

# **TECHNICAL SPECIFICATIONS**

**FOR**

**Garnet A. Williams Community Centre  
501 Clarke Avenue West, Thornhill, Ontario**

**PREPARED ON BEHALF OF**

**CITY OF VAUGHAN  
2141 MAJOR MACKENZIE DRIVE  
VAUGHAN, ONTARIO**

**November 23, 2022**



**Peter T. Mitches & Associates Limited**

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**Section Number      Title      No. PAGES**

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R2	Refrigeration Plan Compressor Room Demolition & New Works
R3	Refrigeration Plan Existing Flow Diagram Replacement Items

**End of Table of Contents**

PART 1 - GENERAL

- |  |                      |  |
|--|----------------------|--|
| 1.1 Section<br><u>Includes</u>                   | .1<br>.2<br>.3<br>.4 | Title and description of Work.<br>Contract Method.<br>Work sequence.<br>Contractor use of premises.  |
| 1.2 Work Covered by<br><u>Contract Documents</u> | .1                   | <p>Work of this Contract involves a variety of items, including but not limited to:</p> <ul style="list-style-type: none"> <li>a. <ul style="list-style-type: none"> <li>▪ Replacement of existing rooftop evaporative condenser</li> <li>▪ Replacement of evaporative condenser water tank</li> <li>▪ Replacement of evaporative condenser water pump</li> <li>▪ Replacement of indoor cold brine pump</li> <li>▪ Replacement of indoor warm brine pump</li> <li>▪ Replacement of compressor jacket cooling pump</li> <li>▪ Miscellaneous repairs and upgrades</li> </ul> </li> <li>b. Various miscellaneous work as shown in the contract documents</li> </ul> <p>All work is located at Garnet A. Williams Community Centre (501 Clarke Avenue West) in Vaughan, Ontario.</p> |
| <u>1.3 Contract Method</u>                       | .1                   | Construct Work under single, stipulated price contract.  |
| <u>1.4 Work Sequence</u>                         | .1<br>.2             | <p>Work is to be completed in a continuous manner. The facility will remain fully operational during the works.</p> <p>Maintain fire access/control.</p>   |
| <u>1.5 Contractor Use of Premises</u>            | .1<br>.2<br>.3       | <p>Contractor shall limit use of premises for Work and storage.</p> <p>Coordinate use of premises under direction of Owner.</p> <p>Obtain and pay for use of additional storage or work areas needed for operations under this Contract.</p>   |

PART 2 - PRODUCTS

- |                     |    |           |
|---------------------|----|-----------|
| <u>2.1 Not Used</u> | .1 | Not used. |
|---------------------|----|-----------|

PART 3 – EXECUTION

- |                     |    |           |
|---------------------|----|-----------|
| <u>3.1 Not Used</u> | .1 | Not used. |
|---------------------|----|-----------|

**End of Section**

PART 1 - GENERAL

- 1.1 Section Includes .1 Cash allowances.
- .2 Contingency allowance.
- 1.2 References .1 Town's Front-End
- 1.3 Cash Allowances .1 Reserved.
- .2 Amount of cash allowance, for Work, as shown in City's Front End and is as follows:
- .1 Testing and inspection
- .3 Expenditures under cash allowance will be authorized by City of Vaughan. Consultant will confirm the type and number of tests required.
- 1.4 Contingency Allowance .1 Included in Contract Price a contingency allowance as shown in the City's Frond End.
- .2 Expenditures under contingency allowance will be authorized in accordance with City of Vaughan procedures.
- 1.5 Overhead and Profit .1 The Contractor's overhead and profit when applied to changes to the contract is understood to include:
- .1 The Contractor's and Sub-Contractor's administrative and incidental costs relating to a change including, without limitation, head office and site office expenses, associated traveling costs, all vehicle costs, downtime, estimating, purchasing, project coordination, workers' tools, financing costs including holdback, bonding and insurance costs, business development.
- .2 The salaries of Superintendents, Project Managers, engineers, timekeepers, accountants, clerks, watch persons and other site supervision staff above foreperson level employed directly on the Work; Administrative costs including payroll and benefits burden, shop drawing production and record drawings, clean-up and disposal of waste materials, etc.

PART 2 - PRODUCTS

2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used .1 Not Used.

**End of Section**

PART 1 - GENERAL

- |                               |    |  |
|-------------------------------|----|--|
| <u>1.1 Section Includes</u>   | .1 | Schedule, form, content.   |
| <u>1.2 Related Sections</u>   | .1 | Section 01330 – Submittal Procedures.  |
| <u>1.3 Schedules Required</u> | .1 | Submit schedules as follows: <ul style="list-style-type: none"> <li>.1 Construction Progress Schedule.</li> <li>.2 Cost Breakdown.</li> <li>.3 Submittal Schedule for Shop Drawings and Product Data.</li> <li>.4 Submittal Schedule for Samples.</li> <li>.5 Product Delivery Schedule.</li> <li>.6 Cash Allowance Schedule for purchasing Products.</li> <li>.7 Shutdown or closure activity.</li> </ul> |
| <u>1.4 Format</u>             | .1 | Prepare schedule in form of a horizontal Gantt bar chart.  |
|                               | .2 | Provide a separate bar for each major item of work, trade or operation.  |
|                               | .3 | Split horizontally for projected and actual performance.   |
|                               | .4 | Provide horizontal time scale identifying first work day of each week.   |
|                               | .5 | Format for listings: Table of Contents of this specification.  |
|                               | .6 | Identification of listings: By specification Section numbers and specification subjects.   |
| <u>1.5 Submission</u>         | .1 | Submit initial format of schedules within 15 working days after award of Contract.   |
|                               | .2 | Submit schedules in electronic format, forward through e-mail as pdf files.  |
|                               | .3 | Submit one opaque reproduction, plus 2 copies to be retained by Consultant.  |
|                               | .4 | Consultant will review schedule and return review copy within 10 days after receipt.   |
|                               | .5 | Resubmit finalized schedule within 7 days after return of review copy.   |

- .6 Submit revised progress schedule with each application for payment.
- .7 Distribute copies of revised schedule to:
  - .1 Job site office.
  - .2 Subcontractors.
  - .3 Other concerned parties.
- .8 Instruct recipients to report to Contractor within 10 days, any problems anticipated by timetable shown in schedule.

1.6 Progress Photographs

- .1 Progress Photographs By Consultant
  - .1 Consultant will take periodic progress photographs.
- .2 Progress Photographs By Contractor
  - .1 Contractor will take daily photographs to illustrate the progress of the work. These photographs to be emailed weekly to the consultant. In addition, at the end of the project, the contractor is to organize all photographs on a CD and submit to the consultant as part of the closeout documents.

1.7 Submittals Schedule

- .1 Include schedule for submitting shop drawings, product data and samples.
- .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.
- .3 Include dates when reviewed submittals will be required from Consultants.

PART 2 - PRODUCTS

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- .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

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PART 1 - GENERAL

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|-----------------------------|----|---|
| <u>1.1 Section Includes</u> | .1 | Shop drawings and product data.   |
|                             | .2 | Samples.  |
|                             | .3 | Certificates and transcripts.   |
| <u>1.2 Related Sections</u> | .1 | Section 01320 - Construction Progress Documentation.  |
|                             | .2 | Section 01450 - Quality Control.  |
|                             | .3 | Reserved.   |
| <u>1.3 Administrative</u>   | .1 | Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.  |
|                             | .2 | Work affected by submittal shall not proceed until review is complete.  |
|                             | .3 | Present shop drawings, product data, samples and mock-ups in SI Metric units.   |
|                             | .4 | Where items or information is not produced in SI Metric units converted values are acceptable.  |
|                             | .5 | Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected. |
|                             | .6 | Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.   |
|                             | .7 | Verify field measurements and affected adjacent Work are coordinated.   |
|                             | .8 | Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.  |



- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
  - .10 Keep one reviewed copy of each submission on site.
- 1.4 Shop Drawings and Product Data
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
  - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
  - .3 Allow 10 days for Consultant's review of each submission.
  - .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
  - .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
  - .6 Accompany submissions with transmittal letter, in duplicate, containing:
    - .1 Date.
    - .2 Project title and number.
    - .3 Contractor's name and address.
    - .4 Identification and quantity of each shop drawing, product data and sample.
    - .5 Other pertinent data.
  - .7 Submissions shall include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Subcontractor.
      - .2 Supplier.
      - .3 Manufacturer.
    - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .8 After Consultant's review, distribute copies.
- .9 Submit 6 prints and 1 electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .10 Submit 6 prints and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .14 The review of shop drawings by Consultant is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of Work of all sub-trades.

- 1.5 Samples
- .1 Submit for review samples in duplicate/triplicate as requested in respective specification Sections. Label samples with origin and intended use.
  - .2 Deliver samples prepaid to Consultant's business address.
  - .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
  - .4 Where colour, pattern or texture is criterion, submit full range of samples.
  - .5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
  - .6 Make changes in samples which Consultant may require, consistent with Contract Documents.
  - .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

- 1.6 Progress Photographs
- .1 Contractor to maintain progress photographs in accordance with Section 01320 - Construction Progress Documentation. . A mandatory requirement for this project is for the contractor to submit **all** progress photographs on a CD at the end of the project as part of the closeout documents. Photographs to be labeled by date/construction activity. Submission of photographs (in hard copy format) will be required in the event of a discrepancy between the Consultant and Contractor

PART 2 - PRODUCTS

- 2.1 Not Used
- .1 Not Used.

PART 3 - EXECUTION

- 3.1 Not Used
- .1 Not Used.

**End of Section**

PART 1 - GENERAL

1.1 Section Includes

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mill tests.
- .4 Equipment and system adjust and balance.

1.2 Related Sections

- .1 Section 01210 - Allowances.
- .2 Section 01330 - Submittal Procedures.
- .3 Reserved.

1.3 Inspection

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.4 Independent Inspection Agencies

- .1 Independent Inspection/Testing Agencies will be engaged by Owner for purpose of inspecting and/or testing portions of Work.
- .2 Allocated costs: to Section 01210 - Allowances.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.

- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Consultant. Pay costs for retesting and reinspection.

1.5 Access to Work

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 Procedures

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

1.8 Reports

- .1 Submit 4 copies of inspection and test reports to Consultant.

- .2 Provide copies to Subcontractor of work being inspected or tested.
  
- 1.9 Tests and Mix Designs
  - .1 Furnish test results and mix designs as may be requested.
  - .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Consultant and may be authorized as recoverable.
  
- 1.10 Mill Tests
  - .1 Submit mill test certificates as required of specification Sections.
  
- 1.11 Equipment and Systems
  - .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
  - .2 Refer to appropriate sections for definitive requirements.

PART 2 - PRODUCTS

- 2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

- 3.1 Not Used .1 Not Used.

End of Section

PART 1 - GENERAL

- |                             |    |  |
|-----------------------------|----|--|
| <u>1.1 Section Includes</u> | .1 | Requirements and limitations for cutting and patching the Work.  |
| <u>1.2 Related Sections</u> | .1 | Section 01110 - Summary of Work.   |
|                             | .2 | Section 01330 - Submittal Procedures.  |
| <u>1.3 Submittals</u>       | .1 | Submit written request in advance of cutting or alteration which affects: <ul style="list-style-type: none"> <li>.1 Structural integrity of any element of Project.</li> <li>.2 Integrity of weather-exposed or moisture-resistant elements.</li> <li>.3 Efficiency, maintenance, or safety of any operational element.</li> <li>.4 Visual qualities of sight-exposed elements.</li> <li>.5 Work of Owner or separate contractor.</li> </ul>   |
|                             | .2 | Include in request: <ul style="list-style-type: none"> <li>.1 Identification of Project.</li> <li>.2 Location and description of affected Work.</li> <li>.3 Statement on necessity for cutting or alteration.</li> <li>.4 Description of proposed Work, and products to be used.</li> <li>.5 Alternatives to cutting and patching.</li> <li>.6 Effect on Work of Owner or separate contractor.</li> <li>.7 Written permission of affected separate contractor.</li> <li>.8 Date and time work will be executed.</li> </ul> |
| <u>1.4 Materials</u>        | .1 | Required for original installation.  |
|                             | .2 | Change in Materials: Submit request for substitution in accordance with Section 01330 - Submittal Procedures.  |
| <u>1.5 Preparation</u>      | .1 | Inspect existing conditions, including elements subject to damage or movement during cutting and patching.   |
|                             | .2 | After uncovering, inspect conditions affecting performance of Work.  |
|                             | .3 | Beginning of cutting or patching means acceptance of existing conditions.  |
|                             | .4 | Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.   |

- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.
- 1.6 Execution
- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.



PART 2 - PRODUCTS

2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used .1 Not Used.

**End of Section**

PART 1 - GENERAL

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| 1.1 Section<br><u>Includes</u>                   | .1<br>.2<br>.3<br>.4 | Title and description of Work.<br>Contract Method.<br>Work sequence.<br>Contractor use of premises.  |
| 1.2 Work Covered by<br><u>Contract Documents</u> | .1                   | <p>Work of this Contract involves a variety of items, including but not limited to:</p> <ul style="list-style-type: none"> <li>a. <ul style="list-style-type: none"> <li>▪ Replacement of existing rooftop evaporative condenser</li> <li>▪ Replacement of evaporative condenser water tank</li> <li>▪ Replacement of evaporative condenser water pump</li> <li>▪ Replacement of indoor cold brine pump</li> <li>▪ Replacement of indoor warm brine pump</li> <li>▪ Replacement of compressor jacket cooling pump</li> <li>▪ Miscellaneous repairs and upgrades</li> </ul> </li> <li>b. Various miscellaneous work as shown in the contract documents</li> </ul> <p>All work is located at Garnet A. Williams Community Centre (501 Clarke Avenue West) in Vaughan, Ontario.</p> |
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| <u>1.4 Work Sequence</u>                         | .1<br>.2             | <p>Work is to be completed in a continuous manner. The facility will remain fully operational during the works.</p> <p>Maintain fire access/control.</p>   |
| <u>1.5 Contractor Use of Premises</u>            | .1<br>.2<br>.3       | <p>Contractor shall limit use of premises for Work and storage.</p> <p>Coordinate use of premises under direction of Owner.</p> <p>Obtain and pay for use of additional storage or work areas needed for operations under this Contract.</p>   |

PART 2 - PRODUCTS

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| <u>2.1 Not Used</u> | .1 | Not used. |
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PART 3 – EXECUTION

- |                     |    |           |
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| <u>1.3 Cash Allowances</u>       | .1 | Reserved.   |
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| <u>1.1 Section Includes</u>   | .1 | Schedule, form, content.   |
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| <u>1.2 Related Sections</u> | .1 | Section 01320 - Construction Progress Documentation.  |
|                             | .2 | Section 01450 - Quality Control.  |
|                             | .3 | Reserved.   |
| <u>1.3 Administrative</u>   | .1 | Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.  |
|                             | .2 | Work affected by submittal shall not proceed until review is complete.  |
|                             | .3 | Present shop drawings, product data, samples and mock-ups in SI Metric units.   |
|                             | .4 | Where items or information is not produced in SI Metric units converted values are acceptable.  |
|                             | .5 | Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected. |
|                             | .6 | Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.   |
|                             | .7 | Verify field measurements and affected adjacent Work are coordinated.   |
|                             | .8 | Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.  |

- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
  - .10 Keep one reviewed copy of each submission on site.
- 1.4 Shop Drawings and Product Data
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
  - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
  - .3 Allow 10 days for Consultant's review of each submission.
  - .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
  - .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
  - .6 Accompany submissions with transmittal letter, in duplicate, containing:
    - .1 Date.
    - .2 Project title and number.
    - .3 Contractor's name and address.
    - .4 Identification and quantity of each shop drawing, product data and sample.
    - .5 Other pertinent data.
  - .7 Submissions shall include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Subcontractor.
      - .2 Supplier.
      - .3 Manufacturer.
    - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.



- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .8 After Consultant's review, distribute copies.
- .9 Submit 6 prints and 1 electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .10 Submit 6 prints and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .14 The review of shop drawings by Consultant is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of Work of all sub-trades.

- 1.5 Samples
- .1 Submit for review samples in duplicate/triplicate as requested in respective specification Sections. Label samples with origin and intended use.
  - .2 Deliver samples prepaid to Consultant's business address.
  - .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
  - .4 Where colour, pattern or texture is criterion, submit full range of samples.
  - .5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
  - .6 Make changes in samples which Consultant may require, consistent with Contract Documents.
  - .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

- 1.6 Progress Photographs
- .1 Contractor to maintain progress photographs in accordance with Section 01320 - Construction Progress Documentation. . A mandatory requirement for this project is for the contractor to submit **all** progress photographs on a CD at the end of the project as part of the closeout documents. Photographs to be labeled by date/construction activity. Submission of photographs (in hard copy format) will be required in the event of a discrepancy between the Consultant and Contractor

PART 2 - PRODUCTS

- 2.1 Not Used
- .1 Not Used.

PART 3 - EXECUTION

- 3.1 Not Used
- .1 Not Used.

**End of Section**

PART 1 - GENERAL

1.1 Section Includes

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mill tests.
- .4 Equipment and system adjust and balance.

1.2 Related Sections

- .1 Section 01210 - Allowances.
- .2 Section 01330 - Submittal Procedures.
- .3 Reserved.

1.3 Inspection

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.4 Independent Inspection Agencies

- .1 Independent Inspection/Testing Agencies will be engaged by Owner for purpose of inspecting and/or testing portions of Work.
- .2 Allocated costs: to Section 01210 - Allowances.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.

- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Consultant. Pay costs for retesting and reinspection.

1.5 Access to Work

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 Procedures

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

1.8 Reports

- .1 Submit 4 copies of inspection and test reports to Consultant.

- .2 Provide copies to Subcontractor of work being inspected or tested.
- 1.9 Tests and Mix Designs
  - .1 Furnish test results and mix designs as may be requested.
  - .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Consultant and may be authorized as recoverable.
- 1.10 Mill Tests
  - .1 Submit mill test certificates as required of specification Sections.
- 1.11 Equipment and Systems
  - .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
  - .2 Refer to appropriate sections for definitive requirements.

PART 2 - PRODUCTS

- 2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

- 3.1 Not Used .1 Not Used.

End of Section

PART 1 - GENERAL

- |                             |    |  |
|-----------------------------|----|--|
| <u>1.1 Section Includes</u> | .1 | Requirements and limitations for cutting and patching the Work.  |
| <u>1.2 Related Sections</u> | .1 | Section 01110 - Summary of Work.   |
|                             | .2 | Section 01330 - Submittal Procedures.  |
| <u>1.3 Submittals</u>       | .1 | Submit written request in advance of cutting or alteration which affects: <ul style="list-style-type: none"> <li>.1 Structural integrity of any element of Project.</li> <li>.2 Integrity of weather-exposed or moisture-resistant elements.</li> <li>.3 Efficiency, maintenance, or safety of any operational element.</li> <li>.4 Visual qualities of sight-exposed elements.</li> <li>.5 Work of Owner or separate contractor.</li> </ul>   |
|                             | .2 | Include in request: <ul style="list-style-type: none"> <li>.1 Identification of Project.</li> <li>.2 Location and description of affected Work.</li> <li>.3 Statement on necessity for cutting or alteration.</li> <li>.4 Description of proposed Work, and products to be used.</li> <li>.5 Alternatives to cutting and patching.</li> <li>.6 Effect on Work of Owner or separate contractor.</li> <li>.7 Written permission of affected separate contractor.</li> <li>.8 Date and time work will be executed.</li> </ul> |
| <u>1.4 Materials</u>        | .1 | Required for original installation.  |
|                             | .2 | Change in Materials: Submit request for substitution in accordance with Section 01330 - Submittal Procedures.  |
| <u>1.5 Preparation</u>      | .1 | Inspect existing conditions, including elements subject to damage or movement during cutting and patching.   |
|                             | .2 | After uncovering, inspect conditions affecting performance of Work.  |
|                             | .3 | Beginning of cutting or patching means acceptance of existing conditions.  |
|                             | .4 | Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.   |

- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.
- 1.6 Execution
- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

PART 2 - PRODUCTS

2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Not Used .1 Not Used.

**End of Section**



**PART 1 – GENERAL REQUIREMENTS**1.1 General

- 1.1.1 This section of the specification covers the supply and installation of equipment, testing, start-up, and warranty for required refrigeration equipment as outlined below. **The refrigeration component of this project is the supply and installation of the refrigeration equipment specified herein and as shown on the drawings (Drawing No. R1 up to and including Drawing No. R3) and are only minimum requirements. After shop drawing review, the refrigeration contractor will supply and install the refrigeration equipment and all associated equipment.**
- 1.1.2 The drawings accompanying this specification are an integral part of the tender and the construction documents. Contact the Owner's representative for clarification of any conflict between the specification and the drawings.
- 1.1.3 The work shall be limited to qualified refrigeration contractors; *refer to the Town's front-end documentation for reference details/submission requirements. Refrigeration contractors must be registered with TSSA. Refer to the tender call for further details.*
- 1.1.4 The contractor(s) involved in alterations to the refrigeration system shall hold a valid TSSA Certificate of Authorization for Refrigeration Contractors. Work shall be performed by experienced personnel in accordance with the Trades Qualification and Apprenticeship Act, and Ontario Regulation.
- 1.1.5 Refer to the general conditions of the tender, as prepared by the Owner, for a project schedule and details concerning the completion date.

1.2 Scope of Work Summary

- 1.2.1 This section includes all ice rink equipment work called for, or implied, by the drawings and specifications, together with all necessary incidentals, whether referred to or not, as will be required to complete the work to the full intent and meaning of the drawings and specifications.
- 1.2.2 The ice rink refrigeration system work includes, but is not limited to the following:
1. Utilizing a refrigeration Ammonia pump out trailer, remove Ammonia charge for disposal.
  2. Remove & dispose of the following refrigeration equipment;
    - a. One (1) common evaporative condenser including starter
    - b. One (1) common evaporative condenser water tank
    - c. One (1) common evaporative condenser water pump including starter
    - d. One (1) shell & tube underfloor heat exchanger
    - e. One (1) indoor cold brine pump including starter
    - f. One (1) indoor warm brine pump including starter
    - g. One (1) common compressor jacket cooling pump

## Refrigeration Upgrades

Garnet A. Williams Community Centre

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3. Supply & install the following new refrigeration equipment;
  - a. One (1) common evaporative condenser
  - b. One (1) common evaporative condenser water tank
  - c. One (1) common evaporative condenser water pump
  - d. One (1) indoor cold brine pump
  - e. One (1) indoor warm brine pump
  - f. One (1) common compressor jacket cooling pump
  - g. One (1) water treatment system
4. Provide new housekeeping pad for;
  - a. One (1) indoor cold brine pump
  - b. One (1) indoor warm brine pump
5. Replace all Ammonia and water piping on the roof. Reuse existing roof penetrations.
6. Reuse Ammonia relief header on the roof
7. Start-up & commissioning
8. Provide a minimum two (2) year warranty
9. Existing Building Automation System (BAS) programming modifications and commissioning under cash Allowance.

1.3 Design

- 1.3.1 The refrigeration contractor shall create and submit all refrigeration design drawings to the consultant, these will be reviewed as part of the shop drawing review process. Also include design drawings for all associated civil/structural/electrical/mechanical work required for the new refrigeration system/equipment.
- 1.3.2 Submit all equipment drawings and documentation to the consultant for review prior to fabrication. At a minimum, this will include:
  - Refrigeration flow diagram
  - Condenser layout drawing
  - Wiring diagram
- 1.3.3 Submit ice rink refrigeration equipment operation and maintenance manuals as detailed in General Requirements section. In addition:
  - Provide three (3) USB of operation and maintenance manuals. USB manual must include information covering the specifications, installation and maintenance of all equipment supplied by the refrigeration contractor. Manuals must be supplied upon delivery of the complete ice system to the owners including as-built drawings.
  - Manuals shall contain, as a minimum, the following;
    - System operation and maintenance instructions, troubleshooting guidelines and operating log
    - Safety bulletins and material safety data sheets
    - Equipment operation and maintenance instructions
    - Signed TSSA test data reports
- 1.3.4 Civil/Structural Work
  - a. All cutting and patching through walls, ceilings and floors to allow the passage of piping and ductwork.

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- b. Provide temporary lighting, heating, power and water. Provide all necessities for power tool operation.
- c. Additional material/labour as required by boiler inspector, hydro inspector, health inspector, building inspector, etc.
- d. Cutting, patching, sleeving, sealing and fireproofing of floor, wall and ceiling openings for all refrigeration system piping and related electrical conduits.
- e. Necessary cutting and patching of all refrigeration piping penetrations through building roof.
- f. Crane rental, etc. for equipment to be mounted on the roof

**1.3.5 Electrical Work**

- a. Obtain power from existing sources. The refrigeration contractor shall do all electrical work including control panel and control wiring for the refrigeration system components and as noted on the drawings or specifications.
- b. Provide all electrical work, new starters as required and controls for the modified refrigeration systems, and all miscellaneous items in this section supplied by the refrigeration contractor.
- c. All equipment shall be CSA approved and the complete installation shall meet the latest requirements of the Canadian Electrical Safety Code.
- d. Complete all power and control wiring and connections

**1.3.6 Mechanical Work**

- a. Supply and install all equipment and connections as required

**1.3.7 Shop Drawings:**

- a. All shop drawings to be stamped (signed and dated) by a professional engineer, licensed to practice in Ontario with five (5) years professional refrigeration experience.

1.3.8 Provide all associated components (not shown or specified) but which are necessary to complete the refrigeration system in order to produce and maintain satisfactory ice conditions.

1.3.9 Provide framed schematic flow diagrams with all valves marked and tagged for installation in the Mechanical Room.

**1.4 Referenced Codes and Standards**

1.4.1 Refrigeration Contractor to comply with all codes and standards applicable to this type of work, including:

- .1 CSA B52-99 Mechanical Refrigeration Code
- .2 CSA B51-03 Boiler, Pressure Vessels and Pressure Piping Code
- .3 TSSA Operating Engineers Act
- .4 ASME Boiler and Pressure Vessel Code, 2004 Section VIII, Pressure Vessels, Div. 1
- .5 Technical Standards and Safety Act, 2000 for Operating Engineers
- .6 TSSA Piping System Design Registration
- .7 ANSI B31.5-2001 Refrigeration Piping
- .8 CSA and Local Electrical Safety Codes
- .9 Ontario Occupational Health and Safety Act for Industrial Establishments
- .10 WCB Regulations

**Refrigeration Upgrades****Garnet A. Williams Community Centre****Section 15601 - Page 4 of 10**1.5 Quality Assurance

- A. The refrigeration contractor shall use only licensed high pressure welders, each holding a current, active certificate with TSSA.
- B. Workmanship throughout shall conform to standard of best practice; labour employed shall be competent to do the work. Piping shall run straight between fittings. Vertical piping shall be plumb and horizontal piping shall be parallel with walls whenever possible. Unnecessary offsets and elbows shall be avoided. Piping shall be solidly supported in place. Piping that crosses an open space that affords passageway shall be not less than 7'-3" above floor unless the piping is against the ceiling
- C. The refrigeration system shall be commissioned by a qualified refrigeration journeyman mechanic (no apprentices permitted).
- D. The refrigeration contractor shall be able to provide warranty service work to the equipment after installation for the warranty period specified.

1.6 Warranty

- A. The refrigeration contractor shall warrant the material and installation specified hereunder against original defects in manufacture and workmanship for a minimum period of two (2) years after acceptance by the Owner.

1.7 Manuals and As-Built Drawings

- A. Provide three (3) copies of operating and maintenance manuals for all ice rink equipment covered under this contract, including as-built drawings.
- B. Manuals shall be bound in 3 ring binders and contain, as a minimum, the following;
  - 1. System operation and maintenance instructions, troubleshooting guidelines and operating log.
  - 2. Safety bulletins and material safety data sheets.
  - 3. Equipment operation and maintenance instructions.
  - 4. Signed TSSA Test Data Reports
- C. As-built drawings shall contain, as a minimum, the following;
  - 1. All wiring and flow schematics.
  - 2. Refrigeration equipment layout and schedule.
- D. All of the closeout documents (including the above) are also to be provided in PDF.

**Refrigeration Upgrades****Garnet A. Williams Community Centre****Section 15601 - Page 5 of 10****PART 2 - SYSTEM REQUIREMENTS****2.1 REUSE THE FOLLOWING REFRIGERATION EQUIPMENT**

The following refrigeration equipment shall be reused;

1. All reciprocating compressors for the indoor and outdoor rink
2. All heat exchangers for the indoor and outdoor rink
3. All vessels for the indoor and outdoor rink
4. Outdoor rink cold glycol pump
5. Common compressor jacket cooling system piping, fittings, valves and expansion tank. Any modifications if required to suit the new pump will be the responsibility of the contractor.
6. Reuse existing indoor rink cold brine pipe, fittings, valves and insulation. Any modifications if required to suit the new pump will be the responsibility of the contractor.
7. Reuse existing indoor rink warm brine pipe, fittings, valves and insulation. Any modifications if required to suit the new pump will be the responsibility of the contractor.
8. Reuse existing condenser water pump pipe, fittings, valves and insulation. Any modifications if required to suit the new pump will be the responsibility of the contractor.
9. Refrigeration starter panel for indoor and outdoor rink
10. Refrigeration control system for indoor and outdoor rink
11. All expansion tanks for indoor and outdoor rink
12. Cold brine and glycol secondary refrigerant to be reused
13. Indoor and outdoor rink slab, headers and mains

**DESIGN CRITERIA**

Primary Refrigerant	Ammonia
Indoor Rink Cooling Secondary Refrigerant	21% Calcium Chloride
Warm Floor Secondary Refrigerant	21% Calcium Chloride
Compressor Jacket Cooling	50% Ethylene Glycol
Condensing Temperature	95.0°F
Wet Bulb Temperature	75.0°F
Power:	3/60/575 volt (Power), 1/60/120 volt (Control)

**2.2 DEMOLITION OF EXISTING REFRIGERATION EQUIPMENT**

Refrigeration contractor to complete all demolition work required to support the new refrigeration equipment.

Refrigeration equipment to be removed and disposed by the refrigeration contractor unless otherwise specified. The refrigeration equipment demolition list specified is a required but not limited to;

1. One (1) common evaporative condenser including starter
2. One (1) common evaporative condenser water tank
3. One (1) common evaporative condenser water pump including starter
4. One (1) indoor cold brine pump including starter
5. One (1) indoor warm brine pump including starter
6. One (1) common compressor jacket cooling pump

Existing refrigeration controls shall remain. Any modifications, integration or upgrades required will be under a cash allowance.

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## 2.3 NEW REFRIGERATION EQUIPMENT

**Refrigeration Built Up Equipment**

1. Common Evaporative Condenser  
One (1) Common Evaporative Condenser  
Evapco ATC-2121E  
Overall Dimensions: 7'-5 7/8" x 8'-5 1/2" x 11'-10 1/4"  
Operating Weight: 10,420 lbs  
Unit shall come with the following accessories;
  - a. 2 x additional coil circuits
    - a. Additional coil 1: Ammonia
    - b. Additional coil 2: 50% Ethylene Glycol
  - b. External service platform with ladder
  - c. 3' ladder extension
  - d. Safety cage extension
  - e. Motor davit with base
  - f. CRN coils
  
2. Indoor Shell & Tube Underfloor Heat Exchanger  
One (1) Shell & Tube Underfloor Heat Exchanger  
Docal DLHSA-6-4-1  
6" nom. Diam. X 48" NTL  
Carbon Steel Construction
  
3. Indoor Cold Floor Brine Pump  
One (1) Indoor Cold Floor Brine Pump  
S.A. Armstrong Pump Series 4030  
Flow: 950 USGPM  
Base Mounted Centrifugal Pump
  
4. Indoor Warm Floor Brine Pump  
One (1) Indoor Warm Floor Brine Pump  
S.A. Armstrong Pump Series 4030  
Flow: 120 USGPM  
Base Mounted Centrifugal Pump
  
5. Common Condenser Water Pump  
One (1) Common Condenser Water Pump  
S.A. Armstrong Pump Series 4030  
Flow: 340 USGPM  
Base Mounted Centrifugal Pump
  
6. Common Compressor Jacket Cooling Pump  
One (1) Common Compressor Jacket Cooling Pump  
S.A. Armstrong Pump Series 4030  
Flow: 120 USGPM  
Base Mounted Centrifugal Pump

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## 7. Equipment Starters

- a) Supply & install one (1) 3/60/575V starter panel complete with the following starters;

Indoor Cold Brine Pump	30 HP	FVNR
Indoor Warm Brine Pump	3 HP	FVNR
Common Condenser Water Pump	7.5 HP	FVNR
Common Compressor Jacket Pump	3 HP	FVNR
Common Condenser Fan Motor	10 HP	VFD c/w Bypass Starter

- b) All electrical components must be housed in a NEMA12 enclosure complete with convection vents
- c) Each motor must have an on/off/auto selector switch mounted on the door of the control panel.
- d) Individual pilot lights
- e) Non-fused control transformer
- f) FRS fuse-tron fuses
- g) Terminal blocks
- h) Overloads
- i) Descriptive lamacoids
- j) Suction & discharge gauge board
- k) Door mounted reset button
- l) Honeywell back up controller

2.4 **EVAPORATIVE CONDENSER PASSIVATION**

1. The initial commissioning and passivation period is a critical time for maximizing the service life of galvanized equipment. Site specific water treatment protocol includes a passivation procedure which details water chemistry, any necessary chemical addition, and visual inspections during the first six (6) to twelve (12) weeks of operation.
2. During this passivation period, recirculating water pH should be maintained above 7.0 and below 8.0 at all times. Since elevated temperatures have a harmful effect on the passivation process, the new galvanized equipment should be run without load for as much of the passivation period as is practical.
3. The following water chemistry promotes the formation of white rust and should be avoided during the passivation period:
  - a. pH values in the recirculating water greater than 8.3.
  - b. Calcium hardness (as CaCO<sub>3</sub>) less than 50 ppm in the recirculating water.
  - c. Anions of chlorides or sulfates greater than 250 ppm in the recirculating water.
  - d. Alkalinity greater than 300 ppm in the recirculating water regardless of pH value.

2.5 **REFRIGERANT PIPING AND VALVES**

1. All Ammonia refrigerant piping shall conform to the latest edition of the ASME B31.5 Refrigeration Pressure Piping Code and CSA B52 Mechanical Refrigeration Code

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2. All refrigerant piping 1" and larger shall be socket welded or butt-welded. All refrigerant piping up to and including ¾" shall be threaded or socket welded
3. All Ammonia pressure relief valves shall be sized and piped to a suitable location as defined in the CSA B52 Mechanical Refrigeration Code
4. Supply and install two (2) Ammonia isolation valves for evaporative condenser. One (1) on the Ammonia high stage discharge and one (1) on the Ammonia condenser drain line.

**2.6 GLYCOL, WATER PIPING AND VALVES**

1. Glycol and water piping shall be schedule 40 ASTM A53 grade A or B ERW pipe
2. Supply and install all necessary cold glycol piping from plate & frame heat exchanger chiller to exposed trench headers
3. Supply and install two (2) isolation butterfly valves on each pump for safe, convenient operation and maintenance. Butterfly valves shall be full lug type with trim selection compatible with fluid being handled. All butterfly valves shall have lever handle operator. Butterfly valves to be Challenger. On piping 2" and smaller full port steel ball valves shall be used
4. Replace the following glycol and water piping on the roof;
  - a. 1 x Compressor cooling glycol supply line
  - b. 1 x Compressor cooling glycol return line
  - c. 1 x Water supply line
  - d. 1 x Water return line

**2.7 REFRIGERANT**

1. Supply and install complete operating charge of Ammonia
2. Compressor jacket cooling glycol top up charge as required

**PART 3 – EXECUTION****3.1 EXISTING RERIGERATION EQUIPMENT REMOVAL**

- A. The entire charge of ammonia shall be removed and stored in cylinders for reuse. The refrigeration contractor will **ONLY BE PERMITTED TO USE A PORTABLE PUMPOUT UNIT** to safely remove the ammonia before removing the equipment. The City (or its representatives) will be closely monitoring the removal of ammonia and will require this contractor to submit a written plan before proceeding.
- B. Disconnect, remove and dispose the existing refrigeration equipment and piping from the refrigeration room.

**3.2 NEW EQUIPMENT AND PIPING INSTALLATION**

- A. Install all new equipment as recommended by the manufacturer. Provide adequate clearances around the equipment to allow access for maintenance and removal for service. Equipment to be supported and secured to the refrigeration room concrete floor. Coordinate the forming and placing of level concrete bases.



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- B. Install all piping in a neat and professional manner using acceptable trade practices. Piping shall be run straight and true between fittings. Vertical piping shall be plumb and horizontal piping shall be parallel with walls whenever possible. Unnecessary offsets and elbows shall be avoided. Ammonia piping shall be solidly supported in place to comply with TSSA regulations.
- C. Pressure test all ammonia piping to comply with TSSA regulations, prior to painting or insulating. Arrange for TSSA onsite piping inspection and to witness the ammonia piping pressure test.

## 3.3 PAINTING

- A. All shop fabricated package equipment and piping shall be painted with one coat of industrial finish enamel. Touch up any abrasions as required after equipment is installed and construction is complete.
- B. All field-fabricated steel shall be painted with a rust resistant primer.
- C. All un-insulated steel piping shall be painted with industrial machinery enamel paint with colours to match accepted trade standards.

## 3.4 PIPE &amp; VESSEL INSULATION

- 1. All pipes and pressure vessels which will have temperature loss of sweat during normal operation must be factory insulated with minimum 2" foam in place insulation.
- 2. All piping within the refrigeration room which will have temperature loss of sweat during normal operation must be insulated with preformed polyisocyanurate (PIR) ITW Trymer 2000xp insulation with tongue and groove horizontal joints & ship lap end joints. Vapour barrier to be ITW saran film 560CX. Insulated pipe & fittings must be covered with a 0.020" minimum white PVC jacket over vapour barrier. Seal joints with white perma weld glue
- 3. Armaflex insulation & DOW SM will NOT be accepted for any interior pipe insulation
- 4. Insulated pipe must be protected by galvanized sheet metal shields that precisely match the curvature of the outer jacketing surface at all clevis hangers or steel trapeze pipe supports

## 3.5 IDENTIFICATION

- A. All new ammonia, glycol and water lines installed for the ice rink refrigeration system shall be identified after painting and insulation with the fluid in the pipe and the direction of flow. All lines penetrating walls or roofs must be immediately identified on either side. Pipe markers shall be manufactured by Marking Service Inc. or approved equal.

3.6 ELECTRICAL POWER AND CONTROL WIRING

- A. Provide all power and control electrical field wiring from the refrigeration control panel to the refrigeration equipment motors, switches, controls and remote temperature sensors. All electrical wiring must conform to CSA and local codes.

3.7 REFRIGERATION SYSTEM COMMISSIONING AND TRAINING

- A. The refrigeration contractor shall be solely responsible for charging of ammonia refrigerant and compressor lubrication oil into the system. The refrigeration system shall be commissioned by a qualified refrigeration mechanic (no apprentices shall be permitted) including testing and adjusting all operating controls. The refrigeration contractor shall instruct the owners representative in the operation and control of all the equipment on the refrigeration system.
- B. Once the system is commissioned and operational, the refrigeration contractor shall provide a minimum of eight (8) hours of training onsite for the city's operations personnel.

3.8 SIGNAGE

- A. Post a permanent sign displaying the information as required in the CSA B52 Refrigeration Code

**End of Section**