 mm of the elbow or junction box. Branch runs shall not be used to restrain main runs.

3.2 INSPECTION AND CERTIFICATION

- .1 Do not cover any seismic restraint systems until reviewed by the SRS Engineer and the representative of the local authority having jurisdiction.
- .2 Site certification shall be complete prior to request for substantial completion review. Provide a copy of the certificate attached to the request for substantial completion review.
- .3 Include a copy of site certification in O&M manuals.

END OF SECTION

November 28, 2011

1 General

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 26 05 01 - Common Work Results - Electrical.

2 Products

2.1 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40° C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers to have minimum of 22,000 A symmetrical rms interrupting capacity rating.
- .6 Provide fully rated circuit breakers.
- .7 Circuit breaker shall be products of the manufacturer of the existing panelboard, in which the new circuit breaker will be installed.

3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers per manufacturer instructions.

END OF SECTION

1 General

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 26 05 01 - Common Work Results - Electrical.

2 Products

2.1 DISCONNECT SWITCHES

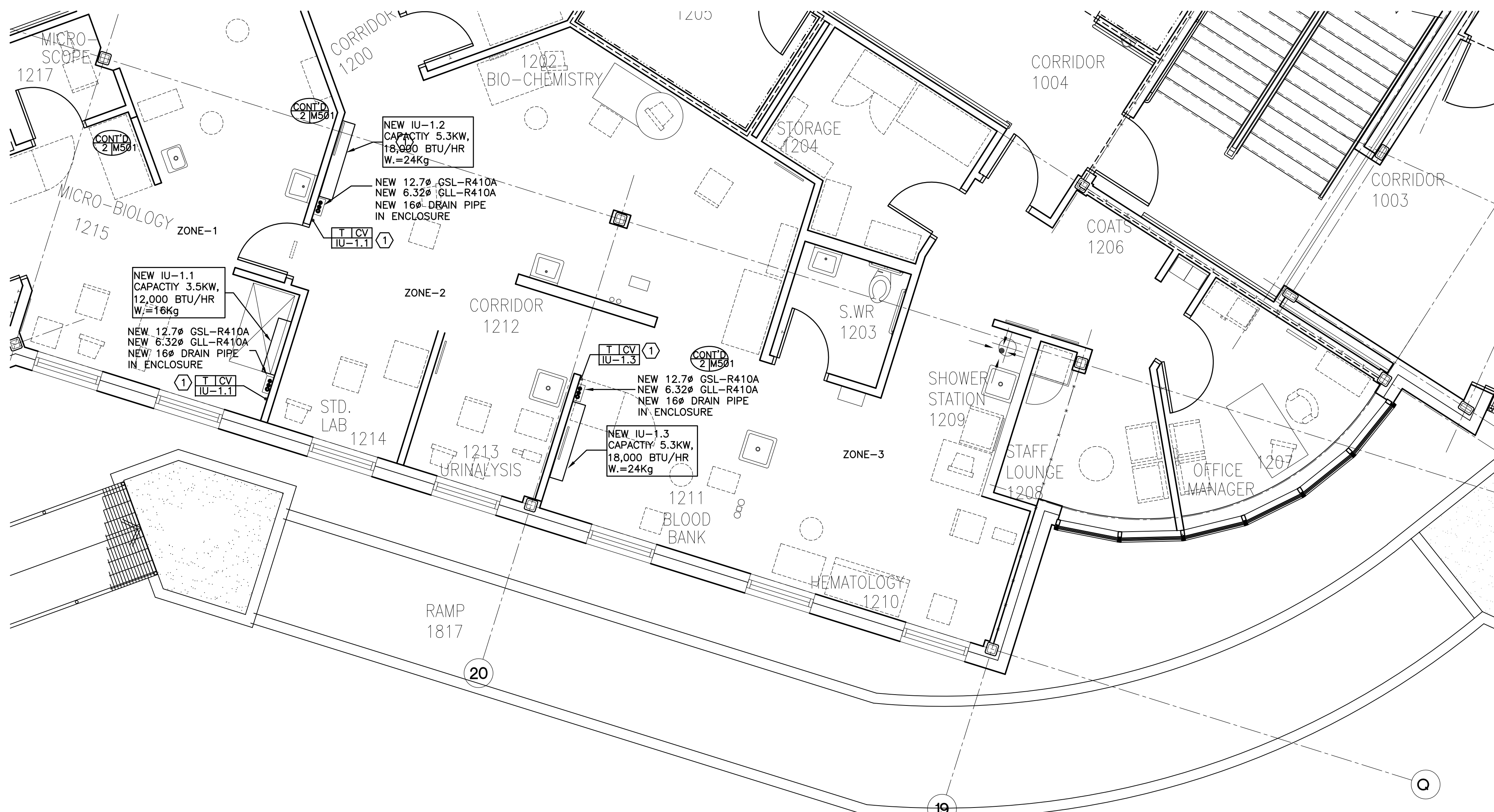
- .1 Fusible or non-fusible, disconnect switch, as indicated herein or necessary as a result of modifications to the mechanical requirements of the loads, in CSA Enclosure type 1 or 3 suitable for the location installed and sprinkler proof, unless indicated otherwise, size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 ON-OFF switch position indication on switch enclosure cover.
- .6 Horsepower rated for load interruption.
- .7 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.
- .2 Locate disconnect switch in site of the load.
- .3 Connect feeders.
- .4 Test and verify the operation of the switch.

END OF SECTION

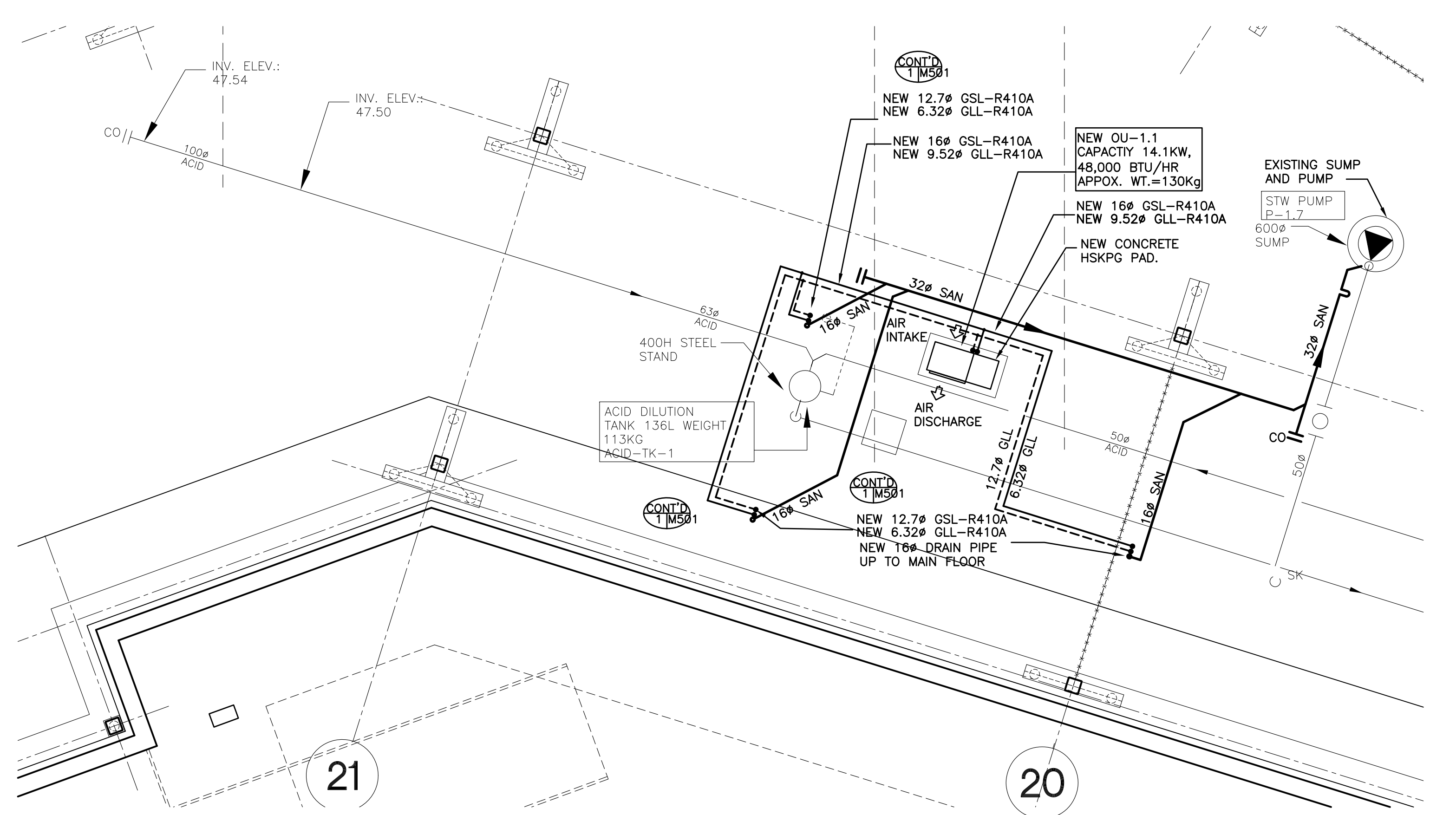


THESE DRAWINGS HAVE BEEN PRODUCED USING EXISTING DRAWING INFORMATION AND SITE VISITS. CONTRACTOR TO VERIFY ACCURACY OF INFORMATION PRIOR TO COMMENCEMENT OF CONSTRUCTION. NOTIFY CONSULTANT OF ALL DISCREPANCIES.

NOTE:
1. LIGHT TEXT AND EQUIPMENT ARE EXISTING. DARK TEXT AND EQUIPMENT ARE NEW.

- NOTES:**
1. THERMOSTAT TO BE WIRED TO INTERIOR COOLING UNITS.
 2. CONTRACTOR IS RESPONSIBLE FOR ALL POWER AND CONTROL ELECTRICAL WORK FOR THIS PROJECT.
 3. CONTRACTOR TO VISIT SITE DURING THE TENDER PERIOD TO VERIFY EQUIPMENT LOCATIONS, THE ROUTING OF SERVICES, AND THE LOCATION OF ELECTRICAL PANELS TO SUPPLY ELECTRICAL POWER.
 4. ALL COLD REFRIGERANT GAS PIPING AND CONDENSATE DRAINS TO BE INSULATED.
 5. THE MECHANICAL AND ELECTRICAL SERVICES TO THE 3 NEW INTERIOR A/C UNITS IN THE LAB ARE TO BE RUN UP THE SURFACE OF THE LAB WALL AND ENCLOSED NEATLY WITHIN A PRE-MANUFACTURED ARCHITECTURAL ENCLOSURE TO THE SATISFACTION OF THE ENGINEER. THE ENCLOSURES TO BE ANODIZED ALUMINUM AS MANUFACTURED BY STYLMARK OR EQUAL.
- KEY NOTES:**
1. THERMOSTAT LOCATED ADJACENT ENCLOSURE SO THAT WIRING CAN BE LOCATED IN ENCLOSURE.

1 MAIN FLOOR-REFRIGERATION PLAN
M501 1:50

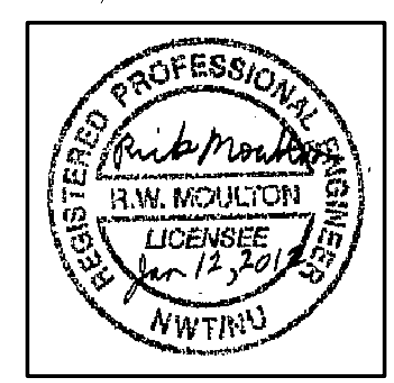


2 CRAWL SPACE-REFRIGERATION PLAN
M501 1:50

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- GENERAL NOTES:**
1. CONTRACTOR TO CONFIRM LOCATION OF EXISTING MECHANICAL EQUIPMENT AND SYSTEM DISTRIBUTION ROUTING PRIOR TO COMMENCEMENT OF CONSTRUCTION. NOTIFY CONSULTANT OF ALL DISCREPANCIES.
 2. CONTRACTOR TO REQUEST PERMISSION TO COMMENCE WORK AT LEAST 2 WEEKS IN ADVANCE OF SCHEDULED DATE.
 3. OWNER HAS TO GIVE PERMISSION TO COMMENCE WORK BEFORE WORK IS DONE.
 4. CONTRACTOR TO SCHEDULE ALL WORK WITH OWNER TO MINIMIZE DISRUPTION DURING REGULAR WORKING HOURS.
 5. CONTRACTOR TO LEAVE ALL MECHANICAL SYSTEMS IN WORKING ORDER AT THE END OF EACH WORK DAY UNLESS COORDINATED AND SCHEDULED WITH OWNER.
 6. SYSTEM SHUTDOWNS TO BE COORDINATED WITH OWNER MINIMUM SEVEN DAYS PRIOR TO SHUTDOWN.
 7. HEATING IN BUILDING TO BE SHUTDOWN IN SUMMER AND/OR AS PERMITTED BY OWNER/STAFF.
 8. ALL APPROPRIATE MEASURES TAKEN AS REQUIRED TO PREVENT CONTAMINATION OF THE AREAS IN USE BY THE OWNER.
 9. CONTRACTOR TO ENSURE OWNER AREA IS CLEANED AND PUT BACK IN ORDER TO THE SATISFACTION OF THE OWNER PRIOR TO CONSTRUCTION DEADLINE.
 10. DISPOSE OF DEMOLITION ITEMS IN ACCORDANCE WITH LOCAL LANDFILL AUTHORITIES AND AUTHORITIES HAVING JURISDICTION.

NO.	REVISION DESCRIPTION	DATE ISSUED
1	ISSUED FOR TENDER	01/12/2012



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PROJECT TITLE
**QIKIQTANI
GENERAL
HOSPITAL**

LOCATION
IQALUIT, NUNAVUT

DRAWING TITLE
**REFRIGERATION
MAIN FLOOR &
CRAWL SPACE
PLANS**

DRAWN BY SM SCALE 1:50

CHECKED BY RM/TG CLIENT PROJECT NO.

FSC PROJECT NO. 2011-7180

DRAWING NO. **M501**

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