



Corporation of the City of NEW WESTMINSTER

REQUEST FOR PROPOSAL

NWRFP-21-03

Replace Ice Plant System - Moody Park Arena

The City is seeking submissions from qualified Proponents for **Replace Ice Plant System - Moody Park Arena** in New Westminster.

Optional Information Meeting

Friday, February 19, 2021
10:00 am, Local Time
Moody Park Arena,
701 Eighth Avenue, New Westminster, BC

Closing Time:

Thursday, March 4, 2021
3:00 PM, Local Time, Vancouver BC

Closing Location:

upload to <https://fileshare.newwestcity.ca/filedrop/~sS3M7G>

Further requests for information :

Heather Rossi
Intermediate Buyer

Email: nwpurchasing@newwestcity.ca

CORPORATION OF THE CITY OF NEW WESTMINSTER

TABLE OF CONTENTS

PART 1	RFP PROCESS & GENERAL REQUIREMENTS	3
1.0	Definitions	3
2.0	Introduction	4
3.0	Proponent Qualifications	4
4.0	Optional Information Meeting	4
5.0	No City Obligations To Proponents	5
6.0	City Discretion	5
7.0	Proposal Instructions	5
8.0	Contract Requirements	6
9.0	General Conditions	6
10.0	Living Wage Employer	7
11.0	Evaluation Criteria and Process	8
12.0	Negotiations	8
PART 2	BUSINESS REQUIREMENTS	9
1.0	City Overview	10
2.0	Background	10
3.0	Performance Bonding	10
4.0	Documents Required of the Successful Proponent	10
5.0	Summary of Work	10
6.0	Schedule	11
PART 3	PROPOSAL FORMAT AND CONTENT REQUIREMENTS	12
1.0	Proposal Cover Page	13
2.0	Request For Proposal Documents	14
3.0	Proposal Format	14
	APPENDIX A – PROPOSAL SUBMISSION REQUIREMENTS	15
	APPENDIX B – DECLARATION, LIVING WAGE EMPLOYER	18
	APPENDIX C – COMPARABLE WORK EXPERIENCE AND REFERENCES	20
	APPENDIX D – SPECIFICATIONS	23
	APPENDIX E – DRAWINGS	89
	APPENDIX F – SUPPLEMENTARY CONDITIONS TO CCDC 2 2008	97
	APPENDIX G - SCHEDULE A - PRIME CONTRACTOR DESIGNATION SCHEDULE	101
	APPENDIX H – HAZARDOUS BUILDING MATERIALS REPORT	105

CORPORATION OF THE CITY OF NEW WESTMINSTER**PART 1****RFP PROCESS & GENERAL REQUIREMENTS****1.0 DEFINITIONS**

- 1.1 “Business Requirements”** means the detailed specifications, requirements and Services set out in Part 2 of this RFP.
- 1.2 “City”, “Owner”** means the Corporation of the City of New Westminster.
- 1.3 “Contract”** means a written contract for the Services that may entered into by the City and a Proponent.
- 1.4 “Proponent”** means a person who submits a Proposal to the City in response to this Request for Proposal.
- 1.5 “Proposal”** means a proposal submitted to the City in response to this RFP.
- 1.6 “Provide” “Supply”** shall mean provide and pay for, and supply and pay for.
- 1.7 “Request for Proposal” “RFP”** means this Request for Proposal, including all Schedules to this Request for Proposal, and any changes the City may from time to time make to this Request for Proposal.
- 1.8 “Services”** means the provision by the successful Proponent of all services, duties, and expectations as described in this RFP, including in the Business Requirements.

CORPORATION OF THE CITY OF NEW WESTMINSTER

2.0 INTRODUCTION

- 2.1** The City is seeking a qualified and experienced contractor to complete Phase 2 and Phase 3 of the upgrade of an existing refrigeration plant system at Moody Park Arena.
- 2.2** Phase 1 of this project was completed in 2020. This Request for Proposal is for Phase 2 and Phase 3 of the project. Phases two and three, to be completed in 2021 include:
- a) Replace Motor Control Centre
 - b) Replace existing Condenser with a Plate and Frame Condenser with a Glycol Fluid Cooler
 - c) Ammonia Water Dilution Tank
 - d) Replace Under Slab Heating Heat Exchanger
 - e) Replace Snow Pit Heat Exchanger
 - f) Replace two compressors

Part 1 of this RFP describes the RFP process and sets out general requirements and expectations.

Part 2 of this RFP sets out the Business Requirements, and contains more detailed requirements regarding the services and products sought by the City under this RFP.

Part 3 of this RFP sets out Proposal format and content requirements, which all Proponents are expected to adhere to in preparing their Proposal

3.0 PROPONENT QUALIFICATIONS

- 3.1** Proponents should have at least five (5) years' experience in successfully completing similar projects within British Columbia. Refer to Section 4 of specifications.
- 3.2** Proponents should have a location in British Columbia, and have experience working with Technical Safety BC.
- 3.3** Proponents should provide at least three examples (in Appendix C) of comparable work experience with the details of similar sized Refrigeration Plant upgrades, preferably in Municipal arenas, completed in the last five years.
- 3.4** All tradespeople working on this project shall be qualified under provincial regulations and experienced in ammonia plant installation.

4.0 OPTIONAL INFORMATION MEETING

- 4.1** The City has arranged an Optional Information Meeting and Site Viewing for all Proponents on **Friday, February 19, 2021** starting at **10:00 am** at Moody Park Arena, 701 Eighth Avenue, New Westminster, BC. Meet at the arena reception area.
- 4.2** While attendance is at the discretion of the Proponents, Proponents who do not attend will be deemed to have attended the Information Meeting and to have received all of the information given at the Information Meeting. The City will not keep nor distribute minutes of the meeting.
- 4.3** The purpose of this Information Meeting is to provide Proponents with an opportunity to view the site, current equipment, and present questions relative to the specifications, requirements, and RFP process.

CORPORATION OF THE CITY OF NEW WESTMINSTER

4.4 It is possible that some questions raised and information provided during the Information Meeting may be the only source of critical information essential to prepare and submit a successful Proposal. Proponents are responsible to ensure they are fully informed and have a clear understanding of the requirements.

4.5 Proponents are encouraged to delegate a senior official to represent the Proponent at the Information Meeting.

5.0 NO CITY OBLIGATIONS TO PROPONENTS

5.1 This RFP is a request for proposals, and not a call for tenders or request for offers and no contractual obligations shall arise between the City and a Proponent upon the Proponent's submission of a Proposal to the City. For clarity, the City shall have no obligations whatsoever to any Proponent until and unless the City and a Proponent enter into a formal, written contract for the Proponent to provide the Services.

6.0 CITY DISCRETION

6.1 For clarity, and without in any way limiting the City's rights, prospective proponents should be aware that the City may, at its discretion:

- a) cancel this RFP at any time;
- b) select a Proposal that deviates from the requirements of this RFP;
- c) select a Proposal that is not the lowest cost Proposal;
- d) select a Proposal with a view to engaging the Proponent to provide only some of the Services;
- e) modify this RFP at any time;
- f) reject a Proposal for any reason, including where in the City's estimation the personnel and/or resources of the Proponent are deemed insufficient or if the City determines that a Proposal is incomplete or does not comply with a requirement under this RFP;
- g) not select any Proposals;
- h) split the provision of the Services requirements between two or more Proponents;
- i) shortlist one or more Proponents to formally present their Proposal to the City's Evaluation Committee;
- j) negotiate with one or more Proponents, including with respect to the form of Contract ; and
- k) consider and select a late Proposal.

7.0 PROPOSAL INSTRUCTIONS

7.1 Proposals should be submitted electronically in one (1) Adobe (PDF) file with "NWRFP-21-03 Submission" in the Subject <https://fileshare.newwestcity.ca/filedrop/~sS3M7G>

7.2 The City will receive Proposals at the location and time indicated on the title page of this Request for Proposal.

7.3 It is the Proponent's responsibility to ensure that the City receives its Proposal prior to the closing time indicated on the title page of this Request for Proposal. The City does not accept facsimile or other unsealed Proposals.

7.4 Requests for clarification or further information should be made in writing only to the individual from the City identified on the first page of this RFP. The City may respond to enquiries that it, in its sole discretion, considers relevant to this RFP. The City intends to respond only to those relevant written enquiries received at least ninety-six (96) hours prior to the closing time indicated on the title page of this RFP. The City may record enquiries and post written responses

CORPORATION OF THE CITY OF NEW WESTMINSTER

on its website at <https://www.newwestcity.ca/business-and-economy/doing-business-with-the-city/request-for-bids-and-proposals-open>

8.0 CONTRACT REQUIREMENTS

- 8.1** Any contract arising from this Request for Proposal will use the CCDC 2 2008 Stipulated Price Contract and the City's Supplementary General Conditions.

9.0 GENERAL CONDITIONS

9.1 OWNERSHIP OF PROPOSALS AND FREEDOM OF INFORMATION

All documents submitted to the City in response to this RFP or as part of any subsequent negotiation will become the property of the City, and will not be returned.

9.2 PROPOSAL CONFIDENTIALITY & FREEDOM OF INFORMATION

Proponents should be aware that the City is subject to the provisions of the *Freedom of Information and Protection of Privacy Act* (FOIPPA) ("Act"). A Proponent may stipulate in their Proposal that a portion(s) of their Proposal that contains confidential information and is supplied to the City in confidence. However, under FOIPPA, the City may nevertheless be obligated to disclose all or part of a Proposal in response to a request made under the Act, even if the Proponent has stipulated that part of their Proposal is supplied in confidence. The Proponent should review Section 21 and other provisions of FOIPPA in order to gain a better understanding of the City's disclosure responsibilities under the Act.

9.3 CONFIDENTIALITY OF CITY INFORMATION

All information provided by the City to a Proponent in connection with this RFP is provided on a confidential basis, and Proponents will not disclose any such information to any person (other than the Proponent's legal advisers or consultants) without the City's prior written consent, nor may any Proponent publicize or advertise its involvement with this RFP process without the prior written consent of the City.

9.4 PROPONENT'S EXPENSES

For clarity, Proponents will be solely responsible for their own expenses incurred in connection with this RFP, including in preparing and submitting a Proposal and in any subsequent negotiations with the City.

9.5 CONTACTING CITY REPRESENTATIVES

Proponents shall not contact City elected officials, officers or employees directly or indirectly regarding this RFP, except as indicated in this RFP.

9.6 CONFLICT OF INTEREST

Proponents shall disclose any potential conflicts of interest and existing business relationships they may have with the City, its elected or appointed officials or employees. The City may reject a Proposal if the City considers that selection of the Proponent to enter into a Contract would give rise to a conflict of interest. The Contract may include a clause providing that a failure to disclose, or false or insufficient disclosure of the nature and extent of any relationship the Proponent may have with the City or any of its elected or appointed officials or employees shall be grounds for immediate termination of the Contract, in the City's sole discretion, without compensation from the City.

CORPORATION OF THE CITY OF NEW WESTMINSTER

9.7 **INSURANCE**

The successful Proponent will, without limiting its obligations or liabilities and at its own expense, provide and maintain throughout the Contract term, Insurance as required under the CCDC-2 2008 Contract General Conditions, the CCDC-41, and the Supplementary General Conditions of this Request for Proposal.

9.8 **PERMITS AND LICENSES**

The successful Proponent may be required to obtain a City of New Westminster or MetroWest Inter-Municipal Business license prior to commencement of work.

9.9 **GOVERNING LAW / JURISDICTION**

This RFP shall be governed by and construed in accordance with the laws of the Province of British Columbia which shall be deemed to be the proper law hereof and in so doing the Courts of British Columbia shall have exclusive jurisdiction to determine all disputes and claims arising out of or in any way connected to this RFP.

9.10 **COVID-19 GLOBAL PANDEMIC**

Due to the COVID 19 global pandemic, the City may be required or decide not to proceed with the Work or to terminate any contract prior to the Work commencing. If this occurs, the City will only pay for actual costs incurred by the contractor.

In submitting a Proposal, the Proponent acknowledges the presence of the COVID-19 virus in Canada and other jurisdictions. The Proponent also acknowledges the consequences and impacts “Known Impacts” of the COVID-19 Pandemic existing as of the date of this Request for Proposal, and said “Known Impacts” have been accounted for by the Proponent within the schedule and pricing.

10.0 **LIVING WAGE EMPLOYER**

10.1 Effective January 1, 2011, the City of New Westminster became a “Living Wage Employer”. As such, the City has established a [Living Wage Policy](#) that requires all firms that are contracted by the City to provide services on City premises, to pay their employees, who perform said service on City property, a Living Wage as calculated by the Living Wage for Families Campaign. The current living wage rate for Metro Vancouver is \$19.50 per hour, assuming the employer provides no benefits.

10.2 In order to determine an employee’s hourly rate with benefits the Living Wage for Families has created a Living Wage Calculator to assist with this determination. Please access the following website to determine your compatibility
http://www.livingwageforfamilies.ca/living_wage_calculator

10.3 The City includes in all its competitive bid documents a Declaration referencing the City’s expectations with regards to compliance of the Policy (attached as Appendix B). **Completion and submission of the Declaration is required prior to Contract award.**

10.4 In evaluating submissions, the City intends to rely on the Declaration provided by a Respondent and shall have no obligation or duty to investigate the truthfulness of the Declaration. Please review the City’s [Living Wage Page](#) for further information.

CORPORATION OF THE CITY OF NEW WESTMINSTER

11.0 **EVALUATION CRITERIA AND PROCESS**

11.1 The City intends to evaluate Proposals in order to identify a Proposal that, in the City's opinion offers the best value to the City.

11.2 The City intends to evaluate Proposals based on the following criteria and weighting:

Evaluation Criteria	Weighting
Ability to start Work April 6, 2020	35
Previous experience (As per section 4.6 of specifications)	25
Company has lower mainland of BC presence	20
References from similar projects	Pass/Fail
Pricing / Fees / Rates	20
Total	100

11.3 In evaluating a Proposal, the City may review and investigate the Proponent's ability to comply with Living Wage Employer requirements of this RFP and the City may choose not to select a Proponent if the City is not satisfied, in its sole discretion, that the Proponent can meet these requirements.

11.4 In evaluating a Proposal, the City may contact references and may choose not to select a Proponent where the references are not satisfactory to the City in its sole discretion. The City reserves the right to seek a reference from sources other than those provided by the Proponent.

11.5 In evaluating a Proposal, the City may request financial information regarding a Proponent and may choose not to select a Proponent where the City is not satisfied, in its sole discretion, that the Proponent is in a financial position to perform the Services.

11.6 There shall be no obligation on the part of the City to receive further information, whether written or oral, from any Proponent or to disclose the nature of any Proposal received.

11.7 The City may invite one or more Proponents for an interview or to provide clarifications of their Proposal(s) and the City may consider the results of such Proponent interview(s) or clarifications in evaluating Proposals.

11.8 In evaluating a Proposal, the City may consider qualifications and experience of the Proponent and past performance of the Proponent in providing similar services.

12.0 **NEGOTIATIONS**

12.1 The award of a contract may be subject to negotiations with the lead Proponent that is deemed to provide the best value to the City. Such negotiations include, but not limited to, the following:

- a) Changes to the requirements or Scope of Work proposed by the Proponent
- b) Price; and
- c) Specific contract details as deemed reasonable for negotiations by the City

12.2 If a written contract cannot be negotiated within fourteen (14) days of notification with the lead Proponent, the City may, at its discretion at any time thereafter, terminate negotiations with the lead Proponent and either enter into negotiations with the next qualified Proponent or cancel the RFP or negotiate with another supplier.



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

PART 2

BUSINESS REQUIREMENTS

1.0 CORPORATION OF THE CITY OF NEW WESTMINSTER OVERVIEW

- 1.1** The City of New Westminster is the first city in Western Canada and is located at the centre of Metro Vancouver. Just 20 km from downtown Vancouver, the City has both major transportation routes and railways running through its boundaries.
- 1.2** The City, apart from the standard service and facility offerings of a typical municipality, also operates its own Electrical Utility and police force.

2.0 BACKGROUND

- 2.1** The purpose of this project is the replacement of some key refrigeration components that have reached end of life. New components, including plate and frame condenser, glycol fluid cooler, and compressors have been chosen to reduce the size of the ammonia charge and reduce energy consumption. The City intends the upgrade to meet or exceed Technical Safety BC requirements.

3.0 PERFORMANCE BONDING

- 3.1** The Successful Proponent may be required to provide to the City of New Westminster, in a form acceptable to the City, Performance Security in an amount equal to fifty percent (50%) of the Contract Price, and in one of the following types:
- a) An Irrevocable Letter of Credit; or
 - b) A Performance Bond.
- 3.2** The Successful Proponent may be required to provide to the City of New Westminster, in a form acceptable to the City, Labour and Material Payment Security in an amount equal to fifty percent (50%) of the Contract Price, and in one of the following types:
- a) An Irrevocable Letter of Credit; or
 - b) A Labour and Material Payment Bond, the Bond **must be a Broad Form** bond protecting all companies with a direct contract with the Principal or any Sub-Contractor of the Principal.

4.0 DOCUMENTS REQUIRED OF THE SUCCESSFUL PROPONENT

- 4.1** Within fifteen (15) days of receipt of the Owner's Notice of Award the successful Proponent shall provide some or all of the following documents and/or requirements to the City:
- a) Certificate of Good Standing from WorkSafe BC;
 - b) Proof of Insurance as required under the CCDC Contract General Conditions, the CCDC -41, and the Supplementary General Conditions of this RFP;
 - c) Names of all Subcontractors and description of the work to be performed by them, or confirmation that no Subcontractor will be involved in this project;
 - d) Proof of a valid City of New Westminster or MetroWest Inter-Municipal Business License;
 - e) Performance Security and Labour and Material Payment Security as called for in Part 2 Section 3.0 of this RFP.

5.0 SUMMARY OF WORK

- 5.1** Refer to Appendix D for detailed specifications and requirements for the Work.
- 5.2** Refer to Appendix E for detailed drawings for the Work.

6.0 **SCHEDULE**

- 6.1** The anticipated timeline for the RFP is currently as follows; however the City reserves the right to modify the actual timing and sequence of events:

Activity	Anticipated Timing
RFP Closes	March 4, 2021
Proponent Selected	March 12, 2021
Work to start	April 6, 2021
Work to be completed	June 12, 2021

NWRFP-21-03

PART 3

PROPOSAL FORMAT AND CONTENT REQUIREMENTS

1.0 PROPOSAL COVER PAGE

Proposals are to include the following Cover Page, completed by the Proponent:

NWRFP-21-03**Replace Ice Plant System - Moody Park Arena****Closing Time:**

Thursday, March 4, 2021
3:00 PM, Local Time, Vancouver BC

Closing Location:

upload to <https://fileshare.newwestcity.ca/filedrop/~sS3M7G>

PROPONENT NAME		
Street Address:		
City Province Postal Code		
Contact Name:		
Telephone number:		Fax:
Email		Date:
Signature: by authorized signatory		

By my signature above, it shall be understood that I have read, understood and accept the requirements outlined in the Request for Proposal, we hereby propose to supply the Services in accordance with the Request for Proposal and as outlined in this Form of Proposal.

2.0 REQUEST FOR PROPOSAL DOCUMENTS

2.1 The RFP Documents include the following documents attached to this Form of Proposal

<u>Appendix Title</u>	<u>Appendix Number</u>
RFP Submission Requirements	Appendix A
Declaration – Living Wage Employer	Appendix B
Comparable Work Experience and References	Appendix C
Specifications	Appendix D
Drawings	Appendix E
Supplementary Conditions to CCDC 2	Appendix F
Schedule A – Prime Contractor Designation	Appendix G
Hazardous Building Materials Report	Appendix H

3.0 PROPOSAL FORMAT

3.1 All Proposals should include the following information and in the same sequence of topics and numbered accordingly.

3.2 Sequence of topics:

- 1) Proponent Information - signed
- 2) Appendix A – RFP Submission Requirements – provide all requested information
- 3) Appendix B – Declaration – Living Wage Employer - signed
- 4) Appendix C – Comparable Work Experience and References

NWRFP-21-03

APPENDIX A

PROPOSAL SUBMISSION REQUIREMENTS

Proposal Submission Requirements

- Proponents should provide the information required under each heading clearly and concisely.
- Note any page number restrictions for each question, where applicable.
- Any attachments required to supplement your response should be clearly cross-referenced and included in your Proposal package.
- Do not respond to any questions in this RFP by referencing another question or information that has been submitted to the City outside of this RFP.

1.0	Company Profile
1.1	Please provide name, address, telephone and web site of your firm, include address of lower mainland BC location.
1.2	A brief overview of your firm, including size, years in service, and other relevant information.

2.0	Capability and Experience
2.1	Provide a one (1) page biography of your key employees who will be working on the project.
2.2	Provide information that demonstrates the company and staff have the qualifications, experience, and requirements provided in Section 4 of the Specifications.
2.3	Provide comparable work experience in Appendix C page 1
2.4	Provide three references in Appendix C page 2

3.0	Pricing
3.1	Price: Supply, install, and commission the Moody Park Arena Refrigeration plant upgrades (price to provide all work per Specifications, Drawings, and other RFP documents) The Proponent, having carefully examined the RFP Documents (instructions, general conditions, specifications, drawings, and subsequent written addenda), and having become familiar with all conditions that affect the execution of the work, hereby offers to the City to execute the Work for the above named project in accordance with the RFP Documents for the amount of _____dollars (\$_____), (including PST) the contract price, which price shall be subject to adjustments as may be provided in the RFP Documents. The contract price excludes the Goods and Services Tax (GST). The above price is based on the following: • The RFP documents including all addenda; • Includes all labour, supervision, tools, equipment, materials, freight, and anything specified in the Specifications and Drawings and RFP Documents; • Includes travel and accommodation; • If overtime or premium costs are required to meet the completion date, it is included in the prices.

3.2	If the existing U/S ammonia/brine heater and heating system is to be re-used. Price Reduction is \$ _____ (_____) Canadian Dollars, PST Included, GST not Included.												
3.3	Separate Additional Price: Provide a simulation test of the water ammonia diffusion treatment system (price to provide all work per Specifications Section 2.2.9., and other specifications & bid document) Separate Additional Price is \$ _____ (_____) Canadian Dollars, PST Included, GST not Included.												
3.4	Any additional labour that is approved by the Engineer shall be provided by the refrigeration contractor at the following hourly rates: <table border="0"> <tr> <td>Refrigeration Journeyman</td> <td>\$ _____</td> <td>Refrigeration Apprentice</td> <td>\$ _____</td> </tr> <tr> <td>Certified Electrician</td> <td>\$ _____</td> <td>Fitter</td> <td>\$ _____</td> </tr> <tr> <td>Certified Welders</td> <td>\$ _____</td> <td>Helpers</td> <td>\$ _____</td> </tr> </table>	Refrigeration Journeyman	\$ _____	Refrigeration Apprentice	\$ _____	Certified Electrician	\$ _____	Fitter	\$ _____	Certified Welders	\$ _____	Helpers	\$ _____
Refrigeration Journeyman	\$ _____	Refrigeration Apprentice	\$ _____										
Certified Electrician	\$ _____	Fitter	\$ _____										
Certified Welders	\$ _____	Helpers	\$ _____										
3.5	Cash Allowance The following Cash Allowance is to be <u>included</u> in the Contract Price amount shown in 3.1 above. The Owner has arranged for the purchase of one (1) BAC unit, model FXV-0812B-20D-J having the capacity to cool 334.60 usgpm of water with 35% ethylene glycol from 85.03F to 75.03F with an entering air wet bulb of 66.2F.												

4.0	Schedule
4.1	Please provide the anticipated start date:
4.2	Please confirm that your schedule includes completion by June 12, 2021 Yes ☐ No ☐



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX B

DECLARATION – LIVING WAGE EMPLOYER



DECLARATION – LIVING WAGE EMPLOYER

I, _____ as a duly authorized signing officer of

Company: _____

Address: _____

_____, confirm that all employees and sub-contractors under our contract with the City as outlined below, are paid not less than the “Living Wage” as calculated by the Living Wage for Families Campaign.

I understand that this requirement extends only to those employees and sub-contractors’ employees that perform work while on City premises and property for durations in excess of one continuous hour per occasion.

I understand that the City will conduct audits if and when notification of breach of this compliance is received by the City. I understand that in the event any breach of this declaration is found to be true, the City reserves the right to cancel its contract without penalty at any time once said authentication of the breach is made.

Contract Name: _____

Authorized Signatory:

Dated:



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX C

COMPARABLE WORK EXPERIENCE AND REFERENCES

COMPARABLE WORK EXPERIENCE

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

(add additional pages if necessary)

REFERENCES

Please provide three (3) references for companies in British Columbia for whom your organization has completed work of a similar magnitude and nature in the past five (5) years. The City of New Westminster may be used as a reference, if work of a similar nature has been provided to the City.

Reference 1	
Company Name and Address	
Contact Name	
Telephone Number	
Email address	
Brief Description of services provided	

Reference 2	
Company Name and Address	
Contact Name	
Telephone Number	
Email address	
Brief Description of services provided	

Reference 3	
Company Name and Address	
Contact Name	
Telephone Number	
Email address	
Brief Description of services provided	

- 1.1** The City reserves the right to contact the references to confirm the nature and performance of the work provided by the Proponent. The City may not enter into any contract with any Proponent whose reference, in the City's sole opinion, are found to be unsatisfactory.
- 1.2** Description of services provided can be expanded but limited to one (1) page per Reference.



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX D

SPECIFICATIONS

CITY OF NEW WESTMINSTER

MOODY PARK ICE ARENA
REFRIGERATION PLANT 2021 UPGRADES

CONDENSER REPLACEMENT
COMPRESSORS REPLACEMENT
MCC REPLACEMENT
&
REFRIGERATION SAFETY IMPROVEMENT

SPECIFICATIONS

701 8th Ave
New Westminster, BC
V3M 2R2

Prepared By: JS Refrigeration Engineering Inc.



Tel: 604 437-3333, Cell: 778 317-9633
www.jsre.ca

TABLE OF CONTENTS

<i>Section 1:</i>	Introduction and General Description	3
<i>Section 2:</i>	Work Scope	5
<i>Section 3:</i>	Schedule	21
<i>Section 4:</i>	Quality Assurance & Workmanship	22
<i>Section 5:</i>	Major Equipment and Material	24
<i>Section 6:</i>	Execution	38
<i>Section 7:</i>	Submittals	46
<i>Section 8:</i>	Appendixes	48
	1. Test Report of the Existing U/S Warm Brine Solution	
	2. Test Report of the Existing Snow Melt Heating Glycol Solution	
	3. Pre-Ordered Equipment	
	<i>BAC FXV-0812B-20D-J Fluid Cooler</i>	

SECTION 1: INTRODUCTION AND GENERAL DESCRIPTION

Moody Park Arena is located at 701 8th Ave, in New Westminster, B.C..

A refrigeration system was designed and installed to make and maintain ice for a NHL size ice rink (85'x200').

There was a major system upgrade completed in 2020 with the aged shell & tube ammonia/brine chiller replaced by a plate & frame one.

The Moody Park Arena refrigeration plant 2021 upgrade project includes but is not necessarily limited to the following:

1. To replace the existing BAC evaporative condenser with a plate & plate condenser and a glycol fluid cooler;
2. To replace the two aged Mycom N8A compressors with Mycom high efficiency compressors – one N2MII and one N4MII;
3. To replace the existing remotely installed condenser water pump;
4. To install a new glycol circulating pump;
5. To install an ammonia water diffusion tank and upgrade the ammonia safety relief system;
6. Necessary ammonia piping, brine piping, and water piping upgrade;
7. Necessary new glycol piping installation;
8. MCC replacement and upgrade;
9. The related electrical and control upgrades;

A new glycol fluid cooler has been pre-ordered by the Owner (the City of New Westminster). A letter of intent has been issued to G.R. Hudson Sales as confirmation of the City of New Westminster's intent to proceed with the Supply and Delivery of One (1) BAC glycol fluid cooler - Model FXV-0812B-20D-J. Please refer to the Section 8: Appendixes of this Specifications for the unit feature details.

Bidders shall contact G.R. Hudson Sales for the unit selection details and price (G.R. Hudson Sales Quotation #390). The successful Refrigeration Contractor shall be responsible for issuing a Purchase Order to G.R. Hudson Sales and paying for the pre-ordered fluid cooler after the contract awarded. The successful Refrigeration Contractor shall accept G.R. Hudson Sales standard terms of

payment upon approval of credit. The successful Refrigeration Contractor shall submit the certificate of G.R. Hudson Sales' approval of credit before the contract awarded.

The cost of the pre-ordered fluid cooler shall be included in the project base price.

This project is designed by JS Refrigeration Engineering Inc.. This specification documentation covers the conditions, work scope, material & equipment specifications, and the installation requirements of the project.

Reference to the Engineer in these Specifications refers to the JS Refrigeration Engineering Inc..

Reference to the Owner refers to the City of New Westminster.

Reference to the Contractor refers to the Refrigeration Contractor.

The Contractor shall perform the work at Moody Park Arena according to General Work Scope, Work Scope Item List and Conditions set in these specifications and drawings.

These design specifications are the property of JS Refrigeration Engineering Inc. and cannot be used or reproduced without the consent of JS Refrigeration Engineering Inc..

SECTION 2: WORK SCOPE

2.1 General Work Scope and Requirement

The work includes but is not necessarily limited to the following:

2.1.1. Supply and install all equipment, material, labor, tools, commissioning, and one-year warranty for the project as per the specifications. All installations shall comply with codes, standards, and regulations listed herein. All installations shall be inspected and approved by Technical Safety BC (TSBC), WorkSafeBC (WCB), and City of New Westminster.

2.1.2. All freight and local cartage costs of the equipment and material for the project to be included in the contract.

2.1.3 All travel and accommodation costs for the project to be included in the contract.

2.1.4. If overtime work is required to meet the completion date, it is to be included in the contract.

2.1.5. Off-loading and rigging costs of all equipment and material for the project to be included in the contract.

2.1.6. Provide shop drawings and as built drawings as detailed in the Section 7 **Submittals**.

2.1.7. Provide system installation and operation manuals as detailed in the Section 7 **Submittals**.

2.1.8. Provide refrigeration system decommissioning and related equipment & refrigerant disposal service as detailed in the Work Scope Item List.

2.1.9. Confirm available site space and access on for the new equipment installation.

2.1.10. Provide new equipment & piping layout plan.

The refrigeration contractor shall confirm the installation space and finalize the installation layout for the new equipment and new piping.

2.1.11. The refrigeration contractor shall confirm the compressor room door size for the required access to remove the existing equipment out of the compressor room and bring the new equipment into the compressor room.

Any cost to remove & reinstall the door frame or make repair wall access shall be included in the project base price if it is required.

2.1.12. Supply and install one Mycom N4MII compressor package and one Mycom N2MII compressor package to replace the two existing Mycom N8A compressor packages as detailed in the Scope of Work Item List.

2.1.13. Supply and install a glycol cooling system for the compressor oil, head cover, & jacket cooling to replace the existing city water cooling system as detailed in the Scope of Work Item List.

2.1.14. Supply and install a plate & frame condenser and a main glycol circulating pump as detailed in the Work Scope Item List.

2.1.15. Supply and install a new glycol/brine U/S heater and system as detailed in the Work Scope Item List.

The bidders shall submit a base price reduction if the existing ammonia / brine U/S heater and system is to be reused.

2.1.16. Retain and reconnect the existing snow melt glycol circulating pump to the new glycol distribution header as detailed on the system P & I drawing. The existing pump and system control shall be retained as well.

2.1.17. Supply and install a glycol fluid cooler and water pump for the remote sump operation upgrade as detailed in the Scope of Work Item List.

2.1.18. Supply and install a new horizontal high pressure ammonia storage receiver as detailed in the Scope of Work Item List.

2.1.19. Install a Owner supplied water ammonia diffusion tank and treatment system as detailed in the Scope of Work Item List.

2.1.20. Provide a simulation test of the water ammonia diffusion treatment system as detailed in the Scope of Work Item List.

The bidders shall submit a separate additional price for providing a simulation test of the water ammonia diffusion treatment system.

2.1.21. Supply and install the replacement of the main power supply field wiring system from the facility main power panel to the new refrigeration MCC as detailed in the Work Scope Item List.

2.1.22. Supply and install a new refrigeration system MCC, related electrical & control upgrade as detailed in the Work Scope Item List.

2.1.23. Supply and install possible plant safety upgrade as detailed in the Scope of Work Item List.

2.1.24. Supply and install preparation for the future DDC system installation as

detailed in the Scope of Work Item List.

2.1.25. Provide system commissioning and startup service as detailed in the Scope of Work Item List.

2.1.26. The treatment of the existing warm brine solution and glycol solution is included in the project work scope.

2.1.27. Supply and install necessary electrical and control system upgrades per the requirements of the new installed equipment.

2.1.28. Supply and install necessary field wiring and conduits for the new equipment power supply and controls.

2.1.29. Supply and install necessary ammonia piping, glycol piping, brine piping, and water piping as detailed in the P & I drawing and specifications.

2.1.30. Supply and install supports and hangers for the new installed pipes and conduits.

2.1.31. Supply and install secondary supports, anchors, anchor bolts, concrete house keeping pad, and seismic restraints for the new installed equipment.

2.1.32. Provide cutting, coring and patching service for any duct, pipe or conduit penetrations walls, floor, and ceiling.

2.1.33. Supply and install sleeves, cans, flashing, caulking and sealing for all duct, pipe and conduit penetrations.

2.1.34. Coordination of work with other trades, TSBC, WorkSafeBC, Refrigeration Consultant, and the City of New Westminster shall be included in the scope of work.

2.1.35. The Contractor is responsible for obtaining and paying the fees for refrigeration installation permit, electrical installation permit, and other necessary permits.

2.1.36. The Contractor is responsible for calling TSBC safety officer, WorkSafeBC occupational hygiene officer, and the City inspector and paying all the fees for the inspections.

2.1.37. Provide pipe welding information and weld map to TSBC and provide X-ray tests for piping welds per any request from TSBC.

2.1.38. Provide pressure test for the new installed pipes and system. Cooperate and coordinate with the safety officer from TSBC for testing witness and documentation sign off.

2.1.39. Supply and install a coat of priming and a coat of finish painting for steel pipes, steel supports, and any unfinished steel surfaces.

2.1.40. Supply and install valve tags, pipe labels, and new equipment identification labels.

2.1.41. Provide system As Built information and transfer information to a hard copy of the P & I drawing, which is to be posted on site during the construction period.

2.1.42. The Contractor is responsible for calling the Engineer for regular inspections and final inspection.

2.1.43. Provide any required piping registration and pay the fees for any pressure piping larger than 3" NPS according to TSBC regulation.

2.1.44. Provide any required TSBC system design registration and pay the fees.

2.1.45. Any required structural, seismic and other professional design, review, and reports for the refrigeration equipment and piping support are included in the scope of work. Issuing structural and seismic schedule B and C-B is the responsibility of the Refrigeration Contractor.

2.1.46. Provide a three-day site instruction and training period to the site operators.

2.1.47. Provide one year onsite labor and material warranty of the upgraded system. Warranty starts from the project substantial completion day.

2.1.48. Clean up job site on completion of the work including removal of the construction debris.

2.1.49. Check job site and dimensions during a site visit and confirm existing equipment, electrical panels, motors, starters, controls, field wiring of the refrigeration system, equipment access, and the available installation space for the new equipment before bidding.

2.1.50. Voltage

1. Power for three phase motors: 575V / 60HZ / 3PH

2. Control power: 120V / 60HZ / 1PH

2.1.51. Bonds

See City of New Westminster's requirements

2.2 Scope of Work Item List

The work includes but is not necessarily limited to the following:

2.2.1. Refrigeration System Decommissioning and Related Equipment & Refrigerant Disposal Service

1. Pump out ammonia refrigerant from the existing brine chiller and evaporative

condenser into a certified portable HPR receiver. This portable tank shall be provided by the Refrigeration Contractor.

2. Dispose the existing ammonia in a safe manner as per applicable regulations and codes by a professional ammonia disposing company. No refrigerant shall be discharged into the environment.
3. Withdraw brine from the existing U/S shell and tube ammonia/brine heater to an approved portable brine tank. This portable tank shall be provided by the Refrigeration Contractor. Brine with the portable tank shall be stored at a safe place (approved machinery room) and in a safe manner as per applicable regulations and codes.
4. Withdraw ethylene glycol from the existing snow melt shell and tube ammonia/glycol heater to an approved portable glycol tank. This portable tank shall be provided by the Refrigeration Contractor. Glycol with the portable tank shall be stored at a safe place (approved machinery room) and in a safe manner as per applicable regulations and codes.
5. Remove, demolish, and dispose the two existing Mycom N8A compressor with 60HP motor packages.
6. Remove, demolish, and dispose the existing U/S shell and tube brine/ammonia heater.
7. Remove, demolish, and dispose the existing snow melt ammonia/glycol heater.
8. Remove, demolish, and dispose the existing BAC VC1-125 evaporative condenser and the water pump.
9. Disconnect, remove, and hand over to the Owner one existing ABB VFD of the BAC condenser fan motor starter.
10. Remove, demolish, and dispose the existing MCP (motor control panel) and the related field wiring.

2.2.2. Supply and Install One Mycom N4MII Compressor Packages (C-1) and One Mycom N2MII Compressor Packages (C-2) to Replace the Existing Two Mycom N8A Compressor packages

1. Supply and install a new concrete housekeeping pad for each new compressor package (a total of 2) if the existing concrete housekeeping pads are not applicable for the new compressor installations.
2. Supply and assemble one new Mycom N4MII reciprocating compressor package with a new 75 HP motor on a structural steel base.
3. Supply and assemble one new Mycom N2MII reciprocating compressor package with a new 50 HP motor on a structural steel base.
4. Mount the new compressor packages on the two separate concrete

housekeeping pads.

5. Supply and install belt drive (new pulley, new belts, and any other necessary parts for both compressor and motor) and OSHA standard belt guard for the new compressor packages.
6. Supply and install suction and discharge isolating valves, and related ammonia piping for the new compressors as specified in the P & I drawing.
7. Supply and install pressure relief valves and relief piping to the main relief header as specified in the P & I drawing.
8. Supply and install a crankcase heater with thermostat for each of the two new compressors.
9. Provide initial charge of compressor oil for each of the two new installed compressors before the refrigeration system startup. The total oil charge and type of oil shall meet Mycom's requirement.
10. Supply and install one MyCore RC-100 controller for each of the two new compressors (a total of 2). Compressor mechanical safety points (temperature and pressure sensors) shall be connected to the controller and the control circuits.

Supply and install pressure sensors & gauges and temperature sensors for the compressor suction, discharge, and oil pressures.

The MyCore RC-100 controller will monitor and control the compressor operating parameters.

The existing pressure gauge board shall be retained, re-tubed, and reused.

The existing head pressure sensor and alarm shall be retained, reconnected and reused.

11. Supply and install automatic load controls for each of the two new compressors (3 stages, 0%, 50% and 100%).

The 2M compressor shall have a special equalizing valve to confirm compressor is balanced when it unloads.

12. Retain and re-pipe the existing HT Industrial coalescing type oil separator for each of the two new compressors as specified in the P & I drawing and the Specifications.

Re-pipe and reconnect the hot gas discharging piping line to connect the new compressors to the existing oil separators.

Retain the existing hot gas discharging piping line with check valve and isolating valve from the oil separators to the hot gas discharge header.

Retain the existing oil return piping line with control solenoid valve, isolating valve, & liquid drainer valve and reconnect the new compressor to the existing oil separator for each of the new compressors (a total of 2).

Retain and reconnect the oil return controls for each oil separator.

Retain the existing safety relief valve and related piping for each of the two oil separators.

13. Retain and modify the existing ammonia discharge main discharge header.

14. Retain the existing ammonia discharge main pressure transducer and wire to the control system.

15. Retain the existing ammonia discharge main pressure switch and re-wire to the safety and building security system.

16. Supply and install new three phase power field wiring from the new refrigeration MCC to the new installed compressor motors.

17. Supply and install control wiring for the new installed compressors and the MyCore RC-100 controllers.

2.2.3. Supply and Install One Glycol Cooling System for the Compressor Oil, Head Cover, & Jacket Cooling

Supply and install one new glycol cooling system for both compressor oil, head cover, and jacket cooling to replace the existing city water cooling system as specified in the P & I drawing.

The new glycol cooling system is to be connected to the refrigeration main glycol system. The system includes a glycol pump, a solenoid valve for each compressor oil cooling loop, isolating valves, pressure gauges, thermometers, temperature control thermostat, glycol piping, and electrical & control system.

1. Supply and install a glycol circulating pump.

2. Supply and install glycol supply and return piping, isolating valves, balance valve, pressure gauges, control valve, purge valves, thermometers and controls from the two compressors to the main glycol circuit as specified in the P & I drawing.

3. Retain and reconnect the existing city water supply pipes to the new compressor oil cooling loop and water return pipes to the existing condenser remote water sump as specified in the P & I drawing.

The city water supply and drain system will be connected as a backup in case of any emergency or glycol cooling loop failure.

4. Supply and install pipe support, hangers, and seismic restrains for the new

installed glycol pipes.

5. Charge oil cooling system with ethylene glycol with 35% concentration.
6. Supply and install power breaker, starter, controls, and other electrical components on the new MCC and field power & control wiring for the new glycol pump motor and system.

2.2.4. Supply and Install One Plate & Frame Condenser, One Main Glycol Circulating Pump, & Related Piping System

1. Supply and install one plate & frame heat exchanger HE2 and pipe it into the system as the system condenser.

The installation of the plate & frame condensers and related piping shall allow full draining of the condensate liquid ammonia to the high pressure vessel.

2. The plate & frame condenser shall be mounted at the top of a steel support platform as shown on the refrigeration layout drawing. The Refrigeration Contractor is responsible for providing the design, fabrication, and installation of the steel platform. The design service shall be provided by a professional structural engineer, who shall be hired by the Refrigeration Contractor.

3. Supply and install ammonia valves and piping lines for the condenser as specified in the P & I drawing.

4. Supply and install dual pressure relief valves and pipe to the main pressure relief header as specified in the P & I drawing.

5. Supply and install concrete housekeeping pad bases for the condenser steel support platform and the main glycol circulating pump.

6. Supply and install a main glycol circulating pump.

7. Supply and install one remotely installed motor VFD for the main glycol circulating pump.

8. Supply and install butterfly isolating valves, check valves, suction guides, and other necessary control and access service valves for the main glycol circulating pump.

9. Supply and install glycol pressure gauges at both pump suction and discharge.

10. Supply and install one Armstrong suction guide with strainer for the pump.

11. Supply and install glycol expansion tank as specified in these specifications and the P & I drawing.

12. Supply and install glycol isolating butterfly valves, glycol vent & drain service valves, and glycol piping from the plate & frame condenser to the fluid cooler as

specified in the P & I drawing.

13. Supply and install a 8" warm glycol distribution header with the waste heat application pipe connections as specified in the P & I drawing.

14. Supply and install thermometers on the glycol supply and return mains.

15. Supply and install temperature transmitters on the glycol supply and return mains and wire to the Honeywell controller and system.

16. The existing 3" snow melt warm glycol supply and return pipes shall be re-piped to the 8" glycol distribution header. The existing snow melt warm glycol pump shall be retained and re-connected.

17. Supply and install new pressure controllers and provide any other necessary controls for the new installed condenser, fluid cooler, main glycol circulating pump, and the water pump.

2.2.5. Supply and Install One U/S Glycol/ Brine Heater & System

1. Supply and install a new U/S glycol/brine heat exchanger (Heater). The new U/S glycol/brine heat exchanger shall be installed together with a 8" glycol distribution header and re-piped to the existing warm brine pump, warm brine supply and return headers.

The refrigeration contractor shall provide a separate base price reduction if the existing U/S ammonia/brine heater and system to be retained and reused.

2.2.6. Supply and Install One Fluid Cooler & One Water Pump for the Remote Sump Operation

Supply and install one new BAC glycol fluid cooler , related valves, glycol piping, electrical components, field wiring, and controls.

The new glycol fluid cooler is designed for remote water sump operation. The existing condenser remote water sump will be retained for the new fluid cooler operation.

Supply and install one new water pump, related valves, water piping, electrical components, field wiring, and controls to replace the existing water pump system.

1. Provide modification and reinforcement of the existing condenser steel support platform per the structural engineers' (Arcus Consulting Ltd.) design for the new glycol fluid cooler installation.

2. Supply and install a pre-ordered closed circuit BAC glycol fluid cooler as specified in the P & I drawing and the Specifications.

3. Supply and install a cat walk platform w/ladder/safety cage for the new glycol cooler (supplied by BAC).

4. Supply and install new glycol isolation valves, service valves, and glycol supply and return piping lines from the plate & frame condenser to the fluid cooler as specified in the P & I drawing.

6. Supply and install a new water pump and related water strainer, water pressure gauge, and related service valves as specified in this Specifications and the P & I drawing.

7. Retain the existing remote water sump and the city water makeup.

The sump water level control shall be replaced and set to suit the new glycol fluid cooler application.

The water sump connection to the new water pump shall be rebuilt.

8. Supply and install new water supply and return piping and isolating valves from the remote water sump to the glycol fluid cooler as specified in the P & I drawing.

9. Supply and install pipe support, hangers, and seismic restrains for new installed ammonia and water pipes.

10. Supply and install remotely installed VFDs for the new condenser fan motor.

11. Supply and install remote disconnect power switch for the rooftop installed fluid cooler according to code requirement.

12. Supply and install new pressure controllers and provide any other necessary controls for the new installed condenser, fluid cooler, and water pump.

13. Supply and install three phase power wiring and control wiring for the new installed fluid cooler fans and new water pump.

14. Supply and install cutting, coring and patching service for any pipe and conduit penetrations on the roof.

15. Supply and install sleeves, cans, flashing, caulking and sealing for the pipe and conduit penetrations.

16. Provide required roofing service. Please confirm the City for the requirements of the roofing service.

2.2.7. Supply and Install One New High Pressure Liquid Ammonia Storage Receiver

1. Provide a concrete housekeeping pad for the new HPR vessel.

2. Supply and install a new horizontal high pressure receiver, flat sight glass liquid

level gauge, isolating valves, safety pressure relief valves, bypass valve, equalizing valve, and related ammonia piping as specified in the P & I drawing.

The liquid ammonia high pressure receiver is to be installed, piped, and used as an ammonia storage vessel during the ice plant shut down period or the system service time period.

2.2.8. Install One Water Ammonia Diffusion Treatment System

1. Supply and install concrete housekeeping pad for one water ammonia diffusion tank.

2. Install one Owner supplied water ammonia diffusion tank. This tank with necessary control components is to be removed from the Queen's Park Arena compressor room.

The diffusion tank is to be installed inside the compressor room. The compressor room temperature shall be maintained at least 40 degree F.

3. The Contractor is responsible for providing necessary professional structural and design and site review for the diffusion tank installation.

4. Supply and install necessary seismic anchors and restraints as the structural design.

5. Supply and install required pressure relief RV header piping and diffusion tank vent piping as specified and detailed on the P & I drawing.

The existing pressure relief stack piping could be used as a part of the diffusion tank vent piping.

6. Supply and install required water piping as specified and detailed on the P & I drawing.

7. Retain the existing water level inferred sensor (dual sensors are preferred) and controls to provide water level monitoring and alarm for the tank as specified and detailed on the P & I drawing.

8. Supply and install a 3/4" stainless steel atmospheric vacuum breaker for the tank as specified and detailed on the P & I drawing.

9. Retain the existing water level indicator of the tank as specified and detailed on the P & I drawing.

10. Retain the existing water PH sensor and re-install the existing detector to monitor the PH level of water. Necessary tubing system shall be provided to connect the the sensor and the controller.

11. Charge water into the tank.

Water level shall be determined to allow the diluted ammonia volume and required ammonia bubbling volume. The water level setup shall be pre-approved by the Engineer.

As soon as the desired water level is approached, the water feed shall be terminated and the water hose shall be disconnected.

12. Provide a test of ammonia diffusion process before the refrigeration system startup.

13. The Facility (Moody Park Arena) is responsible for the water ammonia diffusion system maintenance, ammonia water solution disposal, and other safety procedures.

2.2.9. Provide a Simulation Test of the Water Ammonia Diffusion Treatment System

(To submit a separate additional price)

Testing Method

Ammonia could be introduced to the water tank by manually opening one of the safety relief valve. A video camera shall be installed inside the tank to monitor and record the ammonia absorption in the water. Room ammonia sensor PPM shall be monitored. The water PH test shall be recorded during the simulation test.

Work Scope

1. Supply ammonia for the test (recharge ammonia to the system after the test completed).
2. Install a digital video camera to monitor and record the ammonia absorption in the water.
3. Monitor and record the room ammonia PPM readings through the room ammonia detector system.
4. Provide diffusion water sample and test.
5. Disposal of ammonia contaminated water.
6. Report and documentation. Report would include weight of ammonia absorbed. Consequences (NH₃ PPM) in the room, ammonia contaminated water test report (weight of ammonia absorbed, PH of the water, and potentially Relief Stack Resulting water conditions, Observations, like spillage, off gassing after event, etc.)
7. Safety control shall be included during the test.

Safety Control

1. Two Refrigeration Mechanics with proper training due to live release aspect.

2. Use of personal protective equipment (full face mask and full body protective suits and chemically resistant gloves).
3. A portable ammonia PPM detector shall be carried during the test.
4. Room ammonia detector system and ventilation system shall be activated.
5. SOPs for safe execution including establishing control zone (facility closed).
6. Testing and work procedures are required.

2.2.10. Replacement of the Main Power Feeder Field Wiring to the New Refrigeration MCC

1. Main power supply to the refrigeration MCC: 575 Volt / 3Phase / 60Hz
2. The Contractor shall confirm the capacity of the existing main power feed cable to the new MCC before bidding.
3. The Contractor shall provide fault study, short circuit study, and arc flash study for the related electrical system and MCC.

These studies shall be provided by the professional engineer from the MCC supplier - Eaton Electrical Services & Systems (EESS)
Contact: Sohrab Jilavi, Tel: 604.519.2164)

4. Supply and install new main power feed field cable wiring from the facility main power supply panel to the new MCC.
5. Supply and install new cable tray and supports from the facility main power supply panel to the new MCC.
6. Demolition of the existing electrical motor control panel (MCP) shall be included in the work scope.

2.2.11. Provide Replacement of the Existing Refrigeration MCC (Motor Control Center) and Related Electrical & Control Upgrade

1. Power supply to the three phase motors: 575Volt / 3Phase / 60Hz
2. Control power: 120Volt / 1Phase / 60Hz
3. Supply and install a concrete base for a new Refrigeration System MCC.
4. Supply and install a new Refrigeration System MCC. The new MCC is to be installed at a new location as specified on the the compressor room layout drawing.
5. Provide seismic review and installation for the new MCC.
6. Supply and install required remotely mounted VFDs as required.

7. Provide remote disconnect switches for the remotely installed equipment as per code requirement.
8. Supply and install three phase field power wiring (power cable, cable tray, and supports) from the new MCC starters to all refrigeration equipment motors.
9. Supply and install 110V power wiring and control field wiring from the new MCC starters to the refrigeration equipment, compressor control panels, chiller liquid level controllers, Honeywell thermostats, control valves, safety switches, ammonia detector system, other control panels, etc..
10. Supply and install additional control hardware (necessary sensors, controllers, and control panels) and field wiring for the control of the new installed equipment (condenser, glycol fluid cooler, main glycol circulating pump, new remote operating water pump).
11. Supply and install new electric control panels (MyCore RC-100) and field wiring for the new compressor control.
12. Retain the existing standalone chiller liquid level controls and related field wiring for the existing chiller operating.
13. Retain and reconnect the existing two-stage Honeywell brine thermostats and related field wiring for the compressor staging and cold brine pump operating.
14. Retain the existing ammonia / brine chiller high level float switch and field wiring and re-connect to the new compressor control panel safeties.
15. Retain and reconnect the field wiring of the refrigeration plant emergency shutoff switches (one inside compressor room, one inside the Vestibule, and one inside the fire box).
16. Provide a thermal imaging test for the electrical contacts & the new MCC, and submit related report after all the installation of MCC and field wiring completed.
17. Provide MCC, control, and plant safety commissioning service.

2.2.12. Plant Safety Upgrade

1. To provide a pressure relief header code calculation based on the new equipment installation.
2. Supply and install pressure relief valve and relief piping for the new installed equipment.
3. The individual pressure relief valve and relief piping for the new installed equipment shall be sized based on the code calculation result.
4. Confirm the existing pressure relief header size is in compliance with the code calculation. Upgrade the pressure relief header if it is required.

5. Disconnect, isolate, and remove the existing fire line and the ammonia emergency discharge valve(s).

6. Supply and install safety railing at the compressor room rooftop edge along the fluid cooler air intake side.

7. Provide a thermal imaging test for the electrical contacts, new motors, and starters. The Contractor shall provide necessary correction actions per the test results and recommendations. The report shall be submitted the Engineer for review and approval.

2.2.13. Preparation for the Future DDC System Installation

DDC control system will be installed in the future for the refrigeration system. The installation of the necessary temperature sensor wells and pressure transducer isolating valves shall be included in this upgrade project.

1. Supply and install the following thermowells for the future temperature transmitter installations:

stainless thermowell: common ammonia discharge

stainless thermowell: common ammonia suction

stainless thermowell: common ammonia condensate drain liquid

stainless thermowells: chiller brine inlet and outlet

stainless thermowells: U/S warm brine inlet and outlet

brass thermowells: condenser glycol inlet and outlet

brass thermowells: fluid cooler glycol inlet and outlet

brass thermowells: compressor oil cooling common glycol inlet and outlet

brass thermowells: snow melt glycol inlet and outlet

2. Supply and install Hansen gauge, purge, & transducer valves for the followings
common ammonia suction main
common ammonia discharge main

2.2.14. Provide System Commissioning and Startup Service

1. After pressure test completed and approved by TSBC inspector, the Refrigeration Contractor shall evacuate the system by using a vacuum pump and hold for 12 hours without rise in pressure.

2. Break the system vacuum by anhydrous ammonia.

3. Charge ammonia to the system based on the design system charge. The final ammonia charge shall be approved by the engineer.

4. Charge the existing glycol from the storage tank back to the snow melt system and provide necessary treatment to satisfy density and inhibitor level requirements.

5. Charge inhibited ethylene glycol to the system with specified 35% density.

6. Recharge the existing brine solution from the storage tank back to the U/S heating system.

7. Reduce visible solids of the cold brine solution to less than 30 ppm by circulating the brine solution through an external filtering system during the system commissioning period.

8. Supply and charge additional calcium chloride to bring to specified density of the whole brine solution charge (21% for the brine solution).

9. Provide treatment of the existing brine solution to bring all the parameters to acceptable control range.

10. Provide system start-up and commissioning service for the new installed equipment and system. Operate equipment and system for three days continuously after the installation is completed.

11. Provide test and reports for brine solution, glycol solution, and ammonia. The test and reports shall be provided by certified labs.

SECTION 3: SCHEDULE

1. Tender period

See the schedule provided by the City of New Westminster.

2. Site visit

See the schedule provided by the City of New Westminster.

3. Award work

See Schedule provided by the City of New Westminster.

4. Site ready

See the schedule provided by the City of New Westminster.

5. System start-up

See the schedule provided by the City of New Westminster.

6. Substantial completion

See the schedule provided by the City of New Westminster.

SECTION 4: QUALITY ASSURANCE & WORKMANSHIP

4.1 Code Compliance

Refrigeration system and Class T compressor room are required to be installed, constructed, operated and maintained in accordance with all current applicable codes and regulations (Provincial and Local codes, rules, regulations and ordinances, Technical Safety BC regulations, WorkSafeBC regulations, and etc..) including but not necessarily limited to the following:

- CSA B52:18 Mechanical Refrigeration Code
- CSA B51:19 Boiler, Pressure Vessels and Pressure Piping Code
- ASME Boiler and Pressure Vessel Code, Section VIII Pressure Vessels, Div. 1 - 2017
- ASME B31.5 - 2019 Refrigeration Piping and Heat Transfer Components Code
- ASHRAE15 – 2019 Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants
- CSA C22.1 - 21 Canadian Electrical Code, Part I
- CSA C22.2 No. 0-10, Canadian Electrical Code, Part II
- CSA C22.2 No 14, Industrial Control Equipment
- 2018 BC Building Code
- 2018 BC Fire Code
- OSHA Regulations
- Technical Safety BC Regulations and Safety Orders
- Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation under the Safety Standards Act
- WorkSafe BC Regulations

4.2. All pressure vessels, evaporator units, heat exchangers, valves and other pressure containing components shall be with CRN and registered for use in B.C.

4.3. Provide Schedule B and Schedule C-B for structural & seismic support of major equipment and ammonia piping system.

4.4. Provide piping design registration for pressure piping bigger than NPS 3".

4.5. Provide TSBC system design registration.

4.6. All work shall be site inspected and approved by TSBC safety officer, WCB occupational hygiene officer, and City inspectors.

4.7. Only experienced ammonia refrigeration contractors are qualified for bidding this project. The Contractor is required to provide at least three references with the details of similar sized ice arena facility with plate & frame condenser and fluid

cooler installation completed in the last five years.

4.8. Only qualified welders with certificate registered to TSBC will be allowed to do the welding work. Welder's updated log book must be inspected and approved by TSBC safety officer prior to starting any welding work on site.

4.9. All refrigeration piping welds shall be stamped by the welders. A weld map is to be prepared for the approval of the safety officer from TSBC.

4.10. Welding procedure applied for the ammonia pressure pipe welds shall be registered to TSBC.

4.11. All tradesmen working on this project shall be qualified under provincial regulations and experienced in ammonia plant installation.

4.12. Workmanship of the refrigeration upgrade installation shall conform to a standard of best industrial practice.

4.13. The refrigeration system shall be commissioned by a qualified refrigeration mechanic with at least 5-year ammonia refrigeration experience.

4.14. Ammonia shall not be charged to the system until all the safety equipment and devices are installed and commissioned. The safety equipment and devices shall be inspected and approved by the TSBC safety officer.

4.15. System shall not be started up until the installation inspected and approved by the Engineer and the TSBC safety officer.

4.16. The Contractor's job site superintendent shall be approved by the Engineer and the Owner. This superintendent shall cooperate and coordinate with the Owner and the Engineer to supervise the whole project.

SECTION 5: MAJOR EQUIPMENT AND MATERIAL

5.1 Standards

5.1.1. All equipment and material shall carry CSA approval and conform to all Federal, Provincial, Municipal regulations and standards.

5.5.2. All equipment and material shall be new, of the best quality, and supplied by specified manufacturers.

5.2 Alternates

Any request to the use of alternate materials and equipment must be submitted to the Engineer in writing for approval, three days prior to the closing date of tender.

5.3 Major Equipment and Devices

5.3.1 Compressor Packages

1. Design operating conditions:

11 degree F S.S.T., 90 degree F S.D.T.,

9 degree F Subcooling, 0 degree F Superheat

2. Accepted Manufacturer: Mycom

3. Compressor C1

Make: Mycom

Model: N4MII

Speed: 882 rpm

Capacity: 63.6 TR @ 11 F SST / 90 F SCT, 882 rpm

Motor: 75 HP, high efficiency, 4 pole, ODP, 1.15 S.F., 1770 rpm

4. Compressor C2

Make: Mycom

Model: N2MII

Speed: 1070 rpm

Capacity: 38.4 TR @ 11 F SST / 90 F SCT, 1070 rpm

Motor: 50 HP, high efficiency, ODP, 4 pole, 1.15 S.F., 1770 rpm

5. Compressor shall include suction and discharge stop valves, suction and discharge thermometers, oil lubrication, crankcase heater with thermostat, replaceable cylinder liners, mechanical shaft seal, ethylene glycol cooled headers and ethylene glycol cooled oil cooler, glycol thermostats, automatic capacity control, and ammonia pressure relief valve.

6. Compressor ammonia pressure relief valve shall be sized according to CSA B52 and ASHRAE 15.

7. Compressor and motor shall be packaged on a solid structural steel base.

8. Belt drive and belt guard shall be included in the package. Belt guard shall comply with OSHA regulations.

9. Provide a Mycom MyCore RC-100 controller for each compressor safety and operation control.

The MyCore RC-100 controller shall include the followings: pressure/temperature readings for compressor suction and discharge, compressor suction pressure control, compressor discharge pressure control, oil failure control, compressor discharge thermostat switch, compressor unload solenoid control, etc.

Compressor safety controls shall include the followings: compressor low pressure cutout, compressor high pressure cutout, compressor oil failure cutout, compressor high temperature cutout, high oil temperature cutout, chiller high ammonia liquid level cutout, and cold brine flow switch (no flow cutout).

10. Supply and install pressure gauges for each compressor suction, discharge, and oil.

11. A set of compressor tool kit shall be turned over to the owner at the end of the project.

5.3.2 Compressor Oil Cooling Pump

1. Capacity: 11 GPM, 11.5 psig discharge head

2. Close coupled, vertical in-line pump

3. Construction: BF (Bronze Fitted), Bronze Impeller, Cast Iron Casing

4. TEFC pump motor, 1800 rpm, 3/4 HP, NEMA premium Energy efficient with 1.15 SF.

5. Accepted Manufacturer: Armstrong Model 4380 1.5x1.5x8, 3/4 HP

5.3.3 Plate & Frame Ammonia / glycol Condenser

A new plate & frame type ammonia / glycol condenser is to be installed to replace the existing BAC evaporative condenser

1. The condenser shall be a stainless steel 316 semi-welded plate and frame unit designed for ammonia and ethylene glycol operation.

2. Condenser shall be sized to capture 1,520 MBH compressors' heat rejection. The maximum fluid side pressure drop shall not exceed 10 psig based on a 35%

ethylene glycol solution.

3. Condenser shall be sized for a glycol flow rate of 330 usgpm based on 85 °F glycol outlet and 75°F glycol inlet with 90 °F ammonia condensing temperature approach.
4. The condenser shall be constructed to ASME Sec VIII, Div 1 requirements for 300 psig DWP on the ammonia side and 150 psig DWP on the glycol side.
5. The condenser design shall be registered with the regulatory authority for BC application.
6. The condenser shall be equipped with dual refrigerant pressure relief valves.
7. Accepted Manufacturer: Alfa Laval

5.3.4 Main Glycol Circulating Pump

1. Capacity: 335 usgpm of 35% ethylene glycol @ 36 psig discharge head
The Contractor shall be responsible for confirming the pump head to meet the required flow rate.
2. Close-coupled vertical in-line type pump
3. Pumps to be suitable for ethylene application, bronze impeller, C/W mechanical shaft seal and stainless steel shaft sleeves.
3. TEFC pump motor, 1775 rpm, 15HP, inverter duty, NEMA premium Energy efficient with 1.15 SF.
4. Accepted pump manufacturer and pump model: Armstrong model 4380 6x6x10 series.

5.3.5 Glycol Fluid Coolers

1. One close loop glycol fluid cooler is to be installed at the location, where the existing BAC evaporative condenser is currently placed. The existing building steel support frame and the roof sleepers shall be modified and structurally reinforced as designed by the structural engineer to suit for the new glycol fluid cooler installation.

The structural engineer (Arcus Consulting Ltd.) has been hired by the City. The structural design drawings are provided by Arcus Consulting Ltd.

3. Capacity: The fluid cooler shall cool 335 usgpm of 35% ethylene glycol solution from 85°F to 75°F at 66.2°F entering air wet-bulb temperature.

The capacity of the fluid cooler is sized for a minimum of 100% of the refrigeration system total heat of rejection (1,513,459 BTUH).

4. Whisper quiet fans are to be applied for the new fluid cooler.
5. The fluid cooler will be running in remote water sump operation mode. A water circulating pump will be installed inside the compressor room.
6. All steel panels and structural members of the fluid cooler shall be constructed of heavy-gauge hot-dip galvanized steel, with all sheared edges given a protective coating of zinc-rich compound.
7. Extended lubrication lines with grease fittings located outside the fan section shall be available for lubrication of the fan shaft bearings.
8. Each fluid cooler shall C/W HDG steel cat walk platform with safety railing, aluminum ladder with steel safety cage.
9. Accepted Manufacturer: BAC model FXV-0812B-20D-J

5.3.6 Glycol Expansion Tank

1. Closed steel expansion tank, pre-pressurized bladder or membrane style.
2. Tank is to be sized accordingly to allow for the warm glycol system to expand and contract.
3. Accepted tank manufacturer: Amtrol or approved equivalent

5.3.7 Pressure Vessels

1. Horizontal high pressure receiver (HPR)
Size: 16" Dia x 4'-0" OAL
Design Pressure (DWP): 300 psig
2. Receiver and oil pot shall be designed, constructed, and tested to ASME Sec VIII, Div 1, ASME B31.5, and CSA B51 Code.
3. Pressure Vessel shall be with CRN and registered for installation and operation in B.C.
4. Connection 1-1/2" and smaller shall be XH couplings.
5. Connection 2" and large shall be butt weld fitting with a 6" stub.
6. The CD inlet connection shall be designed at the bottom of the vessel.
7. Contractor shall confirm the connection details based on site installation requirement.
8. Provide a 6" dia x 10" long oil drain leg for the HPR vessel.
9. The high pressure liquid outlet tube of the HPR receiver shall be positioned in

line with the oil drain leg. The high pressure liquid outlet tube shall be extended into the oil drain leg.

10. After pressure testing at manufacturer's shop, vessel shall be cleaned, dried and charged with nitrogen gas. All vessel nozzles shall be sealed before and after shipped to jobsite.

11. Vessel shall receive one coat of primer before shipped to jobsite.

12. Provide liquid level flat glass gauge and indicate a full range of vessel liquid level of the HPR receiver.

13. Acceptable manufacturers: Morfab or approved equivalent.

5.3.8 Condenser Remote Water Pump

1. Capacity: 719 USGPM, 17.5 psig discharge head

2. Close coupled, end suction, horizontal centrifugal pump construction

3. Construction: BF (Bronze Fitted), Bronze Impeller, Cast Iron Casing

4. TEFC pump motor, 1800 rpm, 10 HP, NEMA premium Energy efficient with 1.15 SF.

5. Accepted Manufacturer: Armstrong Model 4280 6x5x11.5 or approved equivalent

5.3.9 Glycol/brine U/S Heater

1. Type: Shell & Tube

2. Design Pressure (DWP)
150 psig

3. Duty: minimum 180 MBTU @
Shell Side Primary Coolant: 335 USGPM 35% ethylene glycol flow
Tube Side Secondary Coolant: 150 USGPM 21% CaCl₂ flow, 38 F inlet, 41F outlet

4. Construction
Tube side connection: 3"
Shell side connection: 8" flange

5. Acceptable manufacturers:
Ultimate Fabrication, contact Brad Goddard
tel: 780-417-3222 ext. 202

5.3.10 Remote Water Sump

1. The existing remote water sump for the original BAC condenser operation is to

be retained and reused for the new fluid cooler remote sump operation.

2. The water level control shall be replaced. What level shall be set up to satisfy the requirements of the fluid cooler remote sump operation.

5.3.11 Water Ammonia Diffusion Treatment System

1. Water Ammonia Diffusion Tank

One of the two water ammonia diffusion tanks, which is currently installed at Queens Park Arena will be removed and installed at Moody Park Arena.

1) Vertical construction

2) 300 gallon (36" dia x 7'-0" high)

The Refrigeration Contractor is responsible for confirming the compressor room door size for the tank site access.

3) Design Pressure (DWP)

45 psig

4) The units shall be designed, constructed, tested, and installed to CSA B51, CSA B52, ASHRAE 15, BC Building Code 2018, and any other applicable codes.

5) Material: ASTM B209 Aluminum and Alloy sheet and plate
ASTM B345 Seamless Pipe

6) The unit shall be suitable for the installation and operation in B.C.

7) Connection 1-1/4" and smaller shall be couplings.

8) Connection 1-1/2" and larger shall be flange (150#) connection.

9) The unit is with a sealed 8" flange connection access.

10) A water level indicator has been installed on the unit.

11) A infrared water level sensor has been installed on the unit.

12) A PH sensor has been installed on the unit. A PH detector (removed from the Queen's Park Arena) shall be reinstalled on site and reconnected to the sensor for water/ammonia test and alarm.

13) Supply and install a new stainless steel atmospheric vacuum breaker.

The stainless steel atmospheric vacuum breaker shall be site mounted on the relief vent header as detailed on the P & I drawing.

14) A vent line shall be supplied and piped to the atmosphere as detailed on the P & I drawing. The existing RV relief stack could be used as part of the vent line.

2. Stainless steel atmospheric vacuum breaker

3/4" stainless steel atmospheric vacuum breaker

Manufacturer: Nicholson

Supplied by Grainger

3. Water level sensor

Infrared dual level sensor and alarm control

Supplier: RCC, contact John Topliss

4. PH sensor for water/ammonia alarm

Manufacturer: HB Products

Model: HBPH-2W-9-MK2

Supplier: RCC, contact John Topliss

5. PH detector for water/ammonia alarm

Manufacturer: HB Products

Model: HBPH-C1-ENC, wall mounted

Supplier: RCC, contact John Topliss

5.3.12 Refrigeration Motor Control Center (MCC)

1. The MCC is to be for 575V, 3 phase, 60HZ service.

2. The MCC shall be built to CSA, NEMA standard and any provincial regulations.

3. The design and installation of the MCC shall be in compliance with Codes, Regulations, and City Building Bylaw for seismic requirements.

4. The MCC enclosure shall be NEMA Type 2 dripproof – indoor, fully gasketed employs a special roof panel with a drip shield. Closed cell neoprene material shall be used for the gasket.

5. Provide a main power disconnect breaker (400A trip) on the MCC.

6. Provide soft starters for the compressor motors.

7. Provide power factor correction capacitors for the two compressor motor starters. The capacitors shall be shipped loose and mounted on top of the MCC.

8. Provide one power feeder breaker on the MCC for each of the remotely mounted variable frequency drive (VFD) (for one cold brine pump motor, one main glycol circulating pump motor, and two fluid cooler fan motors).

9. Provide across the line type starters for all other motors.

10. Provide a 5KVA control power transformer and control power circuit section on MCC for control power supply for refrigeration equipment, controls, future DDC control power, and other necessary safety system. Control power shall be 120/60/1.

11. Provide a control section with necessary pre-wired relays, timers, and indicating lights for the refrigeration equipment control.

12. Provide main horizontal three phase and neutral copper busing bars extending entire width of the MCC and have bracing and supports suitable to withstand short circuit current.

13. Provide a copper ground bus extending continuously to the entire width of the MCC.

14. Provide vertical copper bus and size for vertical section load and have bracing and supports suitable to withstand short circuit current.

15. Provide wiring gutter on the MCC. Wiring within the MCC will be contained in wiring troughs. Where wiring runs outside the troughs, it will be neatly bundled with nylon straps. All external connections will be brought to terminal blocks. All terminal blocks shall be accessible from the front of the MCC.

16. Enclosure shall be NEMA Type 2, drip-proof with gasketed doors, and separate compartment modules for each starter and feeder separated by steel barriers. Each module to house a combination starter, a MCP, relays with necessary contacts, a HOA selecting switch, a transformer, and terminal blocks for future DDC control output connection. Each module shall have individual access door.

17. Motor starters shall be combination type. Size and type shall be confirmed for different applications. All starters shall be equipped with MCP circuit breakers with adjustable instantaneous magnetic trip elements.

The circuit breaker shall be operated externally. The external operating circuit break handle shall be mechanically interlocked with the door.

Provide external push button for overload relay manually reset. Reset push buttons and motor "on" indicating lights shall be mounted on door front.

18. Power feeder breakers shall be thermal magnetic type with adjustable trip setting instantaneous elements.

19. The MCC supplier shall provide fault study, short circuit study, and arc flash study for the related electrical system and the MCC.

20. Provide Lamicoid nameplate (white base, black letter) on each panel and the MCC to identify name, service rating, power and load.

All door mounted items to be identified with Lamicoid nameplates.

21. Each terminal shall be numbered and tagged.

22. Allow 15% spare power capacity of the MCC for the future plant expansion requirement.

23. It may take 60" (width) x 90" (height) x 21" (depth) space to install three (3) section MCC. The bidder shall confirm the dimensions with the final selection.

24. Acceptable MCC manufacturer: Eaton Cutler-Hammer

25. Refrigeration equipment motor reference list

The following is a proposed refrigeration equipment motor list for reference. The Refrigeration Contractor shall confirm the final selection of the equipment and finalize the list for the MCC design.

The list includes but is not necessarily limited to the following:

Qty	HP	Function	Location	Total HP
1 x	75 HP	compressor motor	Compressor room	75 HP
1 x	50 HP	compressor motor	Compressor room	50 HP
1 x	3/4 HP	compressor oil cooling pump motor	Compressor room	3/4 HP
Provide two fused 110V control power supply circuits for two 500W crank case heaters				
1 x	15 HP	Main glycol pump motor	Compressor room	15 HP
(Provide one 15 HP three phase power supply with disconnect switch on MCC for a remotely mounted ABB VFD starter)				
1 x	25 HP	Cold brine pump motor	Compressor room	25 HP
(Provide one 25 HP three phase power supply with disconnect switch on MCC for a remotely mounted ABB VFD starter)				
1 x	3 HP	U/S warm brine pump motor	Compressor room	3 HP
1 x	3 HP	Snow melt glycol pump motor	Compressor room	3 HP
2 x	5 HP	Fluid (glycol) cooler fan motors	Compr. Rm Rooftop	10 HP
(Provide two 5 HP three phase power supply with disconnect switch on MCC for two remotely mounted ABB VFD starters)				
1 x	10 HP	Fluid (glycol) cooler water pump motor	Compressor room	10 HP
1 x	5KVA	575/120V transformer with feed breakers		5 KVA

Please provide a control /relay section.

5.3.13 Remotely Installed VFDs

1. Power: 575V, 3 phase, 60HZ service.
2. Supply and install standalone VFDs and field wiring for the main glycol circulating pump motor and two fluid cooler fan motors.
3. Provide power switch, line reactors, controls, and any other necessary electrical components for the VFDs.
4. Provide across line starter bypass as the fan motor and pump motor VFD

backup.

5. Accepted VFD Manufacturer: ABB

5.3.14 DDC Control System

Delta DDC system is specified for the future refrigeration system DDC control installation. Thermowell selection shall be based on Delta system temperature sensor requirement.

5.3.15 Pressure and Temperature Controls

1. Accepted Manufacturer: Penn, Honeywell, or approved equivalent

5.3.16 Ammonia Valves

1. Acceptable manufacturer: R/S, Hansen, and Danfoss

2. Isolating valve and hand expansion valve to be seal cap.

3. Valve shall be constructed with steel body. Valves shall be industrial quality rated for ammonia service and factory tested for 800 psig.

4. All the new installed valves shall be supplied by the same manufacturer.

5. Isolating valves up to and including 4" will be socket weld.

6. Isolating valves 5" and larger will be butt weld.

7. Any screwed valve to be used shall be pre-approved by the Engineer before the installation.

8. Control valve, motorized valve, and hand expansion valve shall be sized based on required refrigeration capacity and operating conditions.

9. Solenoid valve shall be installed together with strainer. Provide blow-down valves for strainers.

10. All solenoids to have encapsulated coil with pilot light (110V).

11. Pressure relief valve shall be supplied by the same manufacturer as for the existing system.

5.3.17 Ammonia Liquid Level Bullseye Sight Glass Gauge

1. Acceptable manufacturers: R/S Parker, Hansen, Phillips or approved equivalent

2. Unit shall be with CRN and registered for installation and operation in B.C.

3. Unit housing material to be steel, ASME SA36, traceable, zinc chromatic plated.
4. Unit to be suitable for ammonia application at design temperature.
5. Unit shall have frost shield for the low temperature application.

5.3.18 Ammonia Liquid Level Flat Glass Gauge

1. Acceptable manufacturers: Jerguson or approved equivalent
2. Unit to have CRN number for BC installation and operation.
3. Unit to be suitable for ammonia application at operating temperature (around 2,000 psig).
4. Unit shall have automatically closing shut-off valves.

5.3.19 Brine Valves

1. Acceptable manufacturer: Grinnell, Keystone, Bray, or approved equivalent
2. Butterfly valve - lug style with locking handle
3. Balance valve - Armstrong CBV valve
4. Valve material shall be suitable for CaCl₂ brine application in the design operating temperature range.

5.3.20 Glycol Valves

1. Acceptable manufacturer: Grinnell, Keystone, Bray, Armstrong
2. Butterfly valve - lug style with locking handle
3. FTV-Flo-Trex valve – Armstrong multiple function valve (shut off valve, check valve, and throttling valve)
4. Valve material shall be suitable for ethylene glycol application in the design operating temperature range.

5.3.21 Brine In-line Strainer

1. Acceptable manufacturer: Colton, Bray
2. 8" flanged Y strainer, or basket strainer
3. Strainer material shall be suitable for CaCl₂ brine application in the design operating temperature range (Cast iron or steel body with stainless steel screen is acceptable).
4. A 1/16" mesh screen shall be used during the startup. 1/8" standard perforated

screen shall be installed to replace the 1/16" mesh screen after system startup.

5.3.22 Glycol Pump Suction Guide

1. Acceptable manufacturer: Armstrong model SG
2. The unit shall with stainless steel strainer

5.4 Material

5.4.1. Ammonia Pipes and Fittings

1. Ammonia piping shall conform to the latest edition of ASME B31.5, CSA B51, and CSA B52 Code.
2. MTRs for all pipe and fittings shall be provided for TSBC inspection and kept for records.
3. All fitting designs shall be registered for use in B.C..
4. Pipe shall be clean, new, and free of rust, scale, oil, grease, etc.
5. Pipe up to and including 2" NPS:

Pipe: Sch. 80, SA106 grade B seamless

Fitting: Class 3000, S.W. ASTM A105 forged steel,

6. Pipe 2-1/2" NPS and larger:

Pipe: Sch. 40, SA106 grade B seamless

Fitting: Sch.40 B.W. ASTM A234B

7. Ninety (90) degree branch pipe connection with two pipe size difference

Up to 2" NPS (including 2"): Sockolets will be used.

2-1/2" NPS and larger: Weldolets will be used.

7. Forty five (45) degree branch pipe connection
Factory fabricated fittings with CRN

8. Flanges:

Raised face, CL300, ASTM A105

5.4.2. Brine Pipes and Fittings

1. Pipe 2" NPS or less:
ASTM A120 standard galvanized steel pipe

2. Pipe 2-1/2" NPS or larger:
ASTM A-120 Schedule 40 black steel

5.4.3. Glycol Pipes and Fittings

1. Pipe 2" NPS or less:
ASTM A120 standard galvanized steel pipe
2. Pipe 2-1/2" NPS or large:
ASTM A-120 Schedule 40 black steel

5.4.4. Water Pipes and Fittings

1. Pipe 2" NPS or less:
Copper tube and fitting
2. Pipe 3" NPS or large:
Water Supply
Schedule 80 PVC or ASTM A-120 Schedule 40 black steel

Water Return and Drain
Schedule 40 PVC

5.4.5. Secondary Supports for Major Equipment

1. Secondary supports for new installed equipment could be a painted or hot dip galvanized steel frame or concrete pad.

5.4.6. Pipe Stands and Hangers

1. Floor mounted pipe stands, trapeze type hangers and Clevis hangers will be used for different applications.
2. Pipe stand and hanger material and finish shall be painted, cad-plated or hot dip galvanized steel.

5.4.7. Insulation

1. Insulation Material: TRYMER PIR (POLYISOCYANURATE) insulation
2. Blue-Skin Vapor Barrier
3. Cover vapor barrier with aluminum jacket
4. Saddles: use hot dipped galvanized 12 gauge saddles, 12 inches long.
5. Longitudinal Joints to have Tongue & Groove or Ship Lap Joints.
6. Valves and vessels need to be insulated with pre-molded polyisocyanurate insulation to fit the contour of valve and vessel head.
7. The following table primarily shows the insulation thickness necessary to prevent condensation on the outer surface of the insulation system jacket for

indoor application.

PIPE NPS (INCH)	1/ 2	3/4	1	1-1/2	2	2-1/2	3	4	6	8	10	12	VESSEL
INSULATION THICKNESS (INCH)	2	2	2	2	2	2	2	2	2	2	2	2-1/2	3

5.4.8. Electrical

1. Conduit: steel galvanized EMT or rigid conduit with reamed ends
screw type steel galvanized coupling, connector and other fittings
2. Junction boxes: galvanized pressed sheet metal steel boxes
3. Conductors: unless otherwise specified or required by equipment manufacturer,
all wires shall be soft-drawn and annealed, shall be copper of 98%
conductivity with XLPE insulation.

5.4.9. Refrigerant

1. Refrigerant: anhydrous ammonia with a minimum purity of 99.95%.

5.4.10. Secondary Refrigerant

1. Calcium chloride: Dow 97% Mini-Pellets, Anhydrous Calcium Chloride
2. Calcium chloride solution for chiller cold brine to be 22%.

5.4.10 Glycol

Inhibited 35% ethylene glycol

5.4.11. Paint

1. Primer: Rustoleum enamel primer V769402
2. Finish coat: Rustoleum 3600 system Grey or yellow colour multi-purpose epoxy
paint

SECTION 6: EXECUTION

6.1 System Installation

6.1.1. Equipment Installation shall satisfy manufacturer's instructions and guidelines.

6.1.2. Provide service access and enough service space to the new installed equipment and valves according to manufacturer's requirement, Code and Regulation requirement.

6.1.3. Provide enough space in the front and the inlet/outlet connection end of the new plates plate & frame condenser as manufacturer's instruction for future gasket replacement and necessary maintenance service.

6.1.4. The new plate & frame condenser shall be installed on a steel platform as specified on the compressor layout drawing to maintain proper ammonia condensate liquid drain.

6.1.5. The existing support and roof sleepers of the BAC evaporative condenser shall be modified as the structural engineer's design for the new fluid cooler installation.

6.1.6. Place and secure the new MCC on a concrete pad.

6.1.7. Provide seismic restraints and anchorages for the new MCC and power cable tray.

6.1.8. All pipes shall be shipped plugged, and stored inside building with plugs in place.

6.1.9. Pipes shall be cleaned up internally and exteriorly before installation.

6.1.10. Pipe ends shall be properly beveled prior to welding. All burns shall be removed.

6.1.11. Welding procedure applied for pressure pipe welds shall be registered to TSBC. All refrigeration piping welds shall be stamped by the welders.

6.1.12. Butt-welding will be used for pipe connection size 2-1/2" and up. Socket-welding will be used for pipe connection size up to 2".

6.1.13. Only factory fabricated fittings (elbows, tees, reducers, caps, etc,) are allowed to be used.

6.1.14. T pipe connections with two pipe sizes smaller than the main could be field fabricated by using weldolets or sockolets. The related procedure shall be registered to TSBC.

6.1.15. 1/16" gap is required between the fitting shoulder and pipe end for socket weld fitting welding.

6.1.16. Only eccentric reducers will be used for horizontal pipe runs.

6.1.17. Limit the thread fittings application in ammonia piping system. Thread joint compound shall be suitable for ammonia application.

6.1.18. All pipe run changes in direction shall be made with long radius 90 degree elbows only.

6.1.19. Pipe and pipe supports shall be installed at slopes in the direction of flow approved by the Engineer for different application.

6.1.20. Isolating valves are to be installed in such a way with manual valve stems in the horizontal position.

6.1.21. Suction guide with strainer shall be installed for the main glycol circulating pump.

6.1.21. Provide blow down valve on the suction guide.

6.1.22. Pressure relief header and stack shall be sized based on the capacity of existing equipment, new installed equipment, and potential future upgrade equipment.

6.2. Pressure Test of the New Installed Ammonia Piping and System

6.2.1. Pressure test (nitrogen) of new installed ammonia piping and system to at least 110% of the design working pressure (shall not exceed 130% of the design working pressure).

6.2.2. Nitrogen shall be used as testing medium.

6.2.3. The testing pressure shall be continuously maintained for time period as required by the Code. It may then be reduced to design working pressure for leak test.

6.2.4. Hold the leak test pressure for 24 hours.

6.2.5. Soap suds leak tests for each joint and valve packing.

6.2.6. Replace defective materials and re-test the system if any leaks found during the test.

6.2.7. The Refrigeration Contractor shall coordinate with the TSBC to provide any

required pressure test procedure and other document.

6.2.8. Call TSBC Safety Officer for pressure test witness and inspection.

6.2.9. Submit pressure test documentation to TSBC Safety Officer for approval.

6.2.10. After pressure test is satisfactory and approved by TSBC Safety Officer, blow out system pressure through drain valves.

6.2.11. After pressure test completed, the ammonia piping and system shall be evacuated to minimum 29" mercury by a vacuum pump and hold for 12 hours without rise in pressure.

6.2.12. Owner's representative shall witness and sign off related document for the vacuum process.

6.2.13. Break the system vacuum with anhydrous ammonia.

6.3. Brine & Glycol Piping System Pressure Test

6.3.1. Pressure test the new installed brine main piping system to 75 psig and hold for 24 hours.

6.4. Painting

6.4.1. Painting will be done after piping pressure test completed and approved by TSBC.

6.4.2. A coat of primer and a coat of epoxy painting are required for all ferrous pipes, supports, and unfinished surfaces.

6.5. Penetrations

6.5.1. All pipe and conduit penetrations shall be sealed and finished in an approved procedure and system.

6.5.2. Tightly seal any conduit piercing fire rated walls, floor, and ceiling with certified one-hour fire rating material and system. Only CSA certified fire stop material and system are allowed to be used.

6.6. Secondary Supports

6.6.1. Install secondary supports to primary supports by bolts or in a manner approved by the structural engineer.

6.6.2. Equipment and piping support installation needs being approved and inspected by the structural engineer.

6.7. System Ammonia Charge

6.7.1. All safety devices are to be tested and approved by TSBC Safety Officer before charging ammonia to the system.

6.7.2. During the system commissioning, the amount of system ammonia charge shall be confirmed on site based on the plate and frame brine chiller and high pressure receiver operating liquid level.

6.8. CaCl₂ Brine Treatment

6.8.1. If the visible solids are at high PPM. An external filtering system is required to be installed in order to decrease visible solids to < 30 ppm.

1. CaCl₂ brine shall be charged through an external filtering system.

2. The visible solids of the existing CaCl₂ brine solution shall be decreased by circulating the solution through the external filtering system during the system commissioning.

6.8.2. Take brine sample and provide test report before the installation and after system started up.

6.8.3. Cold brine solution of whole system shall satisfy 22% density, inhibitor level, PH, and all other necessary requirement.

6.9. Insulation

6.9.1. Follow the instructions of "Installation Guideline for Trymer Insulation of ITW Insulation Systems" for the insulation installation.

6.9.2. Insulation shall not be applied until piping has been leak tested, pressure tested, and painted.

6.9.3. All insulation shall be tightly butted and free of voids and gaps.

6.9.4. Apply insulation in two layers for total thickness of 2" or more.

6.9.5. Do not insulate control valves or strainer.

6.9.6. Do not insulate plate & frame heat exchanger (chiller and condenser).

6.9.7. Do not insulate brine pumps.

6.9.8. Do not insulate the external oil pot (the chiller internal oil pot shall be insulated) .

6.9.9. Insulate isolating valves and leave valve stems, adjusting stems, and packing nut exposed.

6.9.10. Cover all insulation with a layer of Blue-Skin vapor barrier.

6.9.11. Clean up the insulation surface and get rid of any solid particles before installing of the Blue-Skin vapor barrier.

6.9.12. All insulation shall be jacketed with aluminum jacket.

6.9.13. Insulation shall be installed only by experienced insulation sub-contractor, which is familiar with industrial refrigeration piping insulation.

6.10. Identification of System

6.10.1. All refrigeration valves will be tagged with stainless steel (or match the existing tag material) tags . The tags shall be attached to the valves by stainless steel cable. Valve identification numbers are to be recorded on the as-built drawing.

6.10.2. All restricted used valves shall be tagged with instruction tag. The restricted used valve shall be identified on the system P & I drawing.

6.10.3. Identify major equipment by self stick Lamacoid nameplates.

6.10.4. Apply self stick vinyl pipe marker for all the refrigeration pipes.

6.10.5. Pipe marker system shall be in compliance with IIAR guidelines for Identification of Ammonia Refrigeration Piping and System Components and the TSBC regulations.

6.11 Electrical

6.11.1. Control and power wiring to be enclosed in rigid conduit or steel EMT.

6.11.2. Main power feed cable to be installed in a cable tray.

6.11.3. Supply and install fastening and supports for conduits and equipment.

6.11.4. Supply and install junction boxes for new wiring and components.

6.11.5. Tightly seal any conduit piercing fire rated walls, floor, and ceiling with CSA certified one-hour fire rating material and system.

6.11.6. Conduit shall run parallel or perpendicular to building lines.

6.11.7. All wiring terminals shall be labelled. The related information shall be transferred to wiring diagram.

6.11.8. The electrical panels and junction boxes shall be labelled.

6.11.9. Before energizing the system, Megger tests on feeders and circuits are required. Any problems discovered are to be corrected by the Contractor. Final test report shall be provided to the Engineer.

6.12 Control of New Installed Equipment

6.12.1. The Contractor shall confirm the details of the existing refrigeration system control before bidding.

6.12.2. The existing ammonia liquid level probe transmitter and the standalone liquid level controller shall be retained and integrated into the upgraded refrigeration system controls.

6.12.3. There is one existing Honeywell 2-stage thermostat controller with temperature sensors for the cold brine supply and return temperature. It is field wired and programmed as the compressor stage control and cold brine pump control. This controller shall be retained and integrated into the upgraded refrigeration system controls.

6.12.4. The existing cold brine pump VFD control and procedure shall be retained and integrated into the upgraded refrigeration system controls.

6.12.5. Each of the new compressor packages is C/W a MyCore RC-100 controller panel. It will replace the existing gauge board for the compressor operation and safety control.

6.12.6. The existing chiller high liquid level safety float switch shall be wired to both new compressor safeties.

6.12.7. Supply and install new pressure control switches of the ammonia main discharge for the fluid cooler fans and remote water pump circulating control.

6.12.8. Supply and install a new Honeywell 2-stage thermostat controller and glycol temperature sensors for the main supply and return glycol. The new installed sensors shall be wired to the new Honeywell 2-stage thermostat controller as part of the condenser, fluid cooler, and related water and glycol pump controls.

6.12.9. Retain the existing U/S heating pump and snow melt pump control system. Necessary modification may be required for the upgraded system.

6.12.10. The existing ammonia discharge main pressure switch and transducer shall be retained and wired to the existing alarm system.

6.12.11. The solenoid valve for the high pressure ammonia liquid makeup to the ammonia / brine chiller shall be able to be shut off remotely at any emergency situation (fire, ammonia leak, etc.). This safety feature has been installed during the plant 2020 upgrade. The Refrigeration Contractor shall confirm it for the 2021 upgrade project.

6.12.12. Critical safety alarm points include chiller high level, compressor high discharge pressure, compressor high discharge temperature, and compressor room ammonia concentrations, etc..

The Refrigeration Contractor shall confirm all the critical safety alarm points are connected to the central monitoring and alarm system.

6.12.13. All the major equipment and procedure controls (chiller liquid level control, cold brine pump VFD operation, etc.) shall be included in the upgraded controls.

6.14 System Commissioning

6.14.1. Start up and adjust all new installed equipment and system for proper operational conditions and procedures after installation completed.

6.14.2. Provide a system commissioning record with control setup parameters, and motor amperage readings.

6.14.3. The Refrigeration Contractor shall provide a safety device (ammonia detector system and compressor room ventilation system) test and report and submit to TSBC for approval before the refrigeration system commissioning.

6.14.4. It is the Contractor's responsibility to call TSBC safety officer and City inspector for the final inspections.

6.14.5. After system commissioning completed, take brine samples and glycol sample.

6.14.6. The lab test reports of the brine and glycol samples shall be submitted to the Engineer and the Owner. The samples shall be tested at certified labs.

6.15 Inspections

6.15.1 Regular Inspection: The Refrigeration Contractor is responsible for calling the Engineer for inspection at key construction phases.

6.15.2 Final inspection: The refrigeration Contractor shall call the Refrigeration Engineer, TSBC safety officer, WorkSafeBC occupational hygiene officer, and City inspector for a final inspection after the work completed. The Refrigeration Engineer will issue a deficiency list after the final inspection.

The Refrigeration Engineer will do an on-site inspection to verify that all deficiencies have been corrected. The Contractor shall pay the cost of subsequent verification and reports if there is any remaining deficiencies at that time.

6.16 Substantial Completion

6.16.1. Substantial completion is defined as the installation is inspected and approved by TSBC safety officer (A plant operating permit shall be issued after the deficiency items completed), WorkSafeBC occupational hygiene officer, City inspector, and the Refrigeration Engineer.

The Refrigeration Contractor is responsible to correct all the deficiency items listed

in the deficiency lists, which are issued by the TSBC safety officer, WorkSafeBC occupational hygiene officer, the City inspector, and the Refrigeration Engineer.

All the repair works listed in the deficiency lists need to be completed before the substantial completion certificate issued.

6.16.2. Substantial completion date: See Schedule provided by the City of New Westminster.

6.17 Training and Instrumentation

6.17.1. Provide both class room refrigeration knowledge training and compressor room hands on training to the plant operators.

6.17.2. Refrigeration knowledge training includes refrigeration basic, system description of this upgraded refrigeration plant, major equipment controls, ammonia system safety issues and emergency response procedures.

6.17.3. Compressor room hands on training includes refrigeration equipment operation parameter setup, system start-up and shut-down, equipment daily maintenance, oil drain procedure, and manual air purging procedure, restricted used valve operating procedure, etc..

SECTION 7: SUBMITTALS

7.1 Shop Drawings

7.1.1. The Contractor shall submit shop drawings and product data to the Engineer for review before any work commences. Shop drawings include but are not limited to the following: compressors, MyCore RC-100 control panel, ammonia/glycol plate & frame condenser (heat exchanger), glycol fluid cooler, main glycol circulating pump, glycol/brine heat exchanger, fluid cooler remote sump operating water pump, compressor oil cooling glycol pump, steel support frame for the major equipment, Liquid level indicator, liquid drainer, MCC, VFD drive, electrical field wiring diagram, control wiring diagram, control panel, level sensor, control valves, control procedures, compressor room new equipment layout, fluid cooler installation layout, secondary steel support, wall and roof penetration & seal details, etc..

7.2.2. Fault study, short circuit study, and arc flash study for the related electrical system and the MCC.

7.1.3. Review of shop drawing doesn't relieve the Contractor's responsibility for correct equipment selections and installations.

7.2 As-Built Drawings

7.2.1. The Refrigeration Engineer will leave a set of hard copy P & I drawing on site. The Contractor is responsible for marking all the changes of the installation and recording of the valve tagging numbers. This set of drawing shall be submitted to the Engineer after installation completed.

7.2.2. Provide three hard copies and one electronic copy of as-built wiring diagrams to the Engineer.

7.3 Manuals

7.3.1. Provide three hard copies and one electronic copy of system installation, operation and maintenance manuals to the Engineer for approval.

7.3.2. Each manual shall be filed in a three ring binder.

7.3.3. Equipment maintenance instruction and procedures shall be included in the manual.

7.3.4. Shop drawings and product data shall be included in the manual.

7.3.5. A written description of the system, component, and control details shall be

included in the manual.

7.3.6. System control description shall be included in the manual.

7.3.7. All construction document, installation permit, TSBC inspection reports, and pressure test reports, equipment and plant operation permit shall be included in the manual.

7.3.8. All the Engineer's review reports and Schedule B letter of structural review shall be included in the report.

7.3.9. MDRs document of pressure vessel shall be included in the manual.

7.3.10. CRN registration information for pressure vessel shall be included in the manual.

7.3.11. Pressure relief pipe and header size code calculation shall be included in the manual.

7.3.12. System operation log sample form shall be included in the manual.

7.3.13. System commissioning records and system original operating set point data shall be included in the manual.

7.3.14. System start-up procedure and system shut-down procedure shall be included in the manual.

7.3.15. Oil drain procedure and system air purging procedure shall be included in the manual.

7.3.16. Restricted used valve operating procedures shall be included in the manual.

7.3.17. All shop drawings and system As Built drawing shall be included in the manual.

7.3.18. Piping and system design registration documentation shall be included in the manual.

7.3.19. Electrical thermal imaging test report shall be included in the manual.

7.3.20. Ammonia, glycol, and brine test report shall be included in the manual.

***SECTION 8:
APPENDIXES***

1. Test Report of the Existing U/S Warm Brine Solution
2. Test Report of the Existing Snow Melt Heating Glycol Solution
3. Pre-Ordered Equipment
BAC FXV-0812B-20D-J Fluid Cooler

TOROMONT**CIMCO****CIMCO Refrigeration**

1095 Cliveden Avenue

Delta, B.C. V3M 6G9

604-525-8899

www.cimcorefrigeration.com

REPORT OF CALCIUM CHLORIDE BRINE ANALYSIS

Date: January 18, 2021

Customer Name: Moody Park Arena

Address:

Phone:

Fax:

Attention: Jon Paulson

cc: Colin McIver

cc: Chris Paulson

Reference: **Moody Park Arena HF**

P.O. 4501068206-4391524

CONSTITUENT	Heating Floor	Control Range
Sample Date	January 5, 2021	
Appearance	Clean/Clear	Clean/Clear
Visible Solids	< 30 ppm	<30 ppm
Specific Gravity	1.18	1.20 Min.
% Calcium Chloride	19.5	21.5% Min
Freezing Point (°C)	-17.00	-5.0 F or -20.5C Min
Visible iron	< 30 ppm	<30 ppm
Complex Phosphate Inhibitor	18 ppm	20/30ppm cP04 at 0.12% Z-5750 HC 10 X added
pH	5.61	8.5 to 9.5
Dissolved iron	< 10 ppm	< 10 ppm
Ammonia	0 ppm	0 ppm

FINDINGS & RECOMMENDATIONS**Heating Floor:**

pH is low at 5.61.

Visible solids are good at < 30 ppm.

cPO₄ is slightly low at 18 ppm.

Add 0.96 lbs. of caustic soda per 1000 L of brine to increase pH to 8.5/9.5.

Add 0.6 L of Z-5750 HC 10X per 1000 L of brine in order to increase cPO₄ concentration to 20/30 ppm.

1977 to 2021 - 44 Years of Service

Kristofer Bacon, Chemical Technologist

Zeotec Limited

WATER MANAGEMENT CHEMICALS * EQUIPMENT * ENGINEERING AND LABORATORY SERVICES

CIMCO makes no warranties or representations whatsoever, either express or implied, oral or written, in fact or by operation of law or otherwise, regarding any measurements and recommendations and disclaims all liability in connection with or arising as a result of providing any services, measurements and recommendations. Cimco accepts no liability or responsibility for any service, measurement or recommendation and does not and shall not be deemed to approve the design, use or function of, any item, material, article or product in connection with the services, measurements or recommendations provided.

TOROMONT**CIMCO****CIMCO Refrigeration**

1095 Cliveden Avenue

Delta, B.C.

V3M 6G9

604-525-8899

www.cimcorefrigeration.com**REPORT OF ETHYLENE GLYCOL ANALYSIS**

Date: January 18, 2021

Customer Name: Moody Park Arena

Attention: Jon Paulson

Address:

cc: Colin McIver

Phone:

cc: Chris Paulson

Fax:

Reference: **Moody Park Snow Melt EG**
P.O. 4501068206-4391524

CONSTITUENT	E.G.	CONTROL RANGE
Sample Date	January 5, 2021	
Appearance	Light Amber/Clear	Clean/Clear
Visible Solids	< 30 ppm	<30 ppm
Specific Gravity	1.022	As Required
% Ethylene Glycol	11.5	As Required
Freezing Point (°C)	-4.40	As Required
Phosphate Inhibitor	800 ppm	1500/5000 ppm
pH	8.93	8.50/10.00
Ammonia	0 ppm	0 ppm

FINDINGS & RECOMMENDATIONS**Ethylene Glycol:**

Ethylene Glycol is 11.5%.

pH is good at 8.93.

Freeze point is -4.40°C.

Phosphate corrosion inhibitor is low at 800 ppm.

Add 6 L of Z-PGIN per 1000 L of glycol in order to increase phosphate inhibitor levels to 1500/5000 ppm.

1977 to 2021 - 44 Years of Service

Kristofer Bacon, Chemical Technologist

Zeo Tec Limited

WATER MANAGEMENT CHEMICALS * EQUIPMENT * ENGINEERING AND LABORATORY SERVICES

CIMCO makes no warranties or representations whatsoever, either express or implied, oral or written, in fact or by operation of law or otherwise, regarding any measurements and recommendations and disclaims all liability in connection with or arising as a result of providing any services, measurements and recommendations. Cimco accepts no liability or responsibility for any service, measurement or recommendation and does not and shall not be deemed to approve the design, use or function of, any item, material, article or product in connection with the services, measurements or recommendations provided.



**BALTIMORE
AIRCOIL COMPANY**

Submittal Data Form

2-5-2021

Sold To : **G R HUDSON SALES LTD**
#114 - 3950 191st Street
SURREY, BC V3S 3M3
Canada

Project: Moody Park Arena
Purchase Order No:
Engineer:
BAC Order # U210599501
Representative: G R HUDSON SALES LTD

All Information is per Unit

Quantity: 1 Model FXV-0812B-20D-J/WQ CLOSED CIRCUIT COOLING TOWER

Certified Capacity: 334.60 USGPM of 35% Ethylene Glycol from 85.03°F to 75.03°F at 66.20°F entering air wet bulb and 8.08 PSIG fluid pressure drop.

Fan Motor(s): Two (2) 5 HP fan motor(s): Totally Enclosed, Air Over (TEAO),
1 Speed/1 Winding - Premium Efficiency (Inverter Duty), suitable for 575 volt, 3 phase,
60 hertz electrical service and Space Heater.
Drives are based on 0 inches ESP.

NOTE: Inverter Duty fan motors, furnished in accordance with NEMA Standard Mg.1 -- Part 31, are required for applications using variable frequency drives for fan motor control.

NOTE: Spray Water Pump supplied by others must provide a 719.00 USPGM Flow at 2.00 PSIG at Spray Water Inlet

Submittal Information	Equipment Summary
BAC Terms and Conditions of Sale Mechanical Specifications Certificate of Wind and Seismic Load Capacity Submittal Drawings/Diagrams UP-U210599501 Unit Print – LH SS-U210599501 Unit Support CG-U210599501 Center of Gravity ML-U210599501 Motor Location VL-U210599501 VCOS Location VW-U210599501 VCOS Wiring EA-U210599501 External Access IA-U210599501 Internal Access SW-U210599501 Space Heater Wiring	CTI Certified Thermal Performance EVERTOUGH Construction Whisper Quiet Fans Galvanized Steel Fan Guard PVC Fill & Drift Eliminators Galvanized Steel Coil, CRN No. 0H7705.5C Structure Designed in accordance with the IBC and ASCE/SEI 7 End Outlet Connection(s); Pump(s) Omitted for Remote Sump Application PVC Spray Branches Water Level Control and Strainer are Omitted for Remote Sump Application Mechanical Vibration Cutout Switch External Platform with Safety Gate and Ladder with Safety Cage Located on Louver Face(s) of Unit Internal Walkway and Ladder

THANK YOU FOR YOUR BUSINESS!

Rigging and Installation Instructions, as well as Operating and Maintenance Instructions are available at www.baltimoreaircoil.com



**BALTIMORE
AIRCOIL COMPANY**

Mechanical Specifications

2-5-2021

Customer: G R HUDSON SALES LTD
Project: Moody Park Arena
Purchase Order No:
Engineer:
BAC Order # U210599501

All Information is per Unit

Quantity: 1 Model FXV-0812B-20D-J/WQ CLOSED CIRCUIT COOLING TOWER

CTI Certification:

The thermal performance of this BAC unit has been certified through performance tests conducted by the Cooling Technology Institute in accordance with their standard STD-201 RS. Your equipment may be selected for factory-testing to verify CTI certified performance. Such certification by an independent third party assures engineers and users that the published thermal capacities accurately reflect the actual unit performance. CTI certification eliminates the additional costs of on-site, individual unit testing, oversizing the equipment or operating cost penalties from deficient equipment.

Materials of Construction:

All structural steel components are constructed from G-235 (Z700 metric) hot-dip galvanized steel protected by a thermosetting hybrid polymer. The distribution system is constructed of Schedule 40 PVC. Polypropylene metering orifices are provided to assure even distribution of water over the coil surface.

The thermosetting hybrid polymer applied by Baltimore Aircoil Company consists of:

- 1) G-235 (Z700 metric) hot-dip galvanized steel components
- 2) parts prepared in a four-step (clean, pretreat, rinse, dry) process
- 3) electrostatically sprayed thermosetting hybrid polymer, fuse bonded to the hot-dip galvanized substrate during a thermally activated curing stage
- 4) quality assurance inspection program including 23 steps throughout polymer application and unit fabrication.

The cold water basin includes a depressed section with drain/clean-out connection and the area under the fill sections is sloped toward the depressed section for easy cleaning. The cold water basin shall be protected with the TriArmor® Corrosion Protection System. This system consists of:

- 1) G-235 (Z700 metric) hot-dip galvanized steel components
- 2) electrostatically sprayed thermosetting hybrid polymer, fuse bonded to the hot-dip galvanized substrate during a thermally activated curing stage
- 3) Polyurethane system creating an air and watertight armor.

The air inlet louvers are constructed of PVC honeycomb shape louver which also act as an air inlet screen and block sunlight to the basin and the front of the fill.

Fan Type:

The unit is supplied with Whisper Quiet Fans to reduce sound levels. The fan is driven by the BALTIDRIVE Power Train. This drive system consists of cast aluminum sheaves located on minimum shaft centerline distances. A premium efficient fan motor provides maximum performance and is backed by BAC's comprehensive 5-year motor and fan drive warranty.

Fan Guard(s):

A heavy gauge, G-235 (Z700 metric) hot-dip galvanized steel wire fan guard is provided over each fan cylinder.

Fill:

The BACross® Fill and integral drift eliminators are formed from self-extinguishing (per ASTM D-568) polyvinyl chloride (PVC), having a flame spread rating of 5 per ASTM Standard E84-77a, and are impervious to rot, decay, and fungus or biological attack. The fill is elevated above the cold water basin floor to facilitate cleaning. This fill is suitable for a maximum entering water temperature of 130°F (54.44°C). The eliminators are designed to effectively strip entrained moisture from the leaving airstream with a minimum of air resistance.

Coil Type:

Coils will be constructed with continuous 1.05" O.D. all prime surface steel tubes encased in steel framework. The entire assembly is hot-dip galvanized after fabrication. Tubes will be sloped for liquid drainage. Coils have a maximum allowable working pressure of 280 psig (1931 kPa) and are tested at 375 psig (2585 kPa) air pressure under water. Canadian Coil Registration Number (CRN) is 0H77055C.

Equipment Structure:

The structure of this product has been designed and analyzed in accordance with the wind and seismic load requirements of the 2006 IBC, 2009 IBC, 2012 IBC, 2015 IBC, ASCE/SEI 7-05, and ASCE/SEI 7-10. Seismic qualification is based on analysis. For more information and specific wind and seismic load capacity ratings, please see the Certificate of Wind and Seismic Load Capacity.

Spray Water Pump Assembly:

A pipe stub connection(s) of a metal compatible with the cold water basin material and appropriately sized for design flow is provided. The connection is beveled for weld and grooved for mechanical connection. Spray water pump(s) are provided by others.

Spray Distribution System:

Spray header with schedule 40 PVC branches. Removable branches and 360° spray pattern plastic spray nozzles are held in place with snap-in rubber grommets.

Basin Water Level Control:

Standard float valve and strainer are omitted for remote sump application.

Vibration Cutout Switch:

Fan system is provided with an appropriate number of vibration cutout switches to limit collateral damage to the unit in the event of a catastrophic fan failure. The vibration switch(es) is mechanically tripped with a frequency range of 0 to 3,600 RPM and trip point of 0.2 to 2.0 g's. No input power is required. Switch rating is 10 amperes at a maximum 480 VAC, and 1/4 ampere at 250 Vdc.

External Platform at Louver Face:

The unit will be configured with a platform (with FRP grating) with galvanized steel protected by a thermosetting hybrid polymer supports, ladder with safety cage and safety railing on the louver face. The safety rails will be constructed of 1 1/4" (32 mm) galvanized steel pipe. A spring loaded safety gate is provided. These access options meet OSHA standards. These components ship loose and are to be assembled and are installed in the field by others.

Internal Access Option:

The unit has access doors on both ends, an internal walkway, and an internal aluminum ladder with supports constructed of galvanized steel protected by a factory applied thermosetting hybrid polymer to facilitate access to the mechanical equipment. All components meet pertinent OSHA standards.



**BALTIMORE
AIRCOIL COMPANY**

Terms and Conditions of Sale

Pricing: Prices set forth in Seller's quotation shall remain firm for thirty (30) days. Within such period, the quotation shall convert into an order provided that all of the following have occurred: (1) Buyer submits either a purchase order or a copy of Seller's quotation displaying an authorized signature of Buyer within that thirty (30)-day period; (2) Buyer provides a release for fabrication; and (3) Buyer requests a shipment date that is no later than twelve (12) weeks from the date of Buyer's submission of a purchase order or signed quotation. In the event Buyer's requested shipment date is later than twelve (12) weeks beyond such submission date, Seller's price in effect twelve (12) weeks prior to such shipment date shall apply. In the event that Buyer requests for its convenience that Seller delay delivery of products subject to an order beyond the scheduled shipment date, pricing shall be subject to the same adjustment.

Payments: Terms of payment shall be net cash in thirty (30) days from date of invoice, subject to Seller's prior credit approval. If the Buyer shall fail to make any payments in accordance with the terms and conditions of sale, the Seller, in addition to its other rights and remedies but not in limitation thereof, may, at its option, without prior notice, cancel this order as to any undelivered products or defer shipments or deliveries hereunder, or under any other agreement between Buyer and Seller, except upon Seller's receipt of cash before shipment or such security as Seller considers satisfactory. Seller reserves the right to impose an interest charge (not exceeding the lawful maximum) on the balance of each invoice not paid on its due date for the period from the due date to the date of receipt of payment by Seller. In the event Buyer's failure to make timely payments to Seller results in Seller incurring additional costs, including but not limited to collection expenses and attorneys' fees, said costs shall be added to the amount due Seller from Buyer. Buyer shall have no right to any discount or retainage and shall not withhold payment as a set-off on Seller's invoice in any amount.

Taxes: Unless listed on the front (reverse) side of this document, prices do not include any federal, state or local sales, use or value-added taxes payable in connection with this order. All such taxes shall be paid by Buyer. Buyer shall indemnify Seller from and against such taxes, plus interest and penalties thereon, including, but not limited to, tax, interest and penalties resulting from a failure to collect such taxes because of Seller's reliance upon an invalid exemption certificate provided to Seller.

Allocation of Risk: Deliveries shall be considered made when the products subject to this order are loaded on the carrier. At such time, title to the goods and all risk of loss, damage or shortage shall pass to Buyer, and any claims based thereon must be filed by Buyer with the carrier.

Force Majeure: Seller shall under no circumstances be liable for any loss or damage resulting from delay or failure in the performance of its obligations under this contract to the extent that such performance is delayed or prevented by: fires, floods, war, terrorist activities, riots, strikes, freight embargoes or transportation delays, shortage of labor, inability to secure fuel, material, supplies or power at current prices, or on account of shortages thereof; acts of God or of the public enemy; any existing or future laws or acts of the federal, state or local government (including specifically, but not exclusively, any orders, rules or regulations issued by any official or agency of any such government) affecting the conduct of Seller's business with which Seller in its judgment and discretion deems it advisable to comply as a legal or patriotic duty, or to any case beyond the Seller's reasonable control.

Warranties: Seller warrants that the equipment sold under this contract shall be free from defects in material and workmanship for a period of twelve (12) months from the date of equipment startup or eighteen (18) months from the date of shipment, whichever occurs first. The following original equipment components only are warranted against defects in materials and workmanship for a period of five (5) years from date of shipment: fans, fan shafts, fan motors, bearings, sheaves, gearboxes, driveshafts, couplings, and mechanical equipment support. Details of option-specific warranties follow:

Original Equipment Fan Motors are warranted against defects in materials and workmanship for a period of seven (7) years from date of shipment when space heaters are field-wired at time of initial installation per the motor nameplate.

Replacement Parts provided by Seller under its original equipment warranty obligations are warranted against defects in materials and workmanship for a period of twelve (12) months from date of shipment or until expiration of their original warranty, whichever occurs first. Parts purchased after expiration of the original equipment warranty are warranted against defects in materials and workmanship for a period of twelve (12) months from date of shipment.

Written notice of any defect shall be given to Seller immediately upon discovery by Buyer, and shall fully describe the claimed defect. Defective parts shall be repaired or replaced F.O.B. point of shipment, provided that inspection by Seller verifies the claimed defect(s). This shall be Buyer's exclusive remedy. **This warranty does not cover the costs of removing, shipping or reinstalling the equipment. Repairs made without the prior written approval of Seller shall void all warranties covering material and workmanship.** Any descriptions of the product(s) in the contract are for the sole purpose of identification and do not constitute a warranty. In the interest of product improvement, Seller reserves the right to change specifications and product design without incurring any liability therefore. The foregoing express warranties or those set forth elsewhere on this document are the only warranties of Seller applicable to the product(s) sold under this contract. **All other warranties, whether verbal or written, and all warranties implied by law, including any warranties of merchantability or fitness for a particular purpose, are hereby excluded. Failure on the part of Buyer or of other parties to properly maintain the product(s) sold under this contract, or the operation of such product(s), by Buyer and/or other parties under conditions more severe than those for which such product(s) were designed, shall void all warranties covering materials and workmanship. Seller's warranties do not apply to defects in product(s) for which payment in full has not been received by Seller, and said warranties do not cover normal wear and tear or the erosion, corrosion and/or deterioration of the product(s) from unusual causes. No warranties by Seller shall apply to accessories manufactured by others,** inasmuch as they are warranted separately by their respective manufacturers, except as stated above. Buyer assumes liability for and shall bear the costs of compliance with all laws, regulations, codes standards or ordinances applicable to the location, operation and maintenance of the product(s) sold under this contract, including those requirements pertaining to the distances between such product(s) and air-conditioning system duct intakes. No representative or agent of Seller is authorized to enlarge upon the express warranties of Seller.

Cancellation/Changes/Returns: Cancellation of or changes in any order by Buyer shall not be effective without Buyer's notice thereof received, agreed

Corporate Headquarters: 7600 Dorsey Run Road, Jessup, MD 20794 – Tele: (410) 799-6200 / Fax: (410) 799-6416

to, and confirmed in writing by Seller. If Seller, in its absolute discretion, approves Buyer's cancellation of an order, Buyer agrees to pay a reasonable cancellation charge. Seller's prior written consent must be obtained before Buyer returns any products, and when so returned will be subject to a handling charge and transportation costs payable by Buyer.

Liability/Indemnification: Seller shall not be liable for any damages caused by delay in delivery of the products. Buyer shall hold harmless and indemnify Seller from and against all liability, claims, losses, damages, and expenses (including attorneys' fees) for personal injury and property damage arising out of Buyer's improper unloading, handling, or use of the products subject to this order, and for Buyer's infringement of another's property rights. The Seller's maximum liability from any causes whatsoever, whether in breach of contract, tort (including negligence), strict liability, or otherwise, shall not exceed the contract price. Neither Buyer nor Seller shall in any event be liable to the other, whether such liability arises out of breach of contract, tort (including negligence), strict liability or any other cause or form of action, for any consequential, special, indirect or incidental damages, including but not limited to loss of actual or anticipated profits or loss of use arising out of this contract, other than such damages resulting from the willful misconduct of Buyer or Seller.

Storage: In the event that Buyer is unable to accept delivery of goods and the Seller is required to hold goods beyond two (2) working days from fabrication completion, a storage fee equal to the greater of \$200/day or 0.20% of the total order value/day will be assessed by Seller for every day beyond two (2) working days from fabrication date which it is required to store goods on behalf of Buyer. Storage will be assessed monthly and will need to be paid in full prior to a new shipment date being scheduled.

Government Contracts: If Buyer's purchase order is for products to be used in the performance of a U.S. Government contract, those clauses of applicable procurement regulations mandatorily required by federal law to be included in U.S. Government subcontracts shall be incorporated herein by reference.

Export Transactions: Buyer shall comply with all applicable export laws and regulations of the U.S. Government, and shall hold harmless and indemnify Seller from and against all liability, damages, and expenses (including attorneys' fees) incurred by Seller as a result of Buyer's violation of any U.S. Government export and/or international antiboycott laws or regulations. Buyer certifies that it will be the recipient of the products to be delivered by seller. Buyer acknowledges that products are subject to export/import control laws of various countries, including the Export Administration Regulations of the United States. Products sold by seller cannot be transferred, sold or re-exported to any party on the Entity List or Restricted Persons list of the US Department of Commerce Bureau of Industry and Security, any party designated by the US Treasury Department Office of Foreign Asset Control and any party debarred or sanctioned for proliferation or terrorism reasons by the US State Department.

Agreement of Sale: Buyer's order is accepted on the terms and conditions stated herein and Seller's acceptance of Buyer's order is expressly made conditional upon Buyer's assent to such terms and conditions, including any of Seller's terms and conditions which may be additional to or different from those contained in Buyer's purchase order or otherwise. Such assent shall be deemed to have been given unless written notice of objection to any such terms and conditions (including inconsistencies between Buyer's purchase order and this acceptance) is given by Buyer to Seller promptly upon receipt of this acknowledgment. Any agreement or understanding, oral or written, which modifies or waives the terms and conditions herein (whether contained in Buyer's purchase order or other documentation) shall be deemed material and shall be rejected unless hereafter agreed to in writing and signed by Seller's authorized officer. Waiver by Seller of any breach or default hereunder shall not be deemed a waiver by Seller of any other or subsequent breach or default which may thereafter occur. Neither the rights nor the obligations of either Buyer or Seller are assignable without the prior written consent of the other party. This agreement of sale and all rights and obligations of Buyer and Seller shall be governed by and construed in accordance with the laws of the State of Maryland.

Electronic copy of the latest version is available online at <http://baltimoreaircoil.com/english/terms>.

(Revised – 01/05/2017)



**BALTIMORE
AIRCOIL COMPANY**

Certificate of Wind and Seismic Load Capacity

2006, 2009, 2012, and 2015 International Building Codes (IBC)

BAC Order #:	U210599501
Product Line:	FXV Closed Circuit Cooling Tower
Model:	FXV-0812B-20D-J/WQ



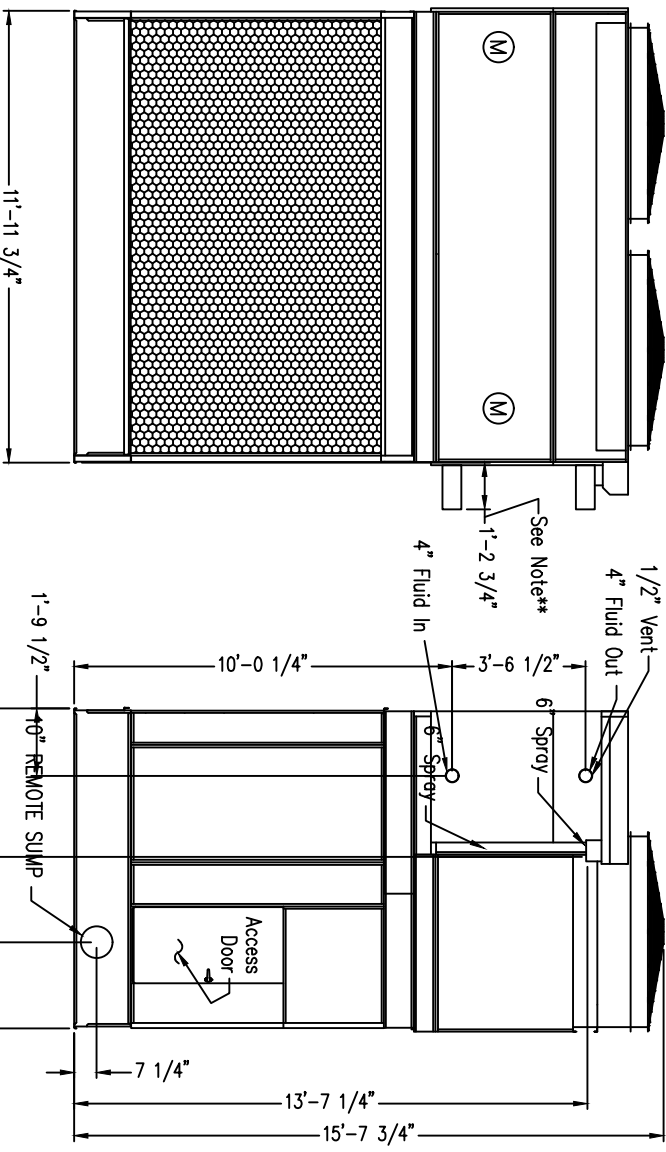
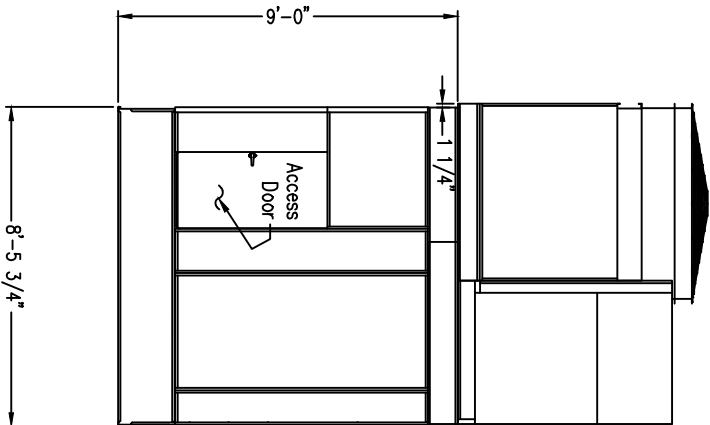
The Baltimore Aircoil Company evaporative cooling product referenced in this certificate has been designed and analyzed in accordance with the wind and seismic load requirements of the 2006 IBC, 2009 IBC, 2012 IBC, 2015 IBC, ASCE/SEI 7-05, and ASCE/SEI 7-10. Seismic qualification is based on analysis.

Wind and seismic load capacities for the referenced unit are provided below. It is the responsibility of the purchaser to determine the suitability of this unit for the specific application. Field modifications to the unit may void this certificate.

Wind Load Rating		
Horizontal Pressure (psf):	$p_h = 35$	in accordance with ASCE/SEI 7-05
Horizontal Pressure (psf):	$p_h = 58$	in accordance with ASCE/SEI 7-10
Vertical Uplift Pressure (psf):	$p_v = 46$	
Conditions:	The unit is supported and anchored as recommended. Anchor bolts are 3/4" diameter, SAE J429 Grade 5 or equivalent.	
Seismic Load Rating		
Design Spectral Acceleration (g) for Component Importance Factor, $I_p = 1.0$:	$S_{DS} = 5.79$	on grade ($z/h = 0.0$), rigid mount
	$S_{DS} = 1.93$	on rooftop ($z/h = 1.0$), rigid mount
	$S_{DS} = 1.29$	on rooftop ($z/h = 1.0$), spring-isolation mount
Conditions:	The unit is installed outside and not within an occupied space.	
	The unit is supported and anchored as recommended. Anchor bolts are 3/4" diameter, SAE J429 Grade 5 or equivalent.	
	All piping provided by others is supported and restrained independently of the unit.	

Notes

- 1) All dimensions are in feet and inches. Weights are in pounds.
- 2) Dimensions showing location of coil and spray water connections are approximate and should not be used for prefabrication of connecting piping.
- 3) The area above the discharge of the fan must be unobstructed.
- 4) For weight loading and support requirements refer to the suggested steel support drawing.
- 5) Do not support piping from unit connections. All necessary piping supports to be supplied by others.
- 6) Weights include all the options and accessories.
- 7) All unit piping connections 3" and smaller are MPT unless otherwise noted.
- 8) Heaviest Section is the Coil Section.
- 9) Coil is provided with a 1/2" threaded vent located on the upper outlet pipe stub.
- 10) Remote Sump (Spray Water) Outlet is Victaulic and beveled for welding.
- 11) Design spray water flow rate: 720 GPM at 1.0 psig. Maximum allowable pressure: 10 psig. Victaulic connection and beveled for welding.
- 12) All coil connections are beveled for welding unless otherwise noted.



Air Inlet Side

Model Number	Shipping Weight	Operating Weight	Heaviest Section
XV-0812B-20D-JMQ	9818	16062	6165

Left Hand

**Coil Connection stick-out dimension measured from outside edge of base unit flange.

ORDER NO: **U210599501**

DATE: **2/5/2021 11:36:42 AM**

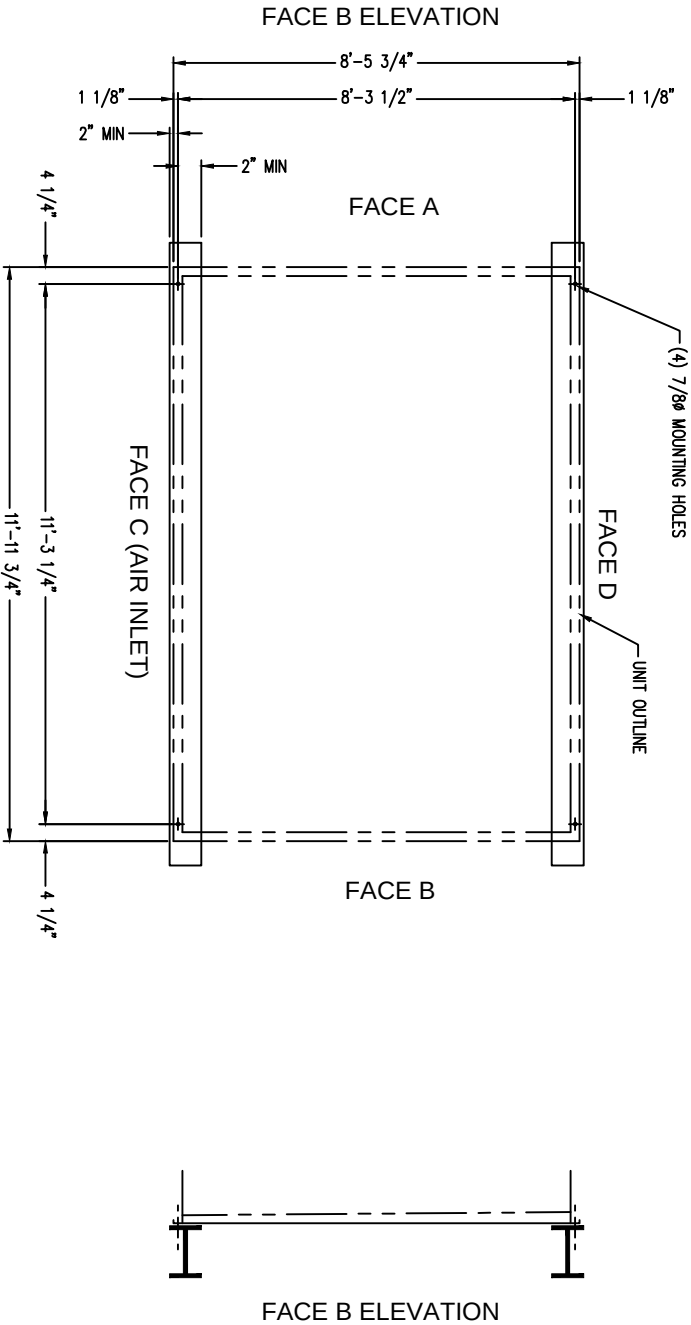


8.5 X 12 Unit Print

DRAWING NUMBER:
UP-U210599501

Notes

- 1) Supporting steelwork and anchor bolts to be designed and furnished by others.
- 2) All supporting steel must be level at top.
- 3) Beams should be selected in accordance with accepted structural practice, maximum deflection of beam under unit to be 1/360 of span, not to exceed 1/2 inch.
- 4) Supporting steel will be greater than or equal to the length of the basin.
- 5) Alternatively the unit may be supported on columns of the four corners of the unit. Consult your BAC Representative for details.
- 6) If vibration isolation rolls are used between unit and supporting steel, be certain to allow for the length of the vibration rolls when determining length of supporting steel. Vibration roll length and mounting hole locations may differ from those of the unit. Refer to vibration isolator drawings for this data.
- 7) Each beam should be designed, as a minimum, for 65% of the total unit operating weight applied as a uniformly distributed load.
- 8) Do not use this drawing to size point vibration isolators. See your BAC Representative for details.
- 9) All Dimensions are in feet and inches. All weights are in pounds.
- 10) Weights include all of the options and accessories.



Model Number	Shipping Weight	Operating Weight
XV-0812B-20D-JMQ	9818	16062

ORDER NO: **U210599501**

DATE: **2/5/2021 11:37:11 AM**



**BALTIMORE
AIRCOIL COMPANY**

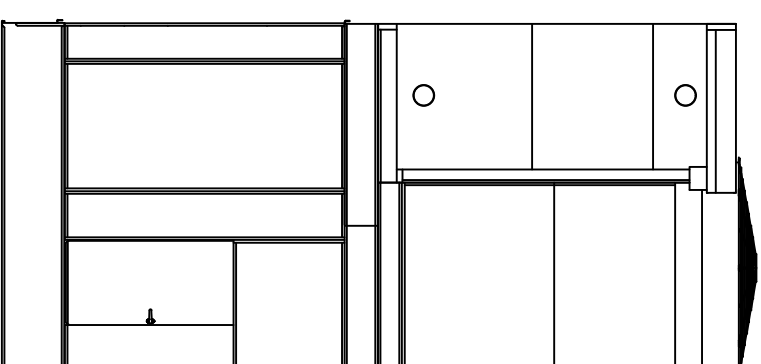
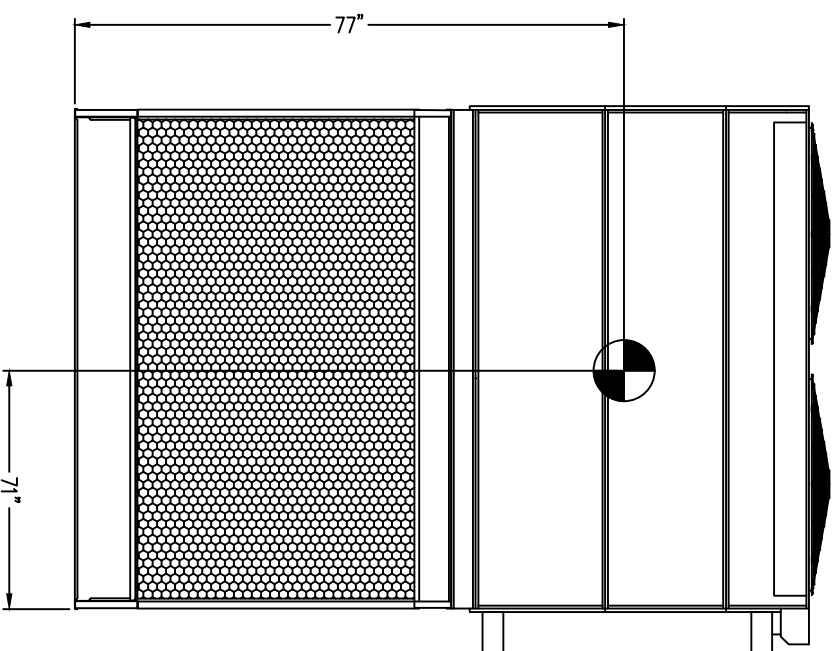
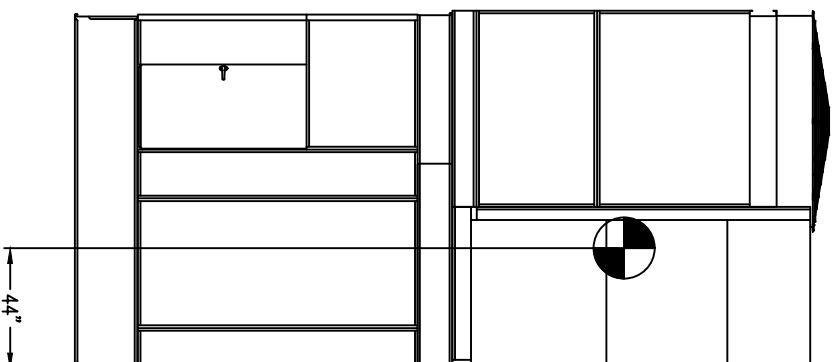
FXV/CXV Cell Unit Support

DRAWING NUMBER:

SS-U210599501

Notes

- 1) All Dimensions are in feet and inches. All weights are in pounds.
- 2) Center of gravity location is based on operating weight.
- 3) Unit shown may not reflect the configured options.



Air Inlet Side

Connection End

Model Number	Shipping Weight	Operating Weight	Heaviest Section
XV-0812B-20D-JMWQ	9818	16062	6165

ORDER NO: **U210599501**

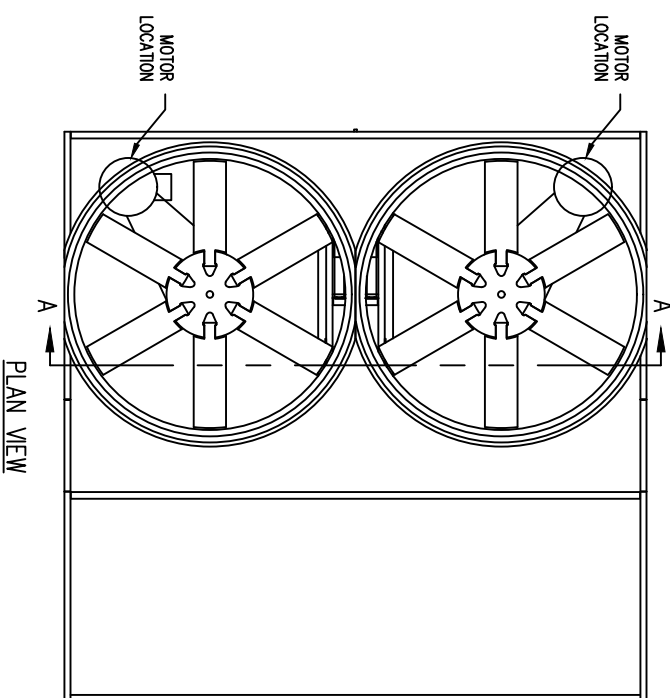
DATE: **2/5/2021 11:38:02 AM**



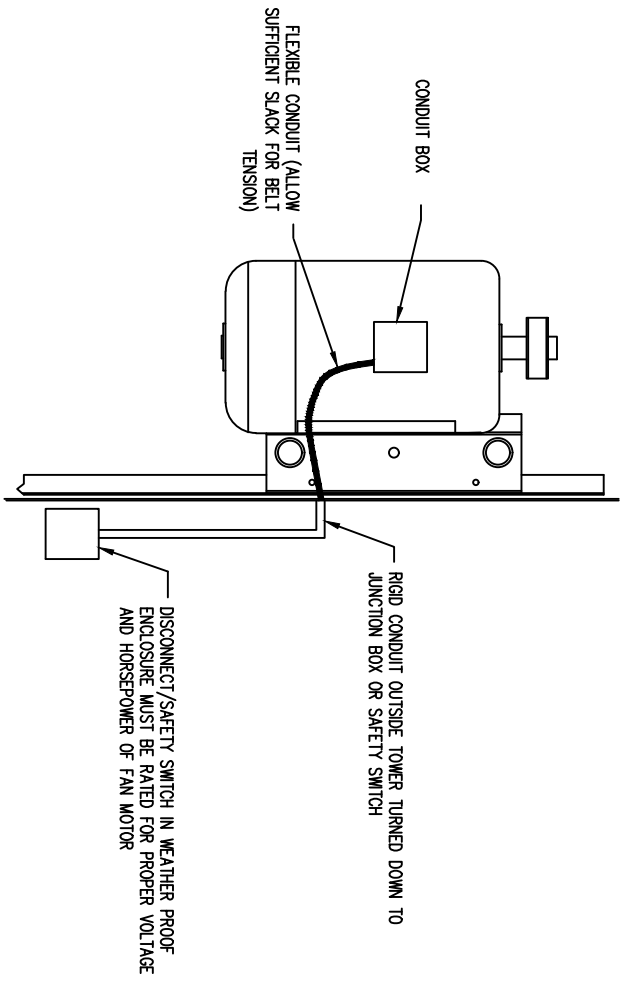
**BALTIMORE
AIRCOIL COMPANY**

8.5 X 12 Unit Center of Gravity

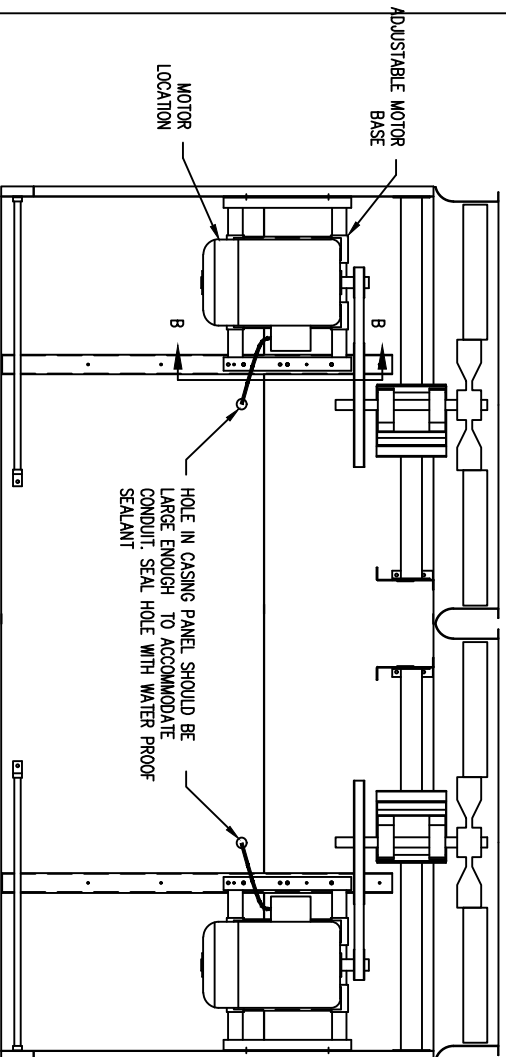
DRAWING NUMBER:
CG-U210599501



PLAN VIEW



SECTION B-B



SECTION A-A

- Notes
- 1) All conduit must be water tight and pitched downward to allow condensation to drain away from motor conduit box, therefore, do not run the conduit through the fan deck.
 - 2) All wiring must conform to local and national electrical codes. Junction box/safety switch and all conduit from fan motor conduit box to be sized, provided and installed by others.
 - 3) Rigid conduit outside casing panel must turn down to junction box.
 - 4) On multi-cell units, use separate conduit lines for each fan motor. Run conduit through adjacent cell to junction box and/or disconnect switch.

ORDER NO: **U210599501**

DATE: **2/5/2021 11:37:28 AM**



**BALTIMORE
AIRCOIL COMPANY**

**Motor and Conduit Location
Dual Fan Independent System**

DRAWING NUMBER:
ML-U210599501

OPERATING INSTRUCTIONS:

Follow the installation drawings and wiring diagram to ensure the proper operation of the vibration switch.
Direct any questions to your local BAC Representative.

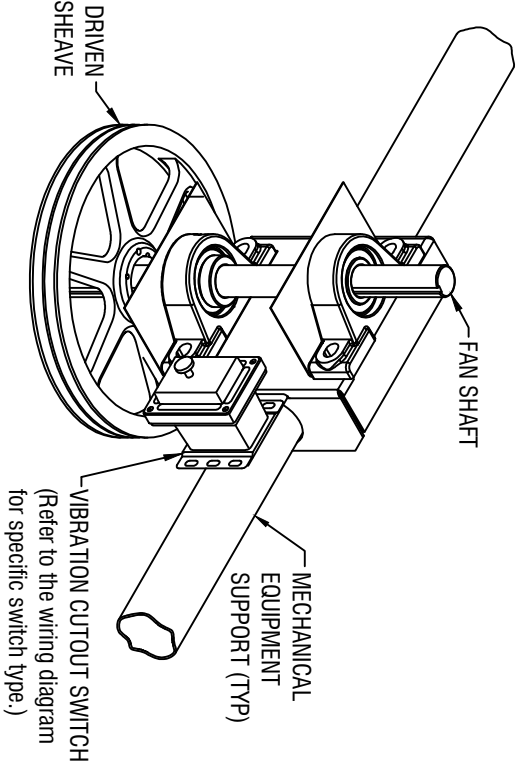
NOTE:

Moisture inside the switch can lead to switch failure. Care must be taken when replacing the cover on the vibration switch to ensure that the proper watertight seal is obtained.

CAUTION:

Before performing any maintenance, adjustment or inspection of the switch, make certain that all power has been disconnected and locked in the off position.

SWITCH LOCATION



ORDER NO: U210599501		 BALTIMORE AIRCOIL COMPANY		VC05 LOCATION	
DATE: 2/5/2021 11:49:22 AM				DRAWING NUMBER: VL-U210599501	

MECHANICAL VIBRATION CUT-OUT SWITCH
(ONE-SINGLE POLE DOUBLE THROW SWITCH)

NOTES:

1. LOCAL PUSH BUTTON RESET.
2. TO MAINTAIN HAZARDOUS DUTY RATINGS, THE FACTORY INSTALLED WATER TIGHT CONDUIT/CABLE CONNECTION FITTINGS MUST BE REMOVED AND THE FOUR CONDUCTOR CABLE MUST BE ROUTED INSIDE OF A SUITABLE EXPLOSION PROOF CONDUIT. NOTE: THE CONNECTORS CAN EASILY BE REMOVED WITHOUT HAVING TO UN-WIRE THE CONDUCTORS FROM INSIDE THE CUTOUT SWITCH.
3. THE MECHANICAL VIBRATION CUTOUT SWITCH COMES WITH TWO WATER TIGHT CONDUIT/CABLE CONNECTORS. ONE CONNECTOR IS USED TO PROVIDE A WATER TIGHT CONNECTION TO THE VIBRATION CUTOUT SWITCH AND THE OTHER IS PROVIDED FOR THE ELECTRICIAN TO CONNECT THE WIRE CABLE TO A JUNCTION BOX LOCATED IN THE VICINITY OF THE VIBRATION CUTOUT SWITCH.
4. THE SWITCH IN THE NORMALLY CLOSED CIRCUIT (BLACK WIRE) WILL OPEN WHEN THE DEVICE EXPERIENCES VIBRATION LEVELS ABOVE THE SETPOINT VALVE. IF REVERSE CONTROL LOGIC IS DESIRED, CUT OFF THE BUTT END CONNECTOR ON THE WHITE WIRE AND INSTALL A WIRE NUT OR BUTT CONNECTOR ON THE NORMALLY CLOSED WIRE (BLACK).
5. THIS MECHANICAL VIBRATION CUTOUT SWITCH COMES WITH ONE SINGLE POLE DOUBLE THROW SWITCH. THE SWITCH CONTACTS ARE "DRY CONTACTS" WHICH CAN BE SUCCESSFULLY USED DIRECTLY IN THE FAN STARTER CONTROL. (TYPICALLY AC VOLTAGE) CIRCUIT OR DIRECTLY IN A BUILDING MANAGEMENT SYSTEM (TYPICALLY D/C VOLTAGE).
CONTACT RATINGS: 3 AMPS@ 125 OR 480 VAC, 1/2 AMP@ 125 VDC, 1/4 AMP@ 250 VDC.
6. CAUTION: MOISTURE INSIDE THE SWITCH CAN LEAD TO SWITCH FAILURE. CARE MUST BE TAKEN WHEN REPLACING THE COVER ON THE VIBRATION SWITCH TO ENSURE THAT THE PROPER WATERTIGHT SEAL IS OBTAINED.

ADJUSTMENTS OF BAC MECHANICAL VIBRATION CUTOUT SWITCH

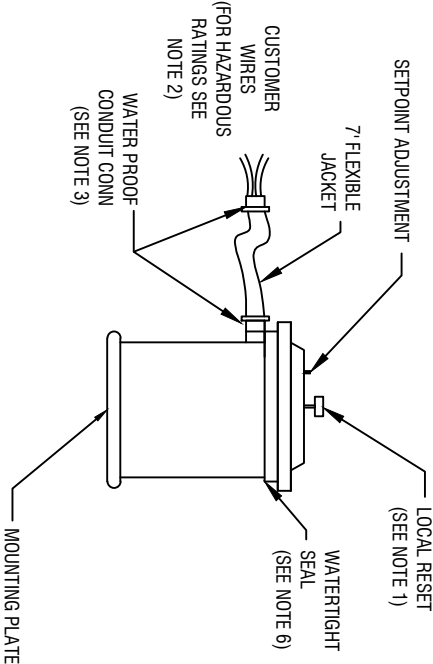
BAC RECOMMENDS THAT EACH VIBRATION CUTOFF SWITCH BE FIELD ADJUSTED AT START-UP TO OPTIMIZE THE TRIP POINT RELATIVE TO THE FINAL MOUNTING POSITION AND VIBRATION CHARACTERISTICS OF THE INSTALLED EQUIPMENT.

NOTE: INSTALLATION AND ADJUSTMENT MUST BE PERFORMED BY QUALIFIED, COMPETENT TECHNICIAN

1. FOR YOUR SAFETY, TURN OFF, THEN LOCK & TAG-OUT THE ELECTRICAL SUPPLY TO THE FAN MOTOR(S).
2. PUSH IN THE MANUAL RESET SWITCH TO ENSURE UNIT IS IN UNTRIP STATE (USING AN OHMMETER, VERIFY THE CIRCUIT BETWEEN "COMMON" AND "N.C." IS CLOSED. THE SWITCH COMES WITH PRE-WIRED CABLE SO OPENING THE SWITCH IS **NOT** NECESSARY TO PERFORM THIS TASK. IF CIRCUIT IS OPEN (TRIPPED STATE) SKIP STEP 3 AND GO TO STEP 4.
3. TURN ADJUSTMENT SCREW COUNTERCLOCKWISE (CCW) 1/8 TURN AT A TIME UNTIL THE CIRCUIT BETWEEN "COMMON" AND "N.C." IS OPEN (TRIPPED STATE)
4. ONCE TRIPPED, ROTATE ADJUSTMENT SCREW 1/4 TURN CLOCKWISE (CW) AND THEN PUSH IN MANUAL RESET BUTTON (THE CIRCUIT BETWEEN "COMMON" AND "N.C." IS CLOSED)
5. START UP FAN(S) TO DETERMINE IF THE START-UP WILL CAUSE THE CUT-OUT SWITCH TO TRIP.
 - a. IF THE VIBRATION CUTOUT SWITCH DOES NOT TRIP.
 - i. START AND STOP THE FAN TWO MORE TIMES AND IF THE CUTOUT SWITCH STILL DOES NOT TRIP, THEN CALIBRATION IS COMPLETE.
 - b. IF THE VIBRATION CUTOUT SWITCH DID TRIP.
 - i. TURN OFF, THEN LOCK & TAG-OUT THE ELECTRICAL SUPPLY TO THE FAN MOTOR(S).
 - ii. ADJUST THE SET POINT SCREW AN ADDITIONAL 1/4 TURN CW AND THEN PUSH IN THE RESET BUTTON.
 - iii. RE-START THE FAN(S) TO DETERMINE IF THE START-UP WILL CAUSE THE SWITCH TO TRIP.
- NOTE: REPEAT THIS ADJUSTMENT PROCESS (STEP 5.a.-5.b.iii) UNTIL THE UNIT DOES NOT TRIP.
- iv. ONCE THE FINAL ADJUSTMENT HAS BEEN MADE, START AND STOP THE FAN TWO MORE TIMES AND IF THE CUOUT SWITCH STILL DOES NOT TRIP, THEN CALIBRATION IS COMPLETE.

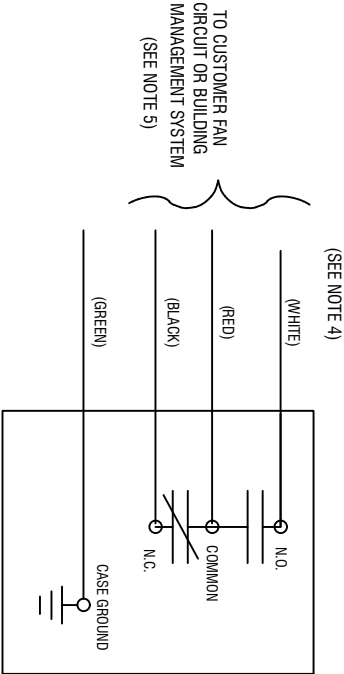
WIRING OF VIBRATION CUTOUT SWITCHES ON UNITS WITH MULTIPLE MOTORS OR CUTOUT SWITCHES:

VIBRATION CUTOUT SWITCHES SHOULD BE WIRED TO SHUT OFF ALL MOTORS ON THE ASSOCIATED FAN DRIVE SYSTEM. THIS MAY REQUIRE WIRING MULTIPLE CUTOUT SWITCHES TO SHUT OFF A SINGLE MOTOR OR WIRING A SINGLE CUTOUT SWITCH TO SHUT OFF MULTIPLE MOTORS. CONTACT YOUR CONTROLS INTEGRATOR FOR DETAILS ON HOW TO WIRE MULTIPLE SWITCHES.



WIRING DIAGRAM

(ONE-SINGLE POLE DOUBLE THROW SWITCH - SEE NOTE 5)



BEFORE PERFORMING ANY MAINTENANCE, ADJUSTMENT OR INSPECTION OF THE SWITCH, MAKE CERTAIN THAT ALL POWER HAS BEEN DISCONNECTED AND LOCKED IN THE OFF POSITION.

Data Version 1.12
DWG Version 1.10

ORDER NO:

U210599501

DATE:

2/5/2021 11:49:06 AM



BALTIMORE
AIRCOIL COMPANY

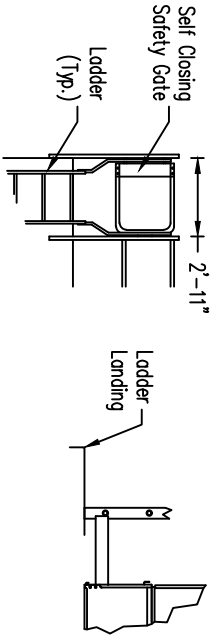
Mechanical VCOS Wiring
Shut Off with Local Reset

DRAWING NUMBER:

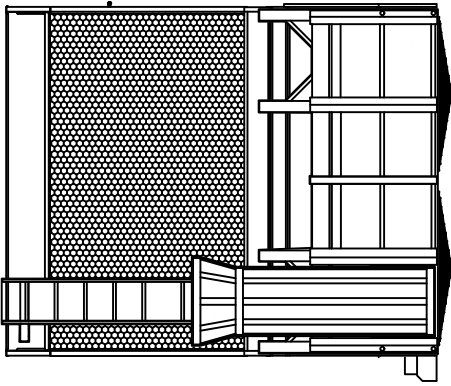
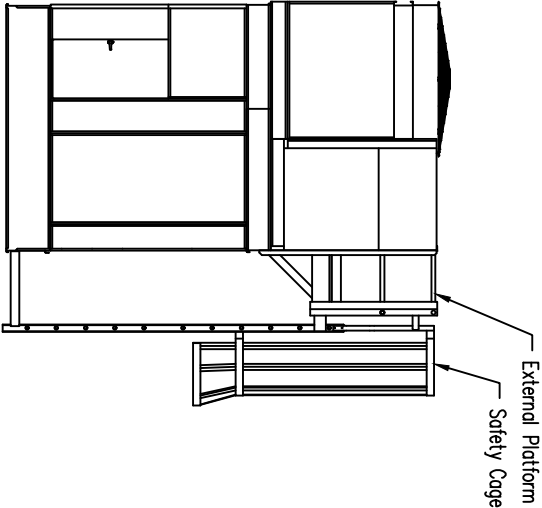
VW-U210599501

Notes

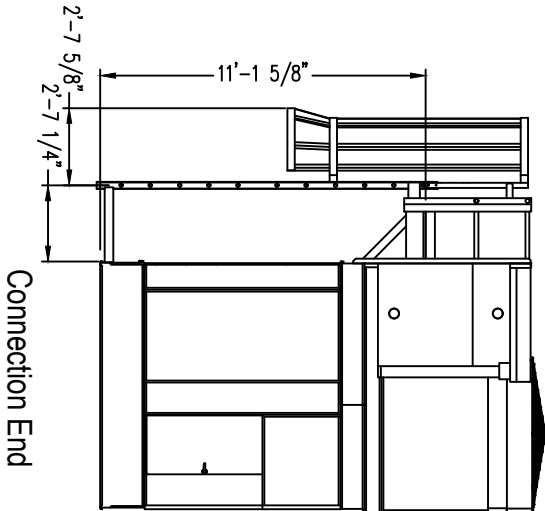
- 1) All Dimensions are in feet and inches. All weights are in pounds.
- 2) This drawing is not indicative of the specific configuration of the unit. Please refer to the unit print and other supporting drawings for configuration details.
- 3) External service platform and ladder ship loose for field assembly.
- 4) External unit access accessories ship loose for field assembly.
- 5) Field piping must be kept clear and supported independently of all unit access accessories.
- 6) Self closing, OSHA-compliant, safety gates are provided for all platform packages. Refer to OSHA and local occupational safety regulations to determine if safety gates are required.
- 7) Optional ladder extensions are available for all ladder packages.



Safety Gate Detail



Air Inlet Side



Model Number	Shipping Weight	Operating Weight	Heaviest Section
XV-4812B-20D-J/M/Q	9818	16062	6165

ORDER NO: **U210599501**

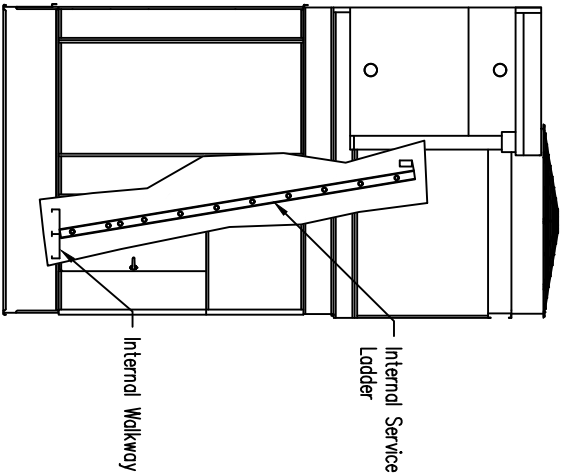
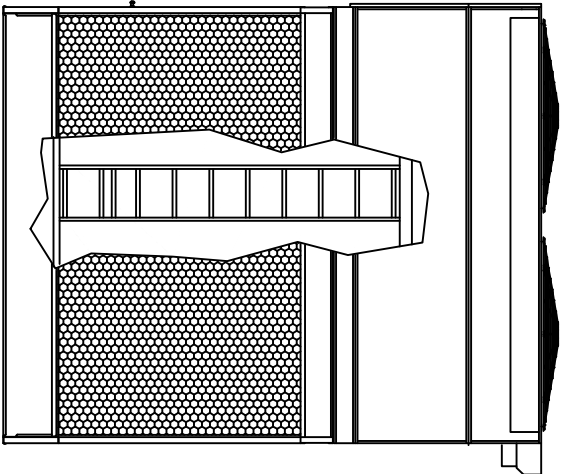
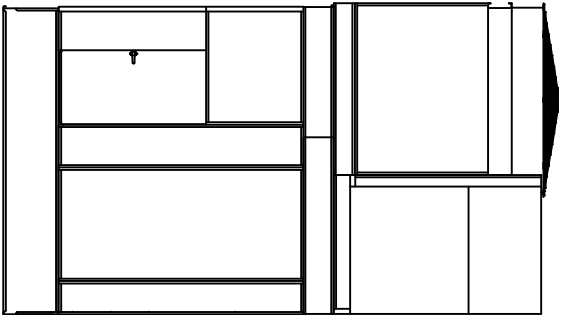
DATE: **2/5/2021 11:46:37 AM**



8.5 X 12 Accessories

DRAWING NUMBER:
EA-U210599501

- Notes
- 1) All Dimensions are in feet and inches. All weights are in pounds.
 - 2) This drawing is not indicative of the specific configuration of the unit. Please refer to the unit print and other supporting drawings for configuration details.
 - 3) Internal Ladder ships loose for field assembly



Air Inlet Side

Connection End

Model Number	Shipping Weight	Operating Weight	Heaviest Section
XV-4812B-20D-J/M/Q	9818	16062	6165

ORDER NO: **U210599501**

DATE: **2/5/2021 11:48:50 AM**



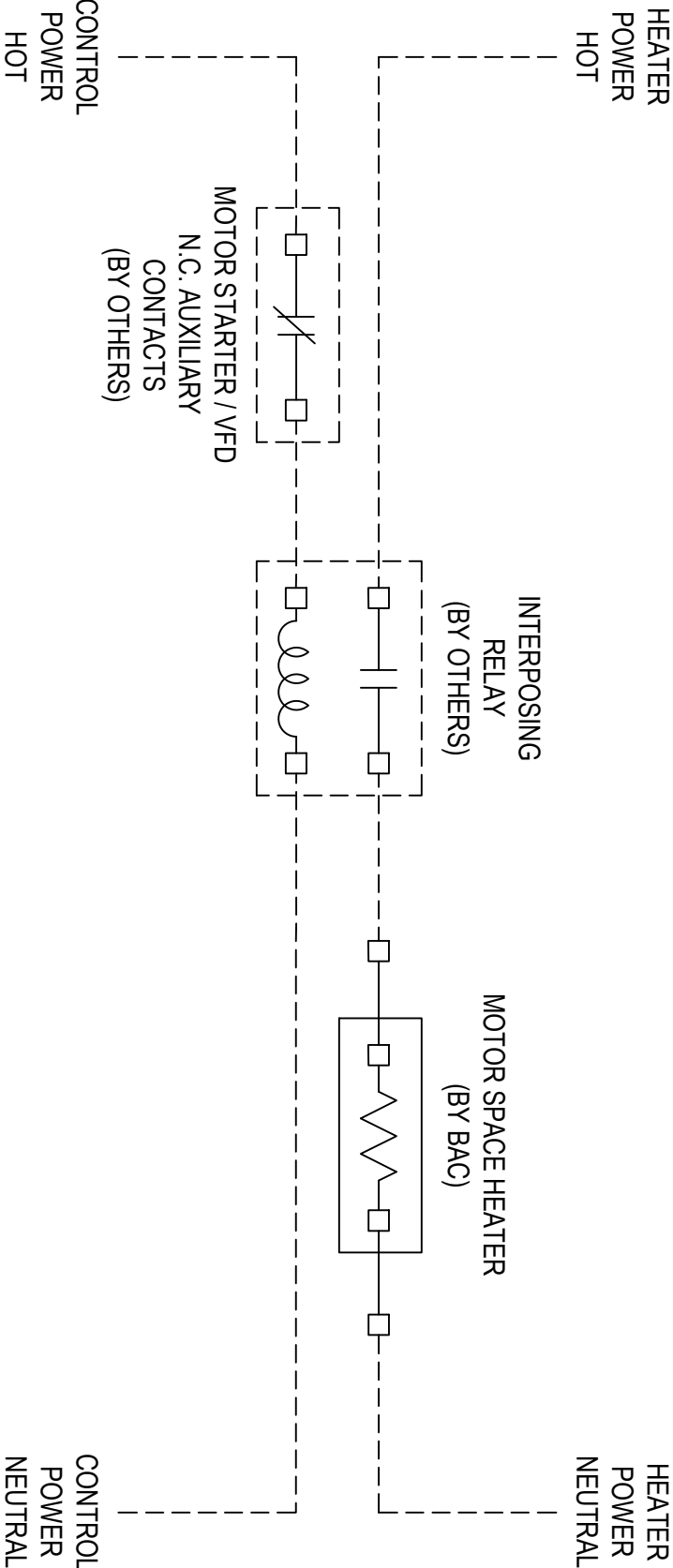
**BALTIMORE
AIRCOIL COMPANY**

8.5 X 12 Internal Access

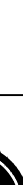
DRAWING NUMBER:
IA-U210599501

Notes

- 1) Motor Heater should only be energized when the fan is stopped (0% fan speed).
- 2) Interposing relay must be sized per the heater power consumption.
- 3) Heater sizes shown below are maximum values. Refer to the motor nameplate for final power requirements.
- 4) General heater wiring details shown, see diagram on motor for specific details.
- 5) All wiring must comply with all codes and standards applicable for the installed jurisdiction, which may include requirements for additional disconnects, over current protection, and/or other safety devices.
- 6) Dashed lines represent field supplied wiring.
- 7) Space heater wiring leads may be located in either the main outlet box, or an auxiliary box if so equipped.



For units that ship from the US, heaters are 110-120 VAC/ 50 or 60 Hz based on motor configuration.
For units that ship from China, heaters are 200-240 VAC/ 50 or 60 Hz based on motor configuration.

ORDER NO: U210599501		 BALTIMORE AIRCOIL COMPANY
DATE: 2/5/2021 11:46:51 AM		
		Fan Motor Space Heater Wiring Schematic - General
		DRAWING NUMBER: SW-U210599501

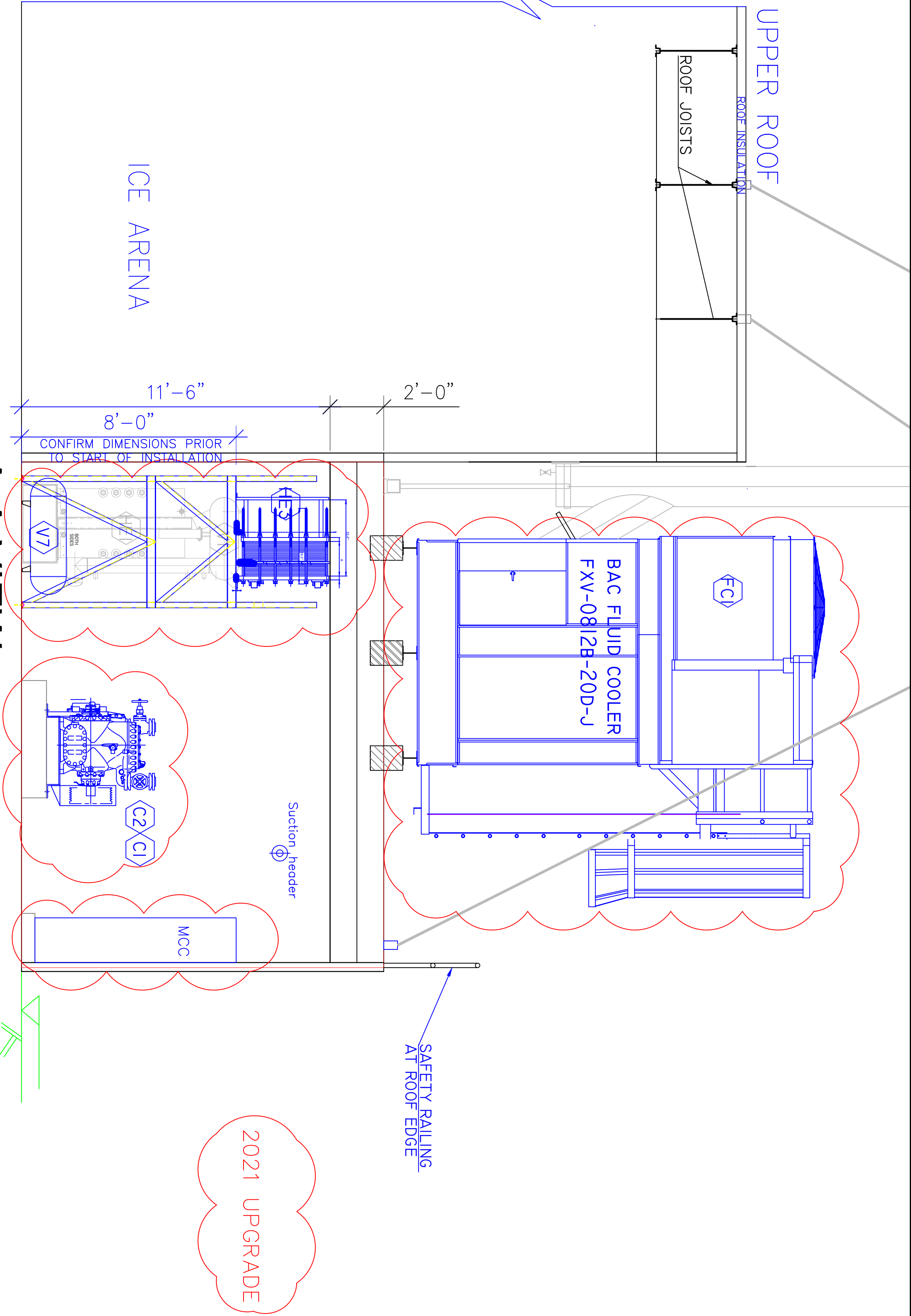


Corporation of the City of
NEW WESTMINSTER

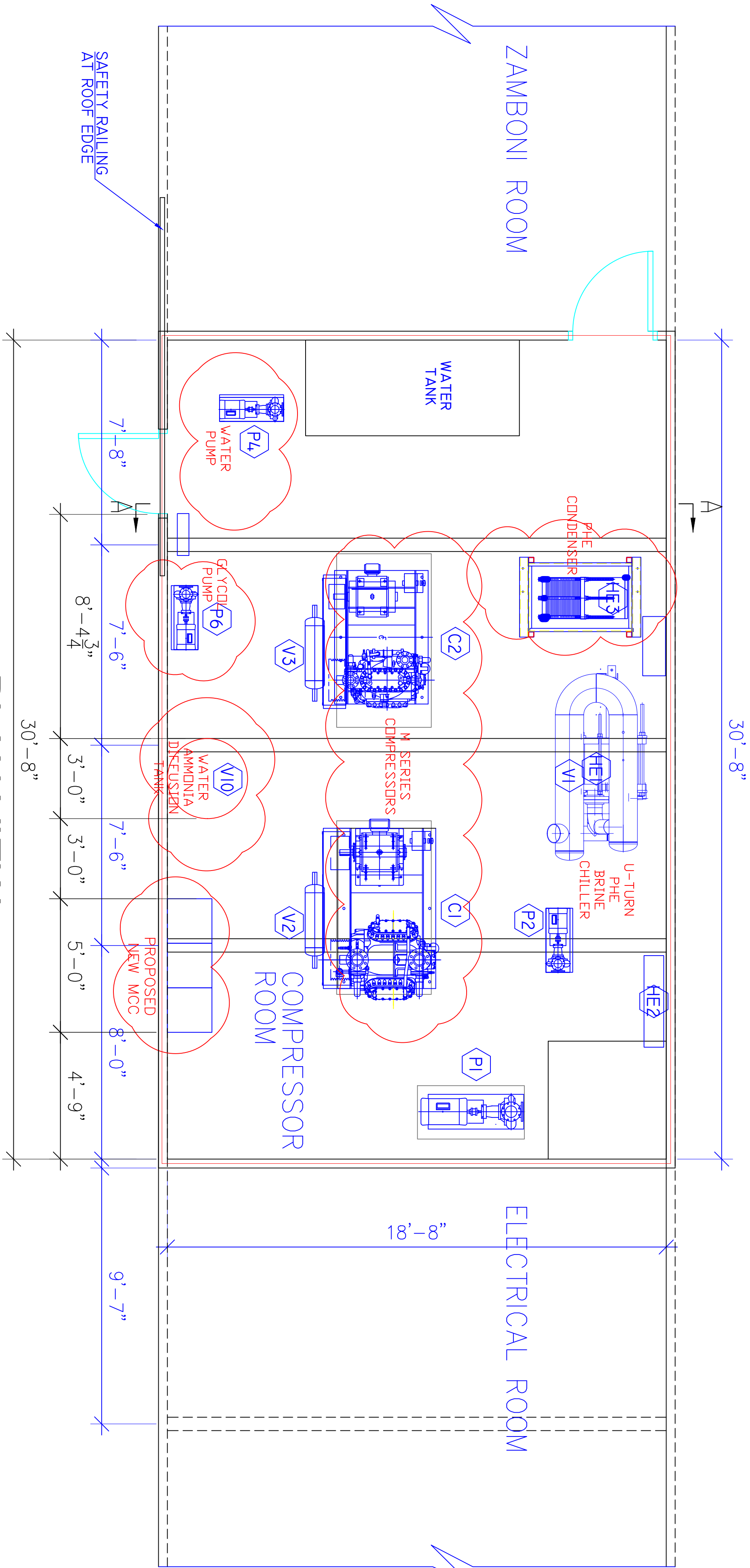
NWRFP-21-03

APPENDIX E

DRAWINGS



A-A VIEW



PLAN VIEW

- NOTE:
1. CONTRACTOR IS TO CONFIRM ALL PIPING DETAILS AND ROOM DIMENSIONS PRIOR TO START OF PROJECT.
 2. CONTRACTOR IS TO CONFIRM THE EQUIPMENT LAYOUT BASED ON THE DIMENSIONS OF FINALIZED EQUIPMENT SELECTION.
 3. THE DIMENSIONS SHOWN ON THIS DRAWING ARE JUST FOR REFERENCE. CONTRACTOR SHALL CONFIRM DIMENSIONS ON SITE FOR THE FINAL EQUIPMENT LAYOUT AND STRUCTURAL SUPPORT DESIGN.
 4. THE STRUCTURAL STEEL SUPPORT FOR THE PLATE & FRAME CONDENSER HE3 SHALL BE DESIGNED BY A STRUCTURAL ENGINEER, WHO IS TO BE HIRED BY THE CONTRACTOR. THE STEEL SUPPORT FRAME FOR THE FLUID COOLER FC01 IS DESIGNED BY ARCUS CONSULTING. PLEASE REFER TO THE STRUCTURAL DRAWING S01, S02, S03, AND S04 FOR THE DETAILS.
 - 5.

EQUIPMENT IDENTIFICATION	
C-1	WYCOM N4M11 COMPRESSOR PACKAGE, 75HP MOTOR, 2021
C-2	WYCOM N2M11 COMPRESSOR PACKAGE, 50HP MOTOR, 2021
HE-1	ALFA LAVAL PLATE & FRAME CHILLER, 2020
HE-2	SUB-FLOOR GLYCOL/BRINE HEATER, 2021
HE-3	ALFA LAVAL PLATE & FRAME NH3/GLYCOL CONDENSER, 2021
HE-4	BUSCH THI-00884 ICE QUICK TAKE-OUT BRINE HEATER
V-1	ALFA LAVAL P&F CHILLER U-TURN SURGE DRUM, 2020
V-2	HT INDUSTRIAL OIL SEPARATOR FOR C1, 2020
V-3	HT INDUSTRIAL OIL SEPARATOR FOR C2, 2020
V-4	HT INDUSTRIAL OIL POT, 2020
V-5	COLD BRINE BALANCE TANK, 2020
V-6	CONDENSER REMOTE WATER SLUMP
V-7	AMMONIA STORAGE HPR RECEIVER, 2021
V-8	WARM BRINE BALANCE TANK
V-9	GLYCOL EXPANSION TANK, 2021
V-10	WATER AMMONIA DIFFUSION TANK (SUPPLIED BY THE OWNER)
P-1	ARMSTRONG COLD BRINE PUMP, 25HP, 2020
P-2	ARMSTRONG S/F HEATING WARM BRINE PUMP, 3HP
P-3	BIRAN CHERILLE SNOW MELT GLYCOL PUMP, 2HP
P-4	FLUID COOLER REMOTE WATER PUMP, 2021
P-5	ARMSTRONG COMP. COOLING WATER PUMP, 3/4HP, 2021
P-6	ARMSTRONG GLYCOL MAIN CIRCULATING PUMP, 2021
FC-1	BAC FXV-0812B-20D-J FLUID COOLER, 2021

No.	DATE	DESCRIPTION
1	09/03/2021	FIRST REVISION FOR REVIEW
2	11/18/2021	RFI

REFRIGERATION DRAWINGS ARE THE PROPERTY OF JS REFRIGERATION ENGINEERING AND MAY NOT BE REPRODUCED WITHOUT THE JS REFRIGERATION ENGINEERING'S PERMISSION.

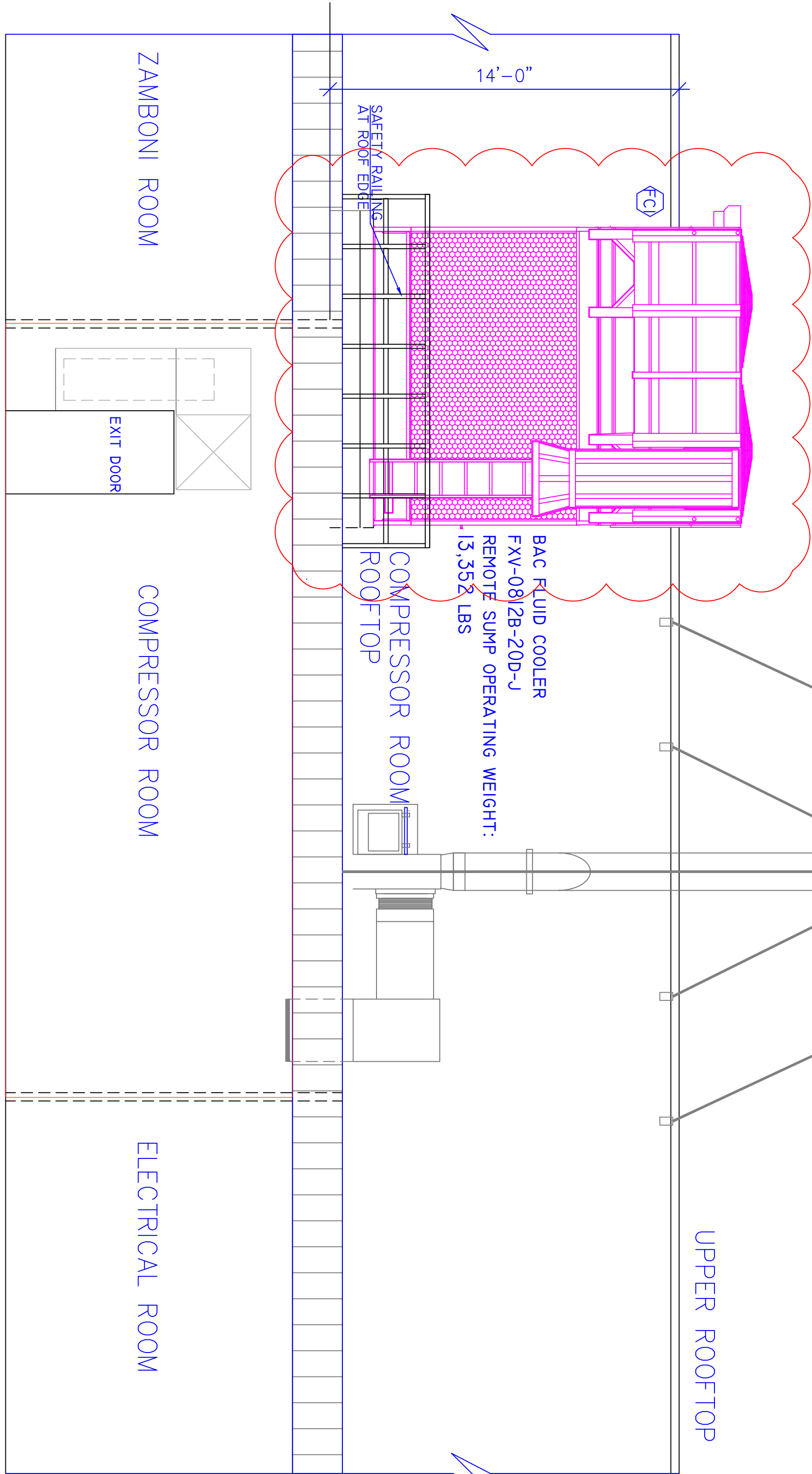
PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

JS REFRIGERATION ENGINEERING INC.
JS REFRIGERATION ENGINEERING INC.
Tel: (604) 437-0000 Fax: (604) 317-9833
www.jsreco.ca

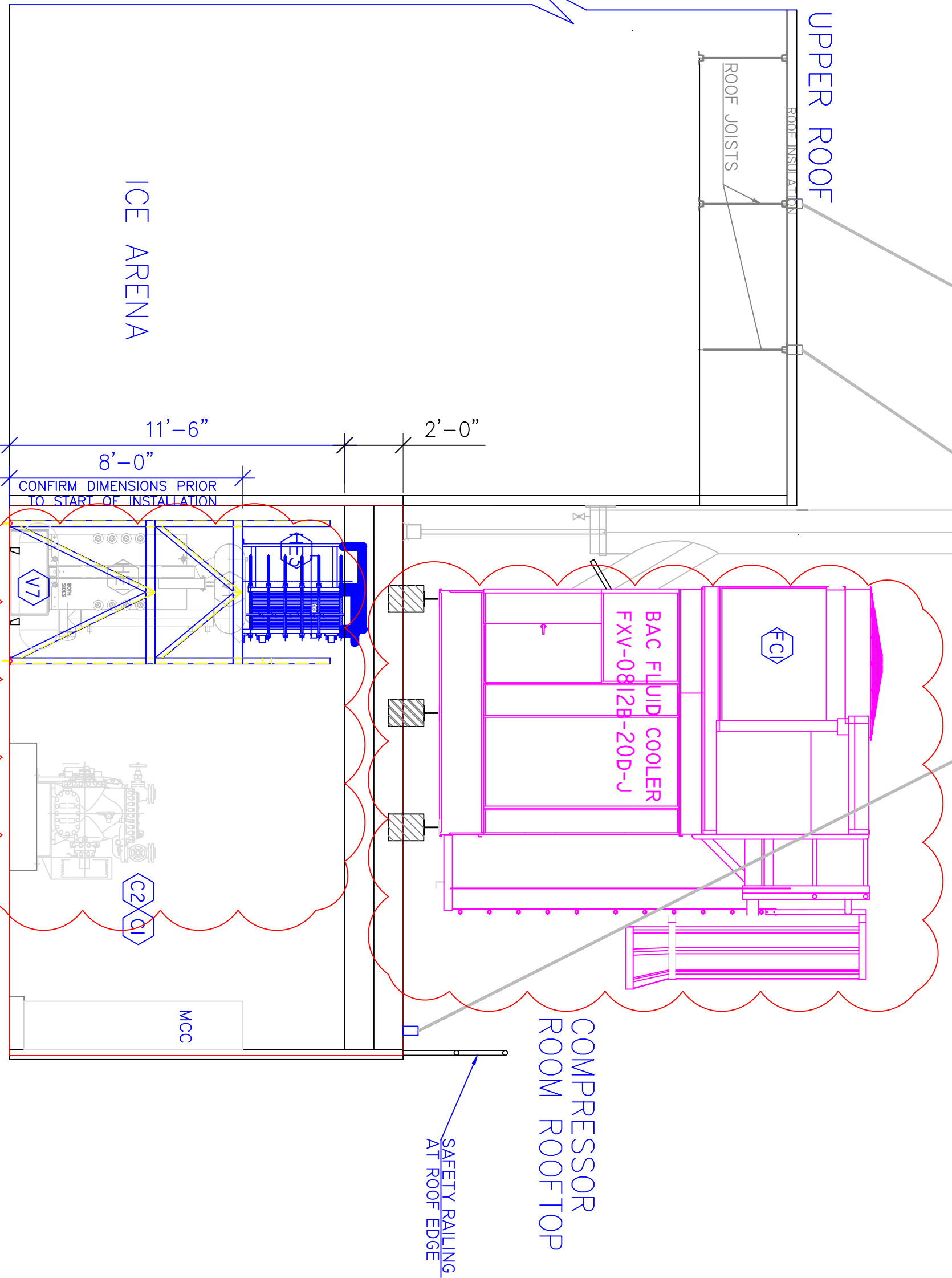
MOODY
REFRIGERATION LTD.
Moody Park Arena
701 8th AVE
NEW WESTMINSTER, BC
CITY OF NEW WESTMINSTER

PROJECT:
REFRIGERATION PLANT
2021 UPGRADES
DRAWING TITLE:
COMPRESSOR ROOM
REFRIGERATION LAYOUT

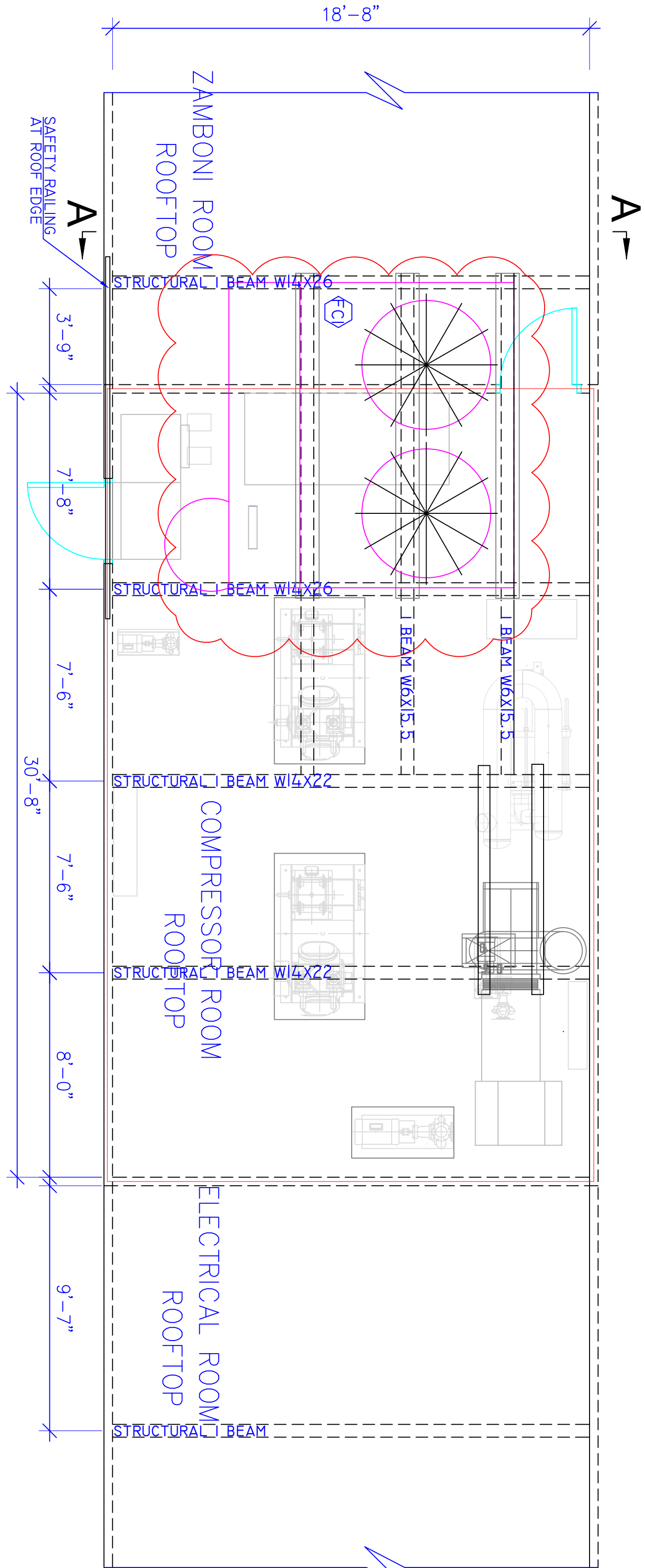
DATE REVISIONED	SCALE	DESIGNED BY
		N T S
DRAWN		GH
REVIEWED		JAMES SHOU
PROJECT No.	2615	
REV. No.	DWG No.	



ELEVATION VIEW



A-A VIEW



PLAN VIEW

EQUIPMENT IDENTIFICATION	
FC-1	WYCON NAAM COMPRESSOR PACKAGE, 75HP MOTOR, 2021
FC-2	WYCON NAAM COMPRESSOR PACKAGE, SUMP MOTOR, 2021
HE-1	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-2	SUB-FLOOR GLYCOL/BRINE HEATER, 2021
HE-3	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-4	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-5	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-6	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-7	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-8	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-9	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-10	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-11	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-12	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-13	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-14	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-15	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-16	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-17	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-18	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-19	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-20	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-21	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-22	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-23	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-24	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-25	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-26	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-27	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-28	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-29	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-30	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-31	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-32	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-33	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-34	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-35	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-36	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-37	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-38	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-39	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-40	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-41	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-42	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-43	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-44	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-45	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-46	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-47	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-48	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-49	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-50	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-51	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-52	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-53	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-54	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-55	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-56	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-57	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-58	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-59	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-60	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-61	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-62	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-63	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-64	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-65	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-66	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-67	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-68	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-69	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-70	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-71	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-72	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-73	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-74	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-75	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-76	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-77	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-78	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-79	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-80	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-81	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-82	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-83	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-84	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-85	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-86	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-87	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-88	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-89	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-90	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-91	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-92	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-93	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-94	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-95	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-96	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-97	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-98	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-99	24" DIA. DIAPHRAGMATIC HEATER, 2021
HE-100	24" DIA. DIAPHRAGMATIC HEATER, 2021

- NOTE:
- CONTRACTOR IS TO CONFIRM ALL PIPING DETAILS AND ROOM DIMENSIONS PRIOR TO START OF PROJECT.
 - CONTRACTOR IS TO CONFIRM THE EQUIPMENT LAYOUT BASED ON THE DIMENSIONS OF FINALIZED EQUIPMENT SELECTION.
 - THE DIMENSIONS SHOWN ON THIS DRAWING ARE JUST FOR REFERENCE. CONTRACTOR SHALL CONFIRM DIMENSIONS ON SITE FOR THE FINAL EQUIPMENT LAYOUT AND STRUCTURAL SUPPORT DESIGN.
 - THE STRUCTURAL STEEL SUPPORT FOR THE PLATE & FRAME CONDENSER HE3 SHALL BE DESIGNED BY A STRUCTURAL ENGINEER, WHO IS TO BE HIRED BY THE CONTRACTOR. THE STEEL SUPPORT FRAME FOR THE FLUID CODLER FC01 IS DESIGNED BY ARCUS CONSULTING. PLEASE REFER TO THE STRUCTURAL DRAWING S01, S02, S03, AND S04 FOR THE DETAILS.
 -

2021 UPGRADE

No.	DATE	DESCRIPTION
1	09/23/2021	FIRST REVISION FOR REVIEW
2	11/13/2021	RFI

REFRIGERATION DRAWINGS ARE THE PROPERTY OF JS REFRIGERATION ENGINEERING AND MAY NOT BE REPRODUCED WITHOUT THE JS REFRIGERATION ENGINEERING'S PERMISSION.

PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

JS REFRIGERATION ENGINEERING INC.
JS REFRIGERATION ENGINEERING INC.
161 (604) 437-1111
161 (604) 437-1111
161 (604) 437-1111

REFRIGERATION LTD.

Moody Park Arena
701 8th Ave
NEW WESTMINSTER, BC

NEW WESTMINSTER
CITY OF NEW WESTMINSTER

REFRIGERATION PLANT
2021 UPGRADES
DRAWING TITLE:
COMPRESSOR ROOM ROOFTOP
LAYOUT

DATE	SCALE	NO.
2021	N T S	2615
2021	OH	2615
2021	JAMES SHOU	2615
2021	2615	2615

THIS DESIGN & DRAWING IS AND AT ALL TIMES REMAIN THE EXCLUSIVE PROPERTY OF ARCUS CONSULTING LTD. AND CANNOT BE REPRODUCED WITHOUT THE CONSENT OF ARCUS CONSULTING LTD.

REVISION	SUBJECT	DATE
----------	---------	------

-	ISSUED FOR TENDER	2021.02.08

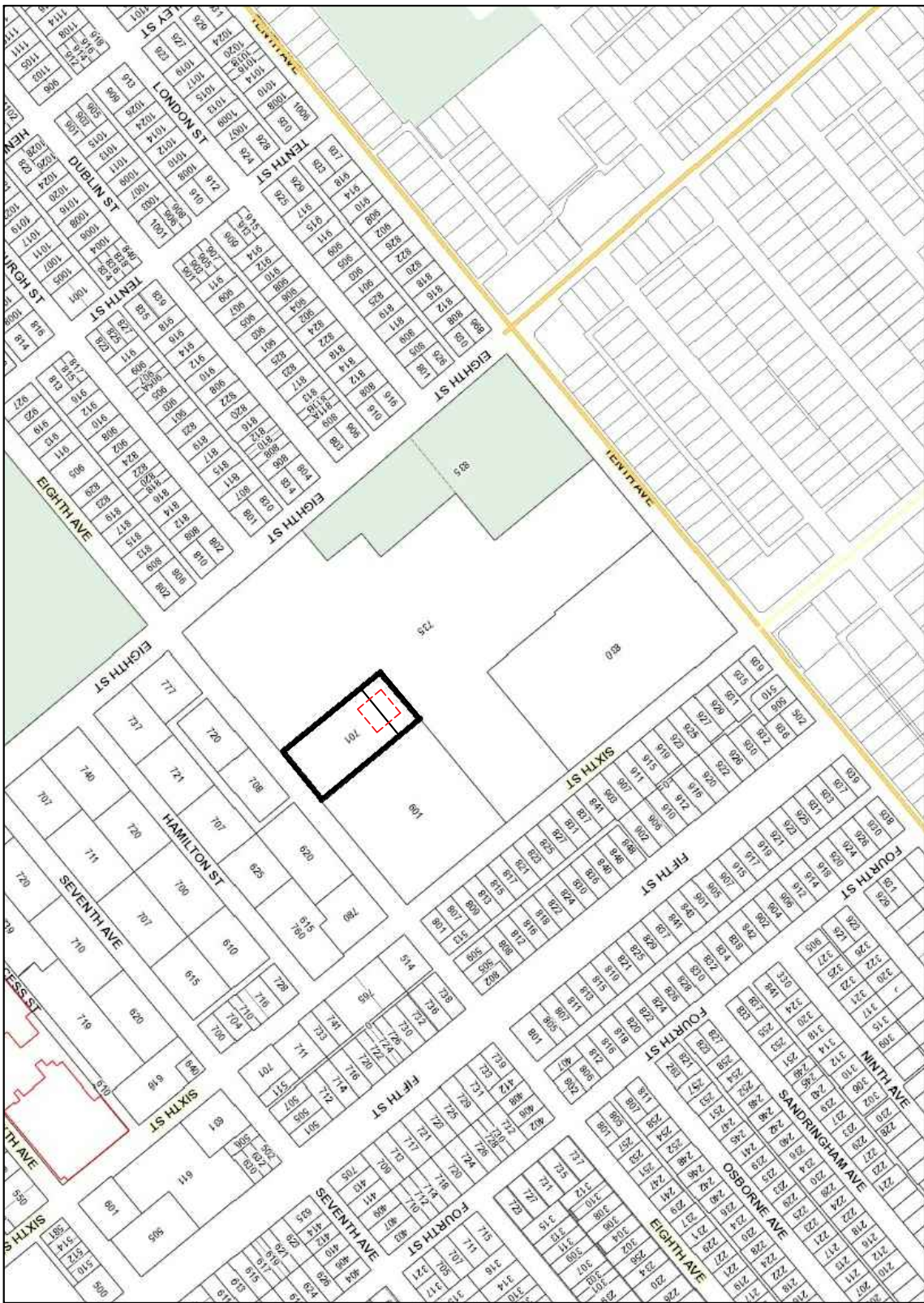
	ISSUED	DATE

THIS DESIGN & DRAWING IS AND AT ALL TIMES REMAIN THE EXCLUSIVE PROPERTY OF ARCUS CONSULTING LTD. AND CANNOT BE REPRODUCED WITHOUT THE CONSENT OF ARCUS CONSULTING LTD.

REVISION	SUBJECT	DATE
----------	---------	------

-	ISSUED FOR TENDER	2021.02.08

	ISSUED	DATE



1 SITE MAP
S02 NOT TO SCALE

PROJECT:
WOODY PARK ARENA
NEW COOLING TOWER

701 Eighth Ave, New Westminster

DRAWING TITLE:

GENERAL NOTES

DRAWN BY: RG	SHEET No.
CHECKED BY: DT	
DATE: FEB 2021	
SCALE: N/A	
PROJECT No: 221-018	S01

5. STRUCTURAL STEEL DECK

- 5.1 ALL STRUCTURAL STEEL DECK AND RELATED WORK SHALL CONFORM TO CSA CAN 3.5316 W COLD-FORMED STEEL MEMBERS CANADIAN SHEET STEEL BUILDING INSTITUTE STANDARDS.
- 5.2 THE THICKNESS AND PROFILE OF THE STEEL DECK SHALL BE SELECTED TO SUPPORT THE APPLICABLE LIVE LOADS PROVIDED BY THE CODES OR THOSE SPECIFIED ON THE DRAWINGS DEFLECTION SHALL NOT EXCEED 1/360 OF THE SPAN LENGTH UNDER THE LIVE LOAD.
- 5.3 THE STEEL DECK AND ALL RELATED MATERIALS SHALL BE DELIVERED IN GOOD CONDITION, COMPLETE WITH MANUFACTURERS STAMPS AND SEAL INTACT. ANY DECK SHOWING SIGNS OF VISUAL DAMAGE WILL NOT BE USED, INCLUDING DECKS THAT ARE DAMAGED DURING INSTALLATION. ALL DECKS SHOULD BE MOVED AND STORED CAREFULLY TO MINIMIZE THE RISK OF DAMAGE.
- 5.4 DECK CLOSURE STRIPS ARE TO BE PROVIDED AT EDGES OF THE DECK AS REQUIRED.
- 5.5 WELDERS MUST BE CWB CERTIFIED FOR THIN GAUGE MATERIALS
- 5.6 THE DECKING AND CLADDING SHALL BE UNIFORM, Y FORMED TO ENSURE THAT LEVELS AND TRUE ALIGNMENTS ARE CONSISTENT.
- 5.7 FOR ALL HOLES REQUIRED, THE DECK SHALL BE CUT OR FITTED ACCORDINGLY BY THE DECK ERECTORS. THE ERECTORS SHALL ENSURE THAT ANY HOLES EXCEEDING 18" IN ANY DIRECTION HAS ADEQUATE STEEL SUPPORT PROVIDED BY THE RELEVANT PARTIES. ANY HOLE THAT CUTS A SUPPORT LEG OF THE DECK MUST BE PROVIDED WITH ADEQUATE REINFORCEMENT AND BRACING.

6. TEMPORARY WORKS AND SITE SAFETY

- 6.1 ALL TEMPORARY WORKS REQUIRED FOR COMPLETION OF THE CONSTRUCTION IS NOT THE RESPONSIBILITY OF ARCUS CONSULTING LTD.
- 6.2 ALL METHODS OF CONSTRUCTION SHALL BE CONSTRUCTED IN A PROPER AND SAFE MANNER, AND SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THESE METHODS INCLUDE BUT ARE NOT LIMITED TO: SHORING, RESHORING, FORMWORK, SCAFFOLDING, BARRIERS, WALKWAYS AND GUARD RAILS.
- 6.3 THE CONTRACTOR IS RESPONSIBLE TO COMPLY WITH ALL REQUIREMENTS RELATED TO THE JURISDICTION OF THE WORKERS COMPENSATION BOARD AND WHERE NECESSARY, PROVIDE ENGINEERING EXPERTISE TO CONFIRM SUCH COMPLIANCE.

7. CONTRACTOR REQUESTED CHANGES

- 7.1 ALL ALTERATIONS MADE AS A RESULT OF UNFORESEEN SITE CONDITIONS OR DIFFERING CONSTRUCTION PROCEDURES SHALL BE MARKED UPON A SET OF STRUCTURAL DRAWINGS, INCLUDING ALL APPLICABLE DIMENSIONS.
- 7.2 IF A CONTRACTOR PERCEIVES THAT A CHANGE IN THE PLANS WILL RESULT IN A BETTER, OR MORE EFFICIENT CONSTRUCTION THEY CAN SUBMIT THESE REQUESTS. IT IS PREFERABLE THAT EACH SUBMISSION BE CLEARLY DETAILED AND ACCOMPANIED BY A SKETCH OF THE CHANGES. ACCEPTANCE, REJECTION OR MODIFICATION OF THE SUBMISSION IS ENTIRELY AT THE DISCRETION OF THE STRUCTURAL ENGINEER.

8. CONDITIONS OF FIELD REVIEW

- 8.1 A MINIMUM OF 48 HRS NOTICE SHALL BE GIVEN TO THE ENGINEER PRIOR TO ANY FIELD REVIEW THAT NEED BE CONDUCTED.
- 8.2 IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE FIELD REVIEWS WITH THE COMPLETION OF APPROPRIATE LEVELS OF WORK TO BE INSPECTED.
- 8.3 AT THE DISCRETION OF THE ENGINEER, WORK THAT HAS BEEN COVERED BY FINISHES PRIOR TO THE FIELD REVIEW MAY NEED TO BE REMOVED. THE CONTRACTOR SHALL INCUR THE COST OF THIS WORK.

9. PRE-DRILLED ANCHORS

- 9.1 ALL DRILLED HOLES INTENDED FOR PREDRILLED ANCHORS SHALL CONFORM TO THE MANUFACTURERS SPECIFICATIONS FOR THE REQUIRED ANCHOR UNLESS INDICATED ON THE STRUCTURAL PLANS.
- 9.2 ALL DRILLED HOLES SHALL BE CLEANED AND DRIED BEFORE ANCHORS ARE SET.
- 9.3 ALL ANCHORS INDICATED ON THE DRAWINGS ARE TO BE INSTALLED WITH HY-200 UNO.

4. STEEL STRUCTURE

- 4.1 ALL STRUCTURAL STEEL TO BE IN ACCORDANCE WITH THE LATEST CSA S16 AND THE C.I.S.C. CODE OF STANDARD PRACTICE.
- 4.2 ALL WELDING TO BE IN ACCORDANCE WITH CSA W59.03, BY WELDERS CERTIFIED IN ACCORDANCE WITH CSA W47.1-03. ALL WELDS TO BE CONTINUOUS UNLESS NOTED AND GROUND SMOOTH. REMOVE ALL BLEMISHES, WELD SPATTER, SHOP MARKS ETC.
- 4.3 INTERIOR STEEL WORK, SITUATED IN NORMALLY DRY CONDITIONS OR STEEL ENCASED IN CONCRETE SHALL BE CLEANED TO SP2 WITHOUT PRIMER, STEEL EXPOSED TO A POTENTIALLY MOIST ENVIRONMENT SHALL BE CLEANED TO SP3 AND PRIMED IN ACCORDANCE CISC GUIDELINES. STEEL EXPOSED TO VIEW OR POTENTIALLY WET CONDITIONS, SHALL BE CLEANED TO SP8, PRIMED IN ACCORDANCE TO CISC GUIDELINES AND COATED AS REQUIRED BY THE ARCHITECT. STEEL THAT IS PERMANENTLY EXPOSED TO THE ELEMENTS, INCLUDING BRICK VENEER OR STONE ANGLE SUPPORTS AND EMBEDS IN EXPOSED CONCRETE, SHALL BE HOT DIPPED GALVANIZED.
- 4.4 THE CONTRACTOR SHALL SUBMIT DETAILED FABRICATION DRAWINGS OF ALL STEEL MEMBERS TO THE ENGINEER FOR REVIEW AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF ANY FABRICATION PROCESS.
- 4.5 U.N.O. , ALL STEEL MEMBERS TO BE AS FOLLOWS:

WIDE FLANGE SECTIONS: CSA/CAN3-G40.21, TYPE 350W

HOLLOW STEEL SECTIONS (HSS): CSA/CAN3-G40.21, TYPE 350W, CLASS C

CHANNEL SECTIONS: CSA/CAN3-G40.21, TYPE 300W

ANGLE SECTIONS: CSA/CAN3-G40.21, TYPE 300W

PLATES, ROOF & MISCELLANEOUS CSA/CAN3-G40.21, TYPE 300W

STEEL MEMBERS:

ALL BOLTS USED FOR STEEL-TO-STEEL CONNECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-325. MINIMUM SIZE 3/4" DIAMETER U.N.O. ALL BOLTS USED FOR ANCHORAGE TO CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-307.

THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS IN THE FIELD TO SUIT. HE SHALL SITE MEASURE AND CONTROL THE PRODUCTION OF WORK ON SITE AND ELSEWHERE TO FULFILL THE INTENT OF THE DRAWINGS.

ALL CONNECTORS SHALL BE DESIGNED BY FABRICATOR U.N.O. , ALL BEAM CONNECTIONS SHALL BE STANDARD FRAME BEAM CONNECTIONS OR EQUIVALENT. THE FABRICATOR SHALL SUBMIT SHOP DRAWINGS SHOWING IN DETAILS AND THEIR CAPACITY. CONNECTIONS AND SPICES NOT SHOWN ON THE STRUCTURAL DRAWINGS BUT REQUESTED BY FABRICATOR SHALL BE DETAILED ON SHOP DRAWINGS AND SUBMITTED TO THE ENGINEER FOR REVIEW.

BOLTED CONNECTIONS SHALL HAVE A MINIMUM OF TWO BOLTS IN EACH CONNECTED PLATE AND BE DESIGNED AS BEARING CONNECTIONS, U.N.O. .

ALL WELDED HEADED STUDS AND WELDED DEFORMED BAR ANCHORS SHALL BE INSTALLED AS PER MANUFACTURERS SPECIFICATIONS AND RECOMMENDATIONS. FILET WELDED STUDS AND DEFORMED BARS ARE CONSIDERED UNACCEPTABLE.

THE SHOP DRAWINGS SHALL BE SEALED BY A B.C. REGISTERED PROFESSIONAL STRUCTURAL ENGINEER, WHO WILL BE RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF CONNECTIONS AND ASSOCIATED COMPONENTS SHOWN IN THE SHOP DRAWINGS.

BEAM CONNECTIONS TO EMBEDDED PLATES SHALL BE DOUBLE ANGLE FRAMING CONNECTIONS, U.N.O. .

WHERE BEAMS SIT OVER COLUMNS, PROVIDE FULL HEIGHT WEB STIFFENER PLATES AT EACH SIDE OF BEAM WEB EXTENDING OUTWARD TO FLANGE EDGES, CENTERED ON COLUMN AND WITH MINIMUM THICKNESS OF 3/8 INCH, U.N.O. .

EBF BRACING ELEMENTS ARE TO BE FABRICATED IN STRICT CONFORMANCE WITH STRUCTURAL DRAWING DETAILS.

REFER TO ARCHITECTURAL DRAWINGS FOR MISCELLANEOUS STEEL AND SIZE VERIFICATION OF ALL MEMBERS.

HSS MEMBERS SHALL BE SEAL WELDED IN DRY CONDITIONS SHOP. FOR ANY HSS MEMBER IN EXTERIOR CONDITIONS, OR POTENTIALLY SUBJECT TO FREEZING, A WEEP HOLE SHALL BE PROVIDED AT THE LOWER END OF THE MEMBER.

PROVIDE GUNNING OF INCOMPLETE STRUCTURE TO PLUMB AND MAINTAIN SAFETY STANDARDS UNTIL COMPLETION.

IF MASONRY WALLS ARE EXPECTED TO ALIGN WITH STEEL COLUMNS THE STEEL CONTRACTOR SHALL PROVIDE MASONRY ANCHOR STRAPS WITH DIMENSIONS OF 1 1/2" WIDE X 8" LONG AND 1/8" THICK, WITH A 1" LEG, @ 32" O.C VERTICALLY.

THE CONTRACTOR SHALL PROVIDE FRAMING FOR MECHANICAL WEIGHTS, AND IN ADDITION, FRAME ANY OPENINGS THROUGH ROOFS OR FLOORS IN EXCESS OF 18" IN ANY DIMENSION.

THE MINIMUM FRAMING AROUND OPENINGS SHALL BE AS FOLLOWS, U.N.O. :

L3x3, 1/2" ANGLES FOR ROOFS IN AREAS WITHOUT SNOW BUILD-UP.

L4x4, 1/2" ANGLES FOR ROOFS IN AREAS WITH SNOW BUILD-UP.

PROVIDE CLIPS TO BEAMS AND JOISTS TO SUIT.

FOR OPENINGS OVER 2'-0" IN ANY DIMENSION, OR FOR OPENINGS WHICH CARRY MECHANICAL DEVICES IN EXCESS OF 600 LBS, THAT ARE NOT SHOWN ON STRUCTURAL DRAWINGS SHOULD BE REPORTED TO THE STRUCTURAL ENGINEER WITH A MARKED LOCATION FOR AN ASSESSMENT.

GROUT UNDER BASE PLATES OF COLUMNS WITH A NON-SHRINK FLOWABLE GROUT. TARGET MACHINE BASE OR SIMILAR CAST UNDER HYDRAULIC HEAD. PROVIDE MIN OF 1" U.N.O. .

PROVIDE SUPPORT FOR STEEL DECK EDGES ALL AROUND AS REQUIRED. PROVIDE STEEL ANGLES OF SIZE TO SUIT (MIN 3 X 3 1/4) AROUND THE PERIMETER OF THE STEEL DECK. IF STEEL DECK EDGES ARE NOT ALREADY SUPPORTED, INCLUDING PARALLEL TO EDGES OF DECK SPAN, WELD DECK ANGLE TO ADJACENT STEEL SUPPORTS OR BOLT TO ADJACENT CONCRETE AS REQUIRED SUITABLE TO THE TRIBUTARY DESIGN FLOOR LOADING.

1. GENERAL

- 1.1 DRAWINGS PROVIDED, INCLUDING BUT NOT LIMITED TO: ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND SURVEY DRAWINGS.
 - 1.2 DRAWINGS ARE NOT INTENDED TO BE PICTORIALY ACCURATE. THEY ARE PROVIDED TO SUPPLY ALL THE RELEVANT SPECIFICATIONS AND DETAILS REQUIRED TO CONVEY THE INTENT OF THE CONSTRUCTION. THE INTENT OF ALL THE DESIGN DRAWINGS SHALL BE UNDERSTOOD AND THE CONSTRUCTION CARRIED OUT TO MEET THAT INTENT.
 - 1.3 PRIOR TO THE COMMENCEMENT OF WORK THE CONTRACTOR SHALL COMPARE ALL DIMENSIONS AND OUTLINES BETWEEN THE RELEVANT ARCHITECTURAL AND STRUCTURAL DRAWINGS. ANY DISCREPANCIES OR OMISSIONS MUST BE BROUGHT TO THE ATTENTION OF ALL RELEVANT PARTIES. ANY VARIATIONS NOT REPORTED PRIOR TO COMMENCEMENT OF WORK ARE THE CONTRACTORS RESPONSIBILITY.
 - 1.4 THE CONTRACTOR IS RESPONSIBLE FOR THE SITE MEASURING AND CONTROLLING THE PRODUCTION OF ALL WORK ON SITE TO ENSURE THEY MEET THE INTENT OF THE DRAWINGS. ANY DIMENSIONAL DEVIATIONS FROM THE PLAN MUST BE REPORTED TO THE ENGINEER.
 - 1.5 ANY CONDITIONS ON SITE THAT MAY IMPACT UPON THE FIL FILTMENT OF THE DESIGNS INTENT, INCLUDING BUT NOT LIMITED TO: SOIL CONDITIONS, RECORDING AND REPORTED.
 - 1.6 ANY ALTERATIONS THAT MAY RESULT IN EXTRA CHARGES BEING APPLIED TO THE CONTRACT MUST BE BROUGHT TO THE ENGINEERS ATTENTION WITH ADEQUATE TIME FOR THE CHARGES TO BE REVIEWED AND APPROVAL SOUGHT FROM THE RELEVANT PARTIES BEFORE ANY OF THE WORK IS CARRIED OUT.
 - 1.7 APPROVAL FROM THE ENGINEER MUST BE OBTAINED BEFORE ANY STRUCTURAL MEMBERS ARE CUT OR DRILLED INTO WHERE IT HAS NOT BEEN SPECIFIED ON THE PLAN.
 - 1.8 WORK FOUND DEFECTIVE AFTER COMPLETION OF THE PROJECT SHALL REMAIN THE RESPONSIBILITY OF THE CONTRACTOR TO AMEND. THIS REQUIREMENT REMAINS ALIVE BEYOND SUBSTANTIAL COMPLETION OF THE PROJECT REGARDLESS OF PRIOR ACCEPTANCE OR APPROVAL.
- ## 2. DESIGN PARAMETERS
- 2.0 GOVERNING CODE: 2018 B.C.B.C.
 - 2.1 DESIGN LOADS:

2.1.1 DEAD LOAD: Operating Weight of New Cooling Tower= 16182 lbs

2.1.2 LIVE LOAD:

SNOW LOAD: Ss =2.3 kPa, S= 0.2 kPa, Cb = 0.8

WIND LOAD: Q1=10 = 0.34 kPa, Q1=50 = 0.44 kPa

2.1.3 SEISMIC DATA:

Sa (0.2) = 0.800
Sa (0.5) = 0.704
Sa (1.0) = 0.401
Sa (2.0) = 0.244

PGA = 0.347

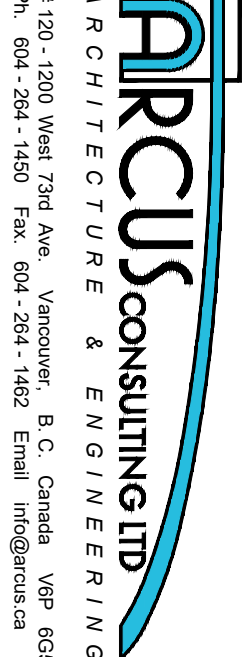
COPYRIGHT RESTRICTION

THIS DESIGN & DRAWING IS AND AT ALL TIMES REMAIN THE EXCLUSIVE PROPERTY OF ARCCUS CONSULTING LTD. AND CANNOT BE REPRODUCED OR USED WITHOUT THE CONSENT OF ARCCUS CONSULTING LTD.

REVISION	SUBJECT	DATE
-	ISSUED FOR TENDER	2021.02.08

ISSUED	DATE

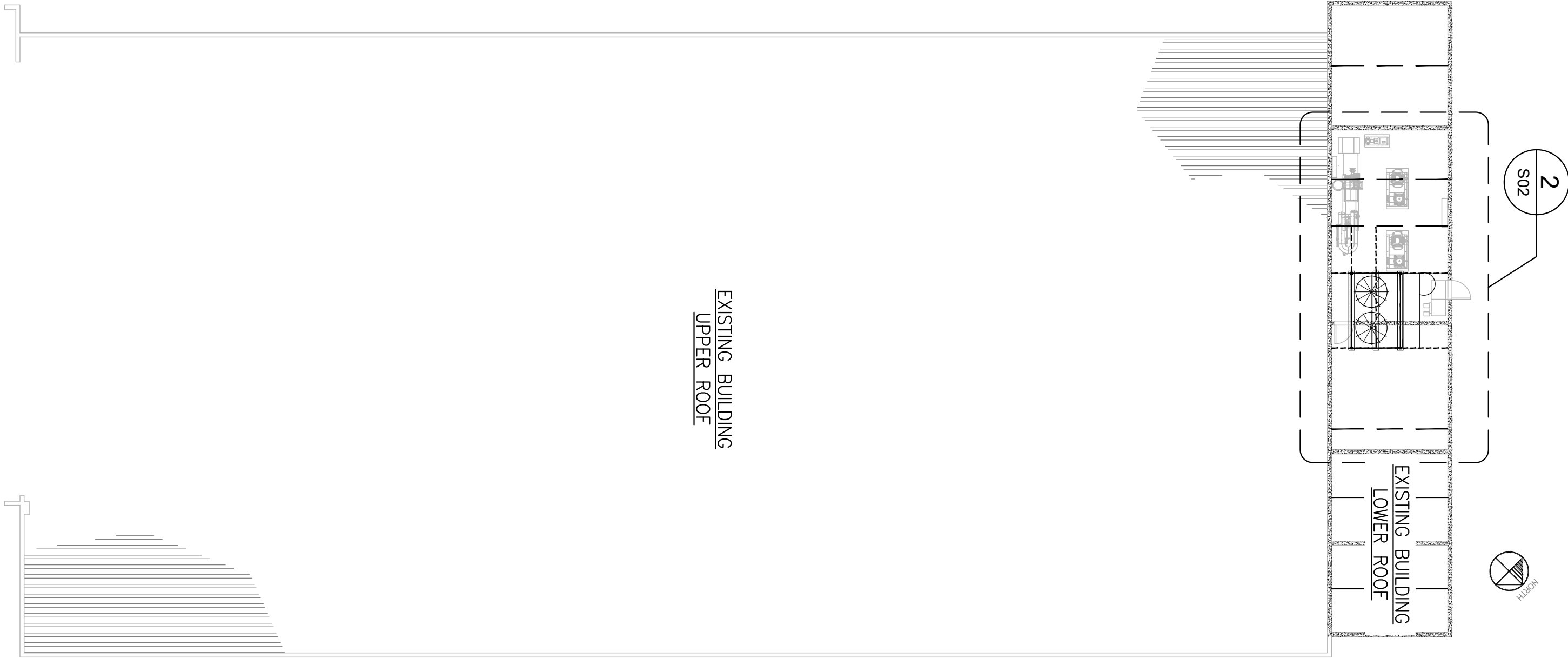
CONSULTANT



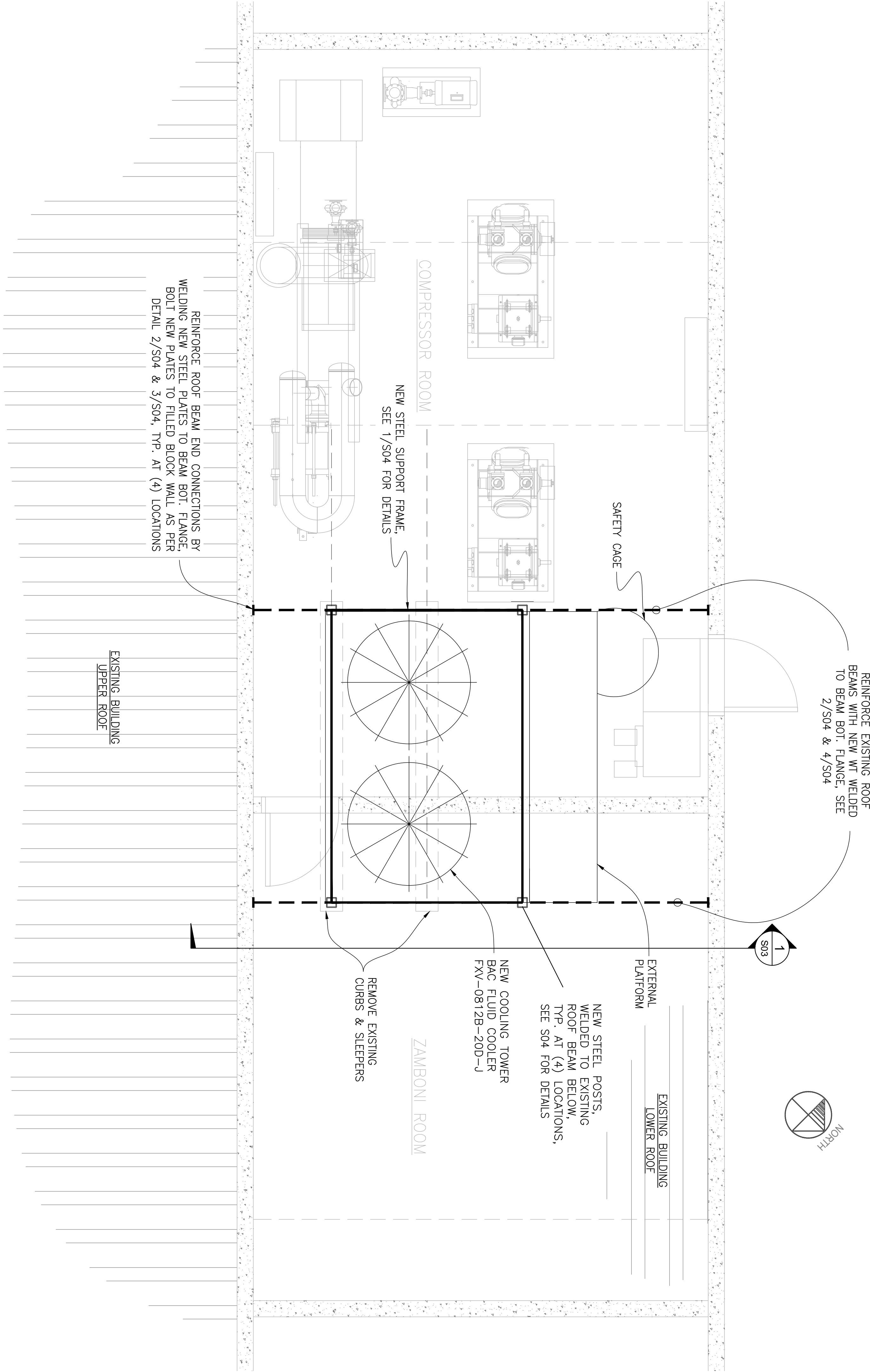
#120 - 1700 West 79th Ave. Vancouver, B.C. Canada V6P 6G5
Ph: 604-284-1460 Fax: 604-284-1462 Email: info@arccus.ca

PROJECT:
WOODY PARK ARENA
NEW COOLING TOWER
701 Eighth Ave, New Westminster

DRAWING TITLE:	BUILDING PLAN AND NEW COOLING TOWER LAYOUT
DRAWN BY: RG	
CHECKED BY: DT	
DATE: FEB 2021	
SCALE: AS SHOWN	
PROJECT No: 221-018	SHEET No. S02



1 EXISTING BUILDING PLAN
S02 PLAN VIEW



2 NEW COOLING TOWER ON LOWER ROOF
S02 PLAN VIEW

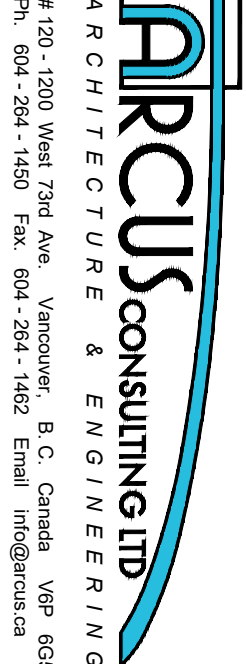
COPYRIGHT RESTRICTION

THIS DESIGN & DRAWING IS AND AT ALL TIMES REMAIN THE EXCLUSIVE PROPERTY OF ARCUS CONSULTING LTD. AND CANNOT BE REPRODUCED OR USED WITHOUT THE CONSENT OF ARCUS CONSULTING LTD.

REVISION	SUBJECT	DATE
-	ISSUED FOR TENDER	2021.02.08

ISSUED	DATE

CONSULTANT



PROJECT:
MOODY PARK ARENA
NEW COOLING TOWER
701 Eighth Ave, New Westminster

DRAWING TITLE:
NEW COOLING
TOWER ELEVATION

DRAWN BY: RG

CHECKED BY: DT

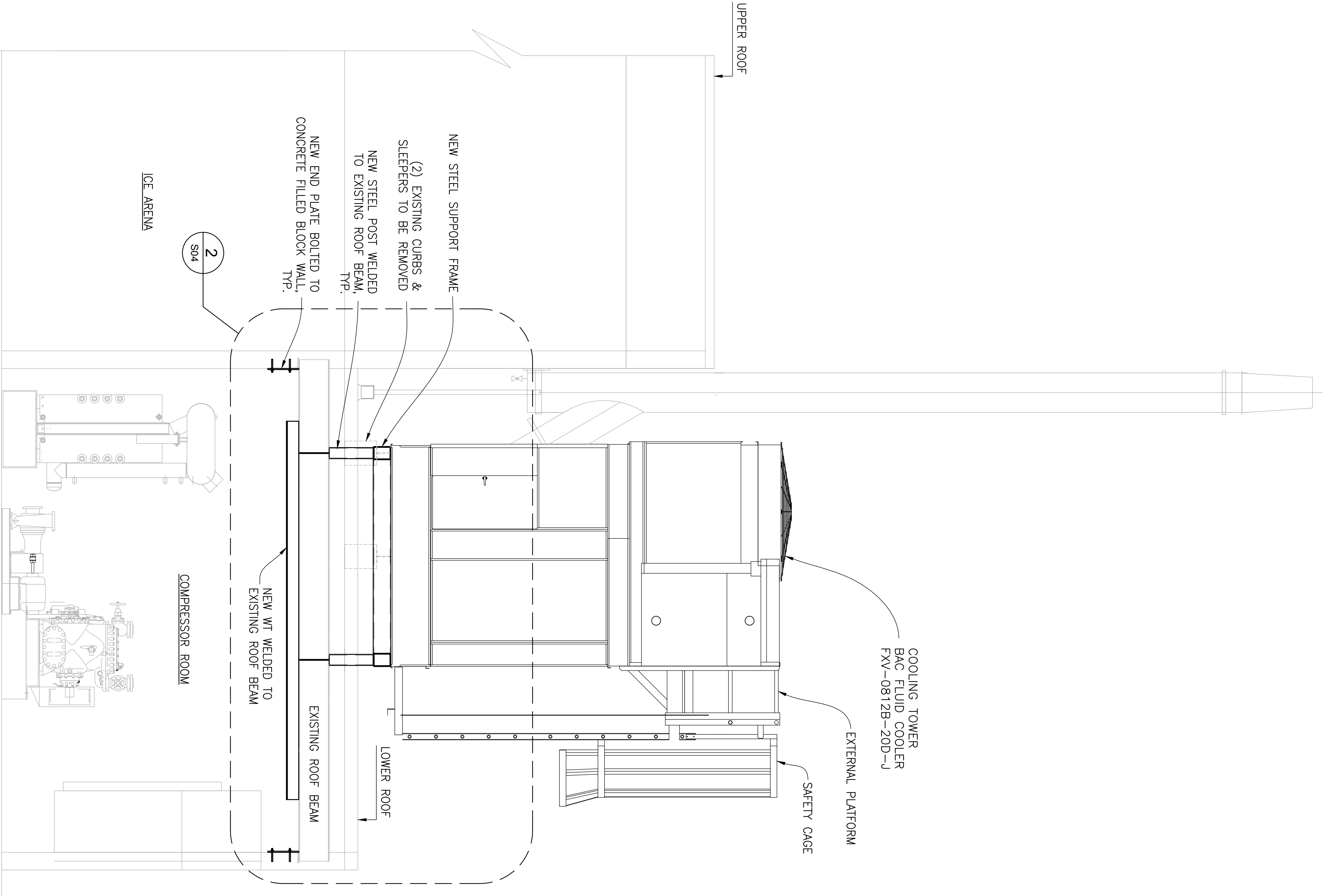
DATE: FEB. 2021

SCALE: AS SHOWN

PROJECT No: 221-018

SHEET No.

S03



BUILDING SECTION AT NEW
COOLING TOWER LOCATION

1
S03 NOT TO SCALE

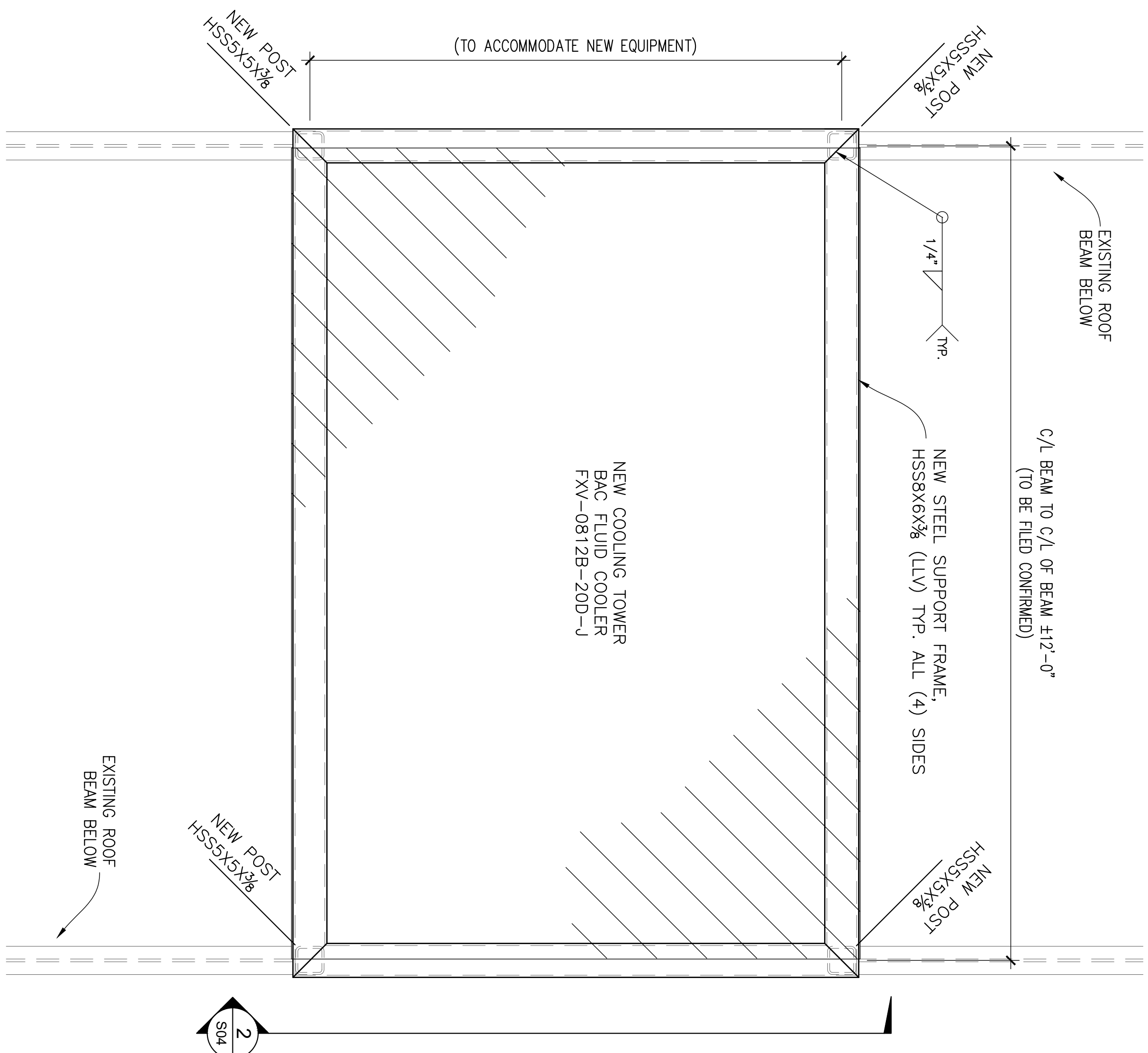
THIS DESIGN & DRAWING IS AND AT ALL TIMES REMAIN THE EXCLUSIVE PROPERTY OF ARCUS CONSULTING LTD. AND CANNOT BE USED WITHOUT THE CONSENT OF ARCUS CONSULTING LTD.

	ISSUED	DATE

CONSULTANT

PROJECT:
MOODY PARK ARENA
NEW COOLING TOWER
701 Eighth Ave., New Westminster

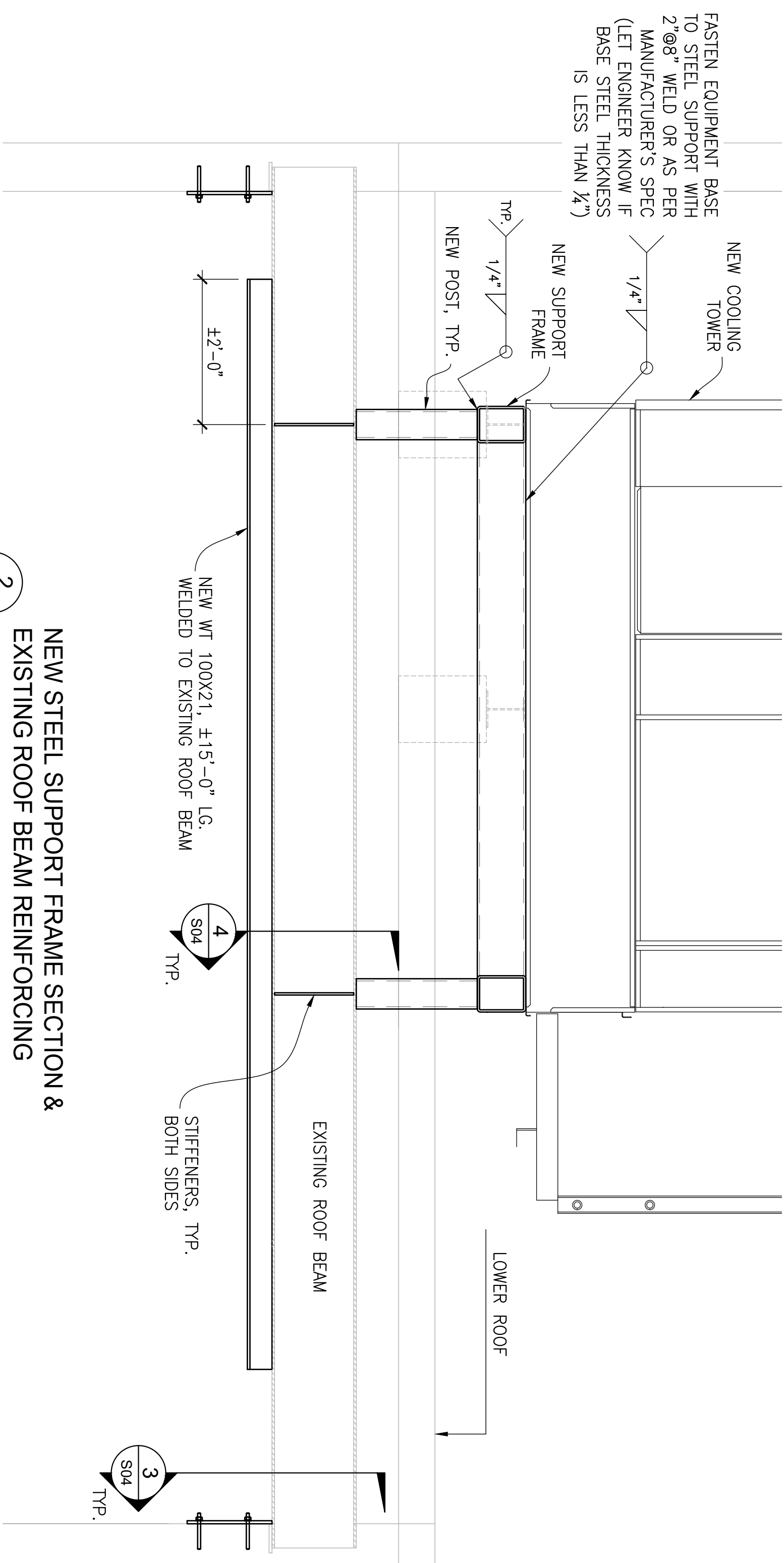
DRAWING TITLE:
NEW SUPPORT FRAME &
EXISTING ROOF BEAM
REINFORCING DETAILS



1	NOT TO SCALE
S04	

NEW STEEL SUPPORT FRAME LAYOUT

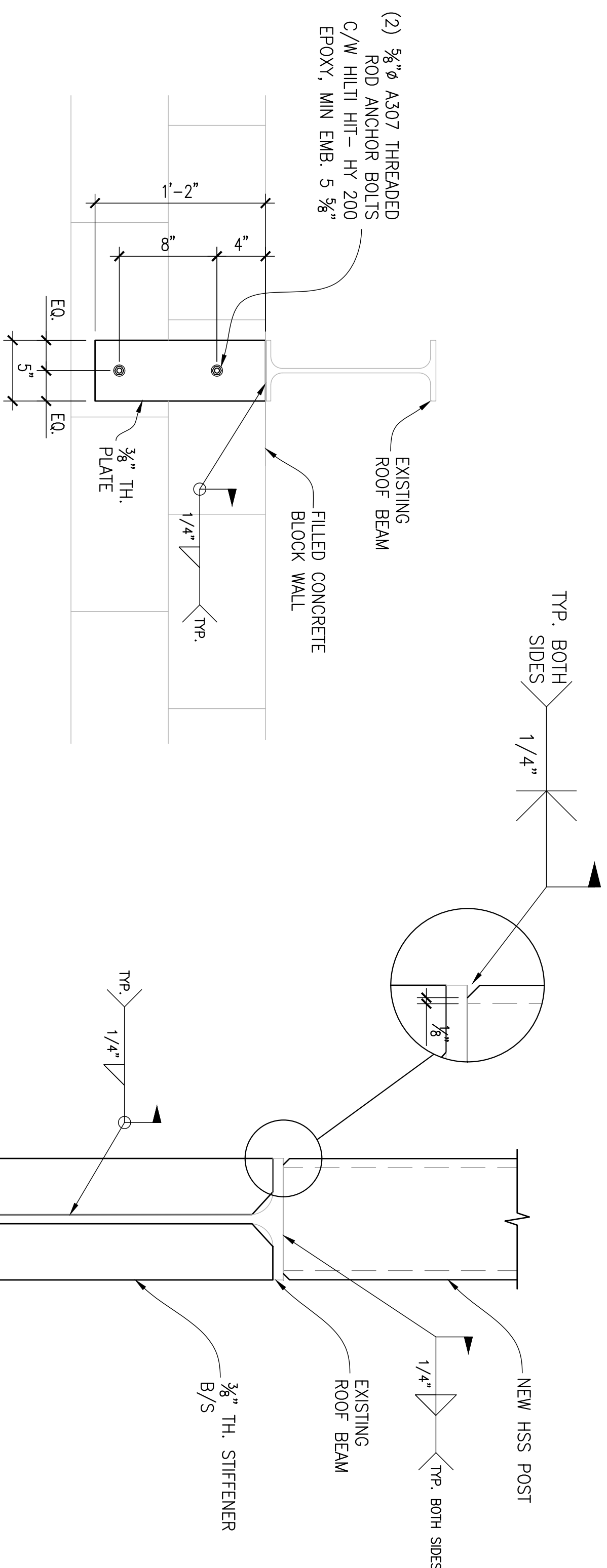
NOTE:
FIELD CONFIRM ALL DIMENSIONS PRIOR TO CONSTRUCTION.



2
S04

NEW STEEL SUPPORT FRAME SECTION &
EXISTING ROOF BEAM REINFORCING

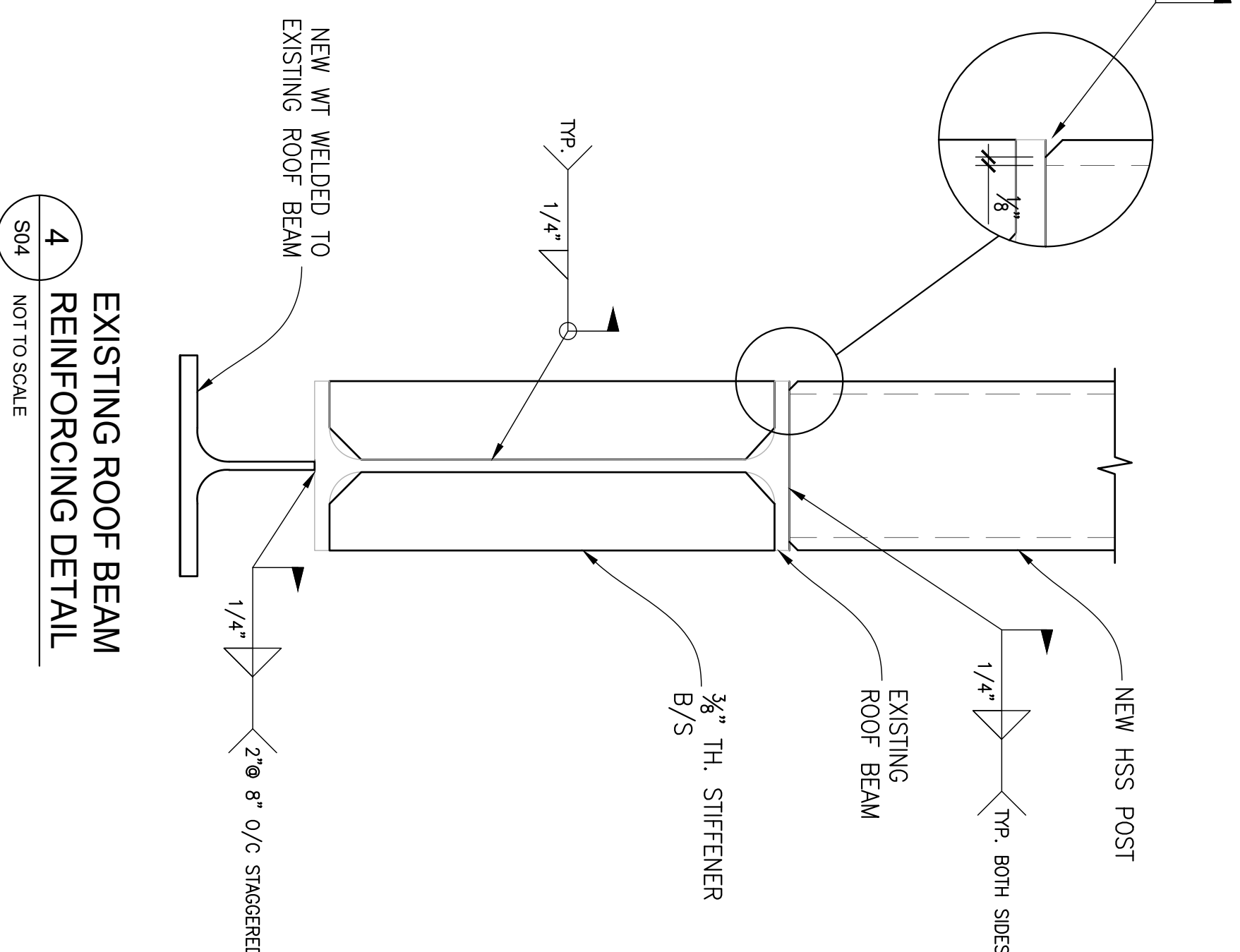
NOT TO SCALE



3
S04

EXISTING ROOF BEAM END
CONNECTION REINFORCING DETAIL

NOT TO SCALE



4 EXISTING ROOF BEAM
REINFORCING DETAIL



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX F

SUPPLEMENTARY CONDITIONS TO CCDC 2 2008

The Supplementary Conditions revise the General Conditions in the CCDC 2-2008 Stipulated Price Contract as follows:

ARTICLE A-5 PAYMENT

Paragraph 5.3 Interest –

Paragraph 5.3.1 (1) – Delete “..2%..” and substitute “..0%..”

Paragraph 5.3.1 (2) – Delete “..4%..” and substitute “..0%..”

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS,

1.1.7.1 Between “the Agreement between the *Owner* and the *Contractor*” and “Definitions” –
Insert “Addenda”

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.2 ROLE OF THE CONSULTANT

2.2.5 *Delete in its entirety and replace with the following*

“2.2.5 Based on the *Consultant's* observations and evaluation of the *Contractor's* applications for payment, the *Consultant* will, in consultation with the *Owner*, determine the amounts owing to the *Contractor* under the *Contract* and will issue certificates for payment as provided in Article A-5 of the Agreement - PAYMENT, GC 5.3 - PROGRESS PAYMENT and GC 5.7 - FINAL PAYMENT.”

PART 4 ALLOWANCES

GC 4.2 CONTINGENCY ALLOWANCE

Delete in its entirety.

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Delete in its entirety.

GC 5.3 PROGRESS PAYMENT

5.3.1.3 Delete “20 calendar days” and substitute with “thirty (30) calendar days”

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

5.4.2 Delete “20 calendar days after receipt” and substitute with “ten (10) calendar days”

GC 5.7 FINAL PAYMENT

5.7.4 Delete “5 calendar days” and substitute with “twenty (20) calendar days”

PART 6 CHANGES IN THE WORK

GC 6.2 CHANGE ORDER

Add

“6.2.3: The allowance for overhead and profit charged by the *Contractor* and subcontractors shall be as follows:

- .1 Cost of materials and labour plus 10% mark-up by the *Contractor* for changes in the work performed by the *Contractor*.
- .2 Cost of labour and materials plus 10% mark-up by the *Contractor* on changes in the work performed by the subcontractors.
- .3 Cost of labour and materials plus 10% mark-up by the subcontractors for changes in the work performed by the subcontractors.
- .4 The overhead and profit for changes in the work shall include supervision, administrative costs, small tools, miscellaneous materials, layout, and recording of the changes on the record drawings.

GC 6.5 DELAYS

Add

“6.5.3.5 Global Pandemic,”

Add

“6.5.6 In the event of any delay, the *Contractor* shall take all reasonable measures to minimize the effects and costs of the delay and this obligation shall be taken into account in the determination of the *Contractor*’s entitlement to an extension of the *Contract Time* and reimbursement of delay costs.”

Add

6.5.7 The parties acknowledge that the *Contract* has been entered into during the on-going COVID-19 Pandemic (the “Pandemic”). The *Contractor* advises that it is able to proceed with the *Work* under the Pandemic conditions and *Restrictions* (collectively the “Pandemic Restrictions”) as they exist as of the date of this *Contract*. The parties acknowledge that Pandemic Restrictions may change so as to cause unavoidable interruptions or interference to the *Contractor*’s performance of the *Work*. The parties confirm:

- (a) notwithstanding the known existence of the *Pandemic*, GC 6.5.3.5 will apply to new Pandemic Restrictions, which arise after the date of this *Contract*, whether anticipated or not, that reasonably interfere with the *Contractor*’s performance of the *Work*, such that upon giving required notice the *Contractor* shall be entitled to an extension of the *Contract Time*, but shall not be entitled to reimbursement of any costs;
- (b) notwithstanding any such new Pandemic Restrictions, the *Contract* will remain valid and in force, subject to the terms of the *Contract* including, without limitation, GC 6.5.6 and GC 9.4;
- (c) if new Pandemic Restrictions occur that cause or threaten *Work* interruptions the *Contractor* will, as required by GC 6.5.4 give the *Consultant* and *Owner* immediate notice, and a written plan of the interim steps the *Contractor* will take, if any, during the *Work* interruption, and when Pandemic Restrictions permit, provide the *Owner* with a written plan for the resumption of the *Work*.

PART 11 INSURANCE AND CONTRACT SECURITY

GC 11.1 INSURANCE

11.1.1.1 *Delete in its entirety and replace with the following:*

“1 General liability insurance in the name of the *Contractor* and include, or in the case of a single, blanket policy, be endorsed to name, the *Owner*, the *Consultant*, sub-consultants and special consultants as identified by the *Owner* as insureds but only with respect to liability, other than legal liability arising out of their sole negligence, arising out of the operations of the *Contractor* with regard to the *Work*. General liability insurance shall be maintained from the date of commencement of the *Work* until one year from the date of *Substantial Performance of the Work*. Liability coverage shall be provided for completed operations hazards from the date of *Substantial Performance of the Work*, as set out in the certificate of *Substantial Performance of the Work*, on an ongoing basis for a period of not less than twenty-four months following *Substantial Performance of the Work*.”

11.1.1.4 In line 1, after “*Owner and the Consultant*” insert “, sub-consultants and special consultants as identified by the *Owner*,”

GC 11.2 CONTRACT SECURITY

11.2.2 *Delete in its entirety and replace with the following:*

“11.2.2 If the *Contract Documents* require surety bonds to be provided, such bonds shall be issued by a duly licensed surety company authorized to transact the business of suretyship in the province or territory of the *Place of the Work* and shall be maintained in good standing until the fulfilment of the *Contract*. The form of Performance Bond shall be in accordance with the latest edition of the CCDC approved Performance Bond form. The Labour and Materials Payment Bond shall be a Broad Form bond, protecting all companies with a direct contract with the Principal or any Sub-Contractor of the Principal.”

CCDC 41 – CCDC INSURANCE REQUIREMENTS

Delete paragraphs 3 and 5



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX G

SCHEDULE A - PRIME CONTRACTOR DESIGNATION SCHEDULE

Schedule A – Prime Contractor Designation

This Schedule forms part of the agreement between the Corporation of the City of New Westminster (the “City”) and _____ (the “Contractor”) respecting _____ (the “Agreement”).

1. DEFINITIONS

1.1 In this Prime Contractor Designation schedule:

- (a) **“Agreement”** means the agreement entered into between the City and the Contractor on [date] in relation to [description of services] for the Project;
- (b) **“Hazardous Materials Report”** means a report prepared by a qualified person in accordance with s. 20.112 of the *OH&S Regulation*;
- (c) **“Owner”** means the City, which is the owner of the Project;
- (d) **“Project”** means [description of project];
- (e) **“Project Manager”** means the City’s designate with responsibility to liaise with the Contractor for the purpose of managing, overseeing, coordinating or in any other way administering the Project

2. PRIME CONTRACTOR DESIGNATION

2.1 The Contractor agrees to assume the responsibilities of Prime Contractor for the Project, as set out in the *Workers Compensation Act* and the *OH&S Regulation*.

3. CONTRACTOR RESPONSIBILITIES AS PRIME CONTRACTOR

3.1 As Prime Contractor for the Project, the Contractor will:

- (a) ensure that the activities of employers, workers and other persons at the Project relating to occupational health and safety are coordinated; and
- (b) do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance at the Project with the *Workers Compensation Act* and the *OH&S Regulation*.

3.2 Without limiting the generality of the foregoing, the Contractor will:

- (a) prior to beginning demolition or construction work on the Project, meet with the Project Manager to review and complete the Pre-Job Meeting Form, to review and discuss the information in the City’s Known Hazards Form and the Contractor’s pre-work hazard identification documents, and to review and discuss the Hazardous Materials Report (if any);
- (b) conduct all necessary and appropriate inquiries of all relevant City staff and City records to ensure the Contractor is not missing any information from the City that is relevant to safety at the Project;
- (c) review, plan to address, and address all hazards identified in the City’s Known Hazards Form, the Contractor’s pre-work hazard identification documents, any

- Hazardous Materials Report, and any hazards or risk identified in the *Workers Compensation Act* or the *OH&S Regulation*;
- (d) maintain and make available the documents listed on the Pre-Job Meeting Form, as appropriate;
 - (e) inform all other employers working on the Project that the Contractor is designated as the Prime Contractor for the Project;
 - (f) establish and maintain a system or process that will ensure compliance with the *OH&S Regulation* when visitors (i.e. couriers, inspectors, suppliers, etc.) enter the Project, which shall include site orientation and hazard communication to such visitors by the Contractor or the Contractor's designate;
 - (g) maintain a current list of persons that each employer at the Project has designated to be responsible for that employer's health and safety activities at the Project;
 - (h) ensure appropriate first aid resources are available for workers at the Project at all times work is being performed, in accordance with and as required by the *OH&S Regulation*;
 - (i) if required by the *OH&S Regulation*, submit a Notice of Project to WorkSafeBC in accordance with the *OH&S Regulation*, and comply with all requirements of the *OH&S Regulation* concerning the Notice of Project;
 - (j) if required by the *OH&S Regulation*, the Contractor will appoint a Qualified Coordinator for the purpose of ensuring the coordination of health and safety activities for the Project, and the Contractor shall ensure that any Qualified Coordinator so appointed is qualified to perform the responsibilities of his or her position and carries out the roles and responsibilities of a Qualified Coordinator as set out in the *OH&S Regulation*;
 - (k) provide the following information, in an always updated form, in a readily available location at the Project;
 - (i) the name of any Qualified Coordinator appointed to the Project;
 - (ii) a site drawing, which must be posted, showing project layout, first aid location, emergency transportation provisions, and the evacuation marshalling station; and
 - (iii) a set of construction procedures designed to protect the health and safety of workers at the Project, developed in accordance with the requirements of the *OH&S Regulation*;
 - (l) immediately notify the City of the identity of any Qualified Coordinator appointed by the Contractor at the Project, from time to time.

4. HAZARDOUS MATERIALS

- 4.1 If during demolition or construction work on the Project the Contractor discovers or has reason to believe that there are hazardous materials at the Project that were not set out in any Hazardous Materials Report, the Contractor will;
- (a) immediately notify the Project Manager;
 - (b) take all reasonably appropriate measures to ensure the safety of workers at the Project; and
 - (c) take all reasonably appropriate measures to ensure the safety of the general public.

- 4.2 Upon notification by the Contractor of additional hazardous materials or suspected hazardous materials at the Project not set out in any Hazardous Materials Report, the City, in accordance with the *OH&S Regulation*, will obtain an updated Hazardous Materials Report, and will share such updated report with the Contractor. If the scope of work of the Project is changed as a result of the updated Hazardous Materials Report, the Project Manager will meet with the Contractor to discuss how the Project may be completed in a safe and cost effective manner.

5. GENERAL

- 5.1 In the event of a conflict between the Agreement and the *Workers Compensation Act* or the *OH&S Regulation*, the legislative requirement(s) will apply.
- 5.2 If any part of this schedule is held to be unenforceable by a court or tribunal of competent jurisdiction, that part shall be severed and the remaining parts of this schedule shall remain in full force and effect.
- 5.3 If the Contractor violates any of the requirements of this schedule or of the *Workers Compensation Act* or the *OH&S Regulation*, the City may treat such violation as a breach of the Agreement resulting in possible termination or suspension of the Agreement and/or any other actions deemed appropriate at the discretion of the City.
- 5.4 No failure or delay by either party to this schedule in exercising any power, right or privilege provided in this schedule will operate as a waiver, nor will any single or partial exercise of such rights, powers or privileges preclude any further exercise of them or the exercise of any other right, power or privilege provided in this schedule.
- 5.5 This schedule may be terminated in accordance with the terms of the Agreement.



Corporation of the City of
NEW WESTMINSTER

NWRFP-21-03

APPENDIX H

HAZARDOUS BUILDING MATERIALS REPORT



CLIENT:

**City of New Westminster
511 Royal Avenue
New Westminster, BC**

PROJECT:

Hazardous Building Materials Assessment Report



**Moody Park Arena
701 - 8th Avenue
New Westminster, BC**

DATE: June 2019

REF: 19200N-HBMA-MPA

#101-Bldg.C-17802-66th Avenue
Cloverdale, BC, Canada V3S 7X1
Tel: 604-575-1122 Fax: 604-575-1152

EXECUTIVE SUMMARY

Astech Consultants Ltd. (Astech) were retained by the City of New Westminster to conduct a Hazardous Building Materials Assessment and compile a detailed report on the presence and location of asbestos containing building materials, PCB containing ballasts/capacitors, lead, mercury, stored chemicals and other hazardous materials, and silica at Moody Park Arena located at 701 8th Avenue, New Westminster, BC.

This assessment was conducted on January 11, 16, 18, May 17, 22, 24, and June 20, 2019 by Trevor Shendruk, Rob Kingsley, Jesse James, Amanda Higgins, and Matthew Spearman of Astech. It must be emphasized that this assessment was concerned exclusively with the subject building, as indicated on the Floor Plans included in Appendix B.

The site assessment was non-destructive in nature, therefore, potential asbestos containing materials and other hazardous materials may be concealed at the building. No attempt was made to investigate other buildings or structures on the property, underground services, or the surrounding property. During day to day work activities if asbestos containing materials, potential asbestos containing materials, or other hazardous materials (not included in this report) are discovered, work should immediately cease in the affected area. At that time, the City's Project Manager should be contacted so that they can initiate appropriate action so that there are no undue delays.

The City's **Hazardous Materials Policy**, **Prime Contractor Designation Policy** and **Construction Projects Safety Process Policy** sets out further information concerning *Hazardous Materials Assessment Reports* for city buildings. *These city safety policies state* Project Managers must ensure that all hazardous materials reports, asbestos inventories, abatement records and related documents will be uploaded and stored on the Q drive under the folder named Hazardous Materials Management. These documents are to be filed in the appropriate file folders in a timely manner upon receiving them, under individual building or property names.

Also, as described in Section 7.1 of this report, project planning must include for site investigation and destructive sampling specific to the project as per Workers' Compensation Board of British Columbia (WorkSafeBC) Occupational Health and Safety Regulation 20.112.

SUMMARY OF INSPECTION RESULTS

Asbestos

- Asbestos and potential asbestos containing paper backed sheet flooring and/or residue.
- Potential asbestos containing ceramic tile grouts and mortar/adhesive.
- Asbestos containing gypsum board filling compound and residue.
- Potential loose fill vermiculite insulation within concrete block walls.
- Asbestos containing mastics on joints of ductwork including wall cavities and ceiling spaces.
- Asbestos containing gaskets at flanges of main pumps in Ice Plant (Engine Room) 126.
- Asbestos containing grey and dark grey pipe thread compounds at fittings of natural gas piping in Boiler Room 130.
- Asbestos containing coating on underside of metal sink in Concession 112.
- Potential asbestos containing adhesive concealed behind mirrors may be present.
- Asbestos and potential asbestos containing sealants in interior and exterior metal-framed windows and windows of doors.
- Potential asbestos containing caulking around exterior metal-framed windows and doors.
- Asbestos containing caulking at and around metal flashing at skylights.
- Potential asbestos containing underground cement drain pipe may be beneath the building and throughout the property.

Lead

- Lead paints/primers/glazings were identified at the building including some in a deteriorated condition and flaking in a few areas (see Section 7.2 of this report).

Mercury

- Mercury containing fluorescent light tubes and bulbs were identified at the building.

Stored Chemicals and Other Hazardous Materials

- A few stored chemicals and other hazardous materials were identified at the facility.

Recommendations specific to the management of these hazardous building materials are provided in this report.

TABLE OF CONTENTS

	page
1.0 INTRODUCTION	1
2.0 SCOPE OF WORK	1
3.0 ASSESSMENT LIMITATIONS	1
4.0 FACILITY DESCRIPTION	2
5.0 METHODOLOGY	2
5.1 Asbestos Containing Materials and Potential Asbestos Containing Materials	2
5.2 Lead and Potential Lead Containing Paints and Lead Construction Materials	3
5.3 PCB Containing Materials, Mercury, Stored Chemicals and Other Hazardous Materials, and Silica..	4
6.0 INSPECTION RESULTS	4
6.1 Asbestos Containing Materials and Potential Asbestos Containing Materials	4
6.2 Lead and Potential Lead Containing Paints and Lead Construction Materials	8
6.3 Polychlorinated Biphenyl (PCB) Containing Materials	9
6.4 Mercury	9
6.5 Stored Chemicals and Other Hazardous Materials	9
6.6 Silica	9
7.0 RECOMMENDATIONS	10
7.1 Asbestos Containing Materials and Potential Asbestos Containing Materials	10
7.2 Lead and Potential Lead Containing Paints and Lead Construction Materials	10
7.3 Polychlorinated Biphenyl (PCB) Containing Materials	11
7.4 Mercury	11
7.5 Stored Chemicals and Other Hazardous Materials	12
7.6 Silica	12
8.0 APPLICABLE LEGISLATION AND GUIDELINES	12
9.0 OWNER'S AND ABATEMENT CONTRACTOR'S RESPONSIBILITIES	12
Appendix A Introduction to Hazardous Building Materials	
Appendix B Floor Plans	
Appendix C Laboratory Asbestos Bulk Sample Reports	
Appendix D Laboratory Lead in Paint/Glazing Bulk Sample Reports	
Appendix E Asbestos and Potential Asbestos Containing Materials Inventory Spreadsheet	
Appendix F Representative Photographs	

1.0 INTRODUCTION

Astech Consultants Ltd. (Astech) were retained by the City of New Westminster to conduct a Hazardous Building Materials Assessment and compile a detailed report on the presence and location of asbestos containing building materials, PCB containing materials, lead, mercury, stored chemicals and other hazardous materials, and silica at Moody Park Arena located at 701 8th Avenue, New Westminster, BC.

This assessment was conducted on January 11, 16, 18, May 17, 22, 24, and June 20, 2019 by Trevor Shendruk, Rob Kingsley, Jesse James, Amanda Higgins, and Matthew Spearman of Astech.

2.0 SCOPE OF WORK

The hazardous materials considered in the assessment include:

- asbestos containing materials,
- lead paints/primers/coatings/glazing,
- lead construction materials,
- PCB containing materials,
- mercury,
- stored chemicals and other hazardous materials, and
- silica.

This assessment was concerned exclusively with the subject building, as indicated on the Floor Plans included in Appendix B.

The City's ***Hazardous Materials Policy, Prime Contractor Designation Policy*** and ***Construction Projects Safety Process Policy*** sets out further information concerning *Hazardous Materials Assessment Reports* for city buildings. *These city safety policies state* Project Managers must ensure that all hazardous materials reports, asbestos inventories, abatement records and related documents will be uploaded and stored on the Q drive under the folder named Hazardous Materials Management. These documents are to be filed in the appropriate file folders in a timely manner upon receiving them, under individual building or property names.

3.0 ASSESSMENT LIMITATIONS

This assessment was conducted while the facility is still in operation, and thus, the assessment was non-destructive in nature. Therefore, the investigation of layered floor, wall, and ceiling systems, for the most part, was restricted to exposed and/or accessible surfaces. No attempt was made to investigate inaccessible building materials that would damage portions of the building in order to gain access. As well, other buildings or structures on the property, underground services, or the surrounding property were not investigated as part of this assessment format.

If asbestos containing materials or other hazardous building materials are suspected of being present in inaccessible areas such as behind newer building materials or within floor, wall, and ceiling cavities, they will be reported herein as potential asbestos containing materials or other hazardous building materials.

During work activities if asbestos containing materials, potential asbestos containing materials, or other hazardous materials (not included in this report) are discovered, work should immediately cease in the affected area. At that time, the City's Project Manager should be contacted so that they can initiate appropriate action so that there are no undue delays.

4.0 FACILITY DESCRIPTION

The subject facility on site is described as an approximate 30,625 square foot ice arena facility. The building is faced with concrete block, metal cladding, and stucco. The building is heated with natural gas forced air furnaces and ductwork, and natural gas space heaters. According to the City of New Westminster, the original age of construction was 1974. The building has undergone a few renovations over the years including a southeast boiler room addition.

5.0 METHODOLOGY

This section describes the methodologies used to collect information and samples for the following hazardous materials: asbestos containing materials, lead paints/glazing, PCB containing materials, lead construction materials, mercury, stored chemicals and other hazardous materials, and silica. Assessment and sampling was conducted in accordance with the specific requirements of the Workers' Compensation Board of British Columbia (WorkSafeBC) Occupational Health and Safety Regulations 6.1 to 6.32 (Asbestos), 6.58.1 to 6.69 (Lead), and other regulations. Inspection results are discussed in Section 6.0 below.

The following previous reports were available for amalgamating their information into this report:

- "Pre-Project Hazardous Materials Survey for the Planned Boiler Replacement Report at Moody Park Arena Located at 701 Eighth Avenue, New Westminster, BC" prepared by Astech Consultants Ltd., dated November 10, 2017.
- "Asbestos Identification and Management (AIM) Program Report, Moody Park Arena, New Westminster, BC" prepared by Astech Consultants Ltd., dated December 2005.

5.1 ASBESTOS CONTAINING MATERIALS

A visual inspection was undertaken in order to determine the type, location, condition, and homogeneous nature of asbestos and potential asbestos containing building materials located at the subject facility. During this inspection, ninety-three (93) bulk samples of potential asbestos containing materials were collected from specific locations of the facility. See Appendix B Floor Plans for sample locations.

The assessment and sample collection strategy includes for the collection of representative fibrous building material samples of differing ages of installation and location in accordance with the specific requirements of the WorkSafeBC Occupational Health and Safety Regulation. The methodology for sample collection and frequency of sampling are conducted in accordance with the guidelines established by WorkSafeBC in their publication Safe Work Practices for Handling Asbestos (2017 Edition) which defines sampling protocol on pages 27 & 28 Bulk Material Sample Collection Guide, and as indicated by actual site conditions. The defined WorkSafeBC sampling protocol requires sampling of all fibrated building materials and describes the specific requirements for collecting the adequate number of samples for each differing building material that is observed on site to be homogeneous in nature. Homogeneous materials are those that are observed to be uniform in texture and appearance, installed at one time, and determined to be of only one type of material or formulation.

WorkSafeBC Regulation 6.1 defines an asbestos containing material as containing 0.5% or more asbestos, with the exception of vermiculite insulation which is defined as any asbestos.

The samples collected were submitted for analysis at Astech's in-house laboratory at their Cloverdale Office in accordance with the WorkSafeBC Occupational Health and Safety Regulation, utilizing polarized light microscopy (PLM), and dispersion staining techniques. The analysis is performed in accordance with

Analytical Method NIOSH 9002, except for vermiculite which is in accordance with EPA/600/R-04/004. However, in order to determine when a result is greater than 0% and less than 0.5%, Astech would send the sample to a second laboratory for analysis using transmission electron microscopy (TEM) plus gravimetric reduction. Our laboratory is in full compliance with WorkSafeBC requirements and participates in an intra-laboratory quality control program and an inter-laboratory Bulk Asbestos Proficiency Analytical Testing (BAPAT) program with American Industrial Hygiene Association (AIHA) (Laboratory Participant ID# 200542).

5.2 LEAD AND POTENTIAL LEAD CONTAINING PAINTS AND LEAD CONSTRUCTION MATERIALS

Lead and Potential Lead Containing Paints

A visual inspection was undertaken in order to determine the type, location, and condition of paints suspected of containing lead at the subject facility. During this inspection, thirty-one (31) bulk samples of potential lead paint/glazing at specific locations of the facility were tested utilizing an X-ray fluorescence (XRF) analyzer. See Appendix B Floor Plans for sample locations.

The assessment and sampling strategy includes for the collection or onsite analysis of representative paints, primers, coatings, and glazing of differing ages of installation and location in accordance with the specific requirements of the WorkSafeBC Occupational Health and Safety Regulation. The methodology for sample collection and frequency of sampling are conducted based on actual site conditions with due consideration to sample differing paints, primers, coatings, and glazing that are observed on site to be uniform in texture and appearance.

Health Canada defines a lead containing surface coating material as a paint or other similar material that dries to a solid film that contains over 90 PPM (or the equivalents of 90 mg/kg or 90 $\mu\text{g/g}$ or 0.009%) dry weight of lead. As stated in WorkSafeBC's publication, Safe Work Practices for Handling Lead, "WorkSafeBC does not numerically define what would be considered a lead containing paint or coating. All suspected paints or coatings should be tested for lead because, depending on the nature of the work, even a small amount could pose a risk to workers. In order to determine which controls and personal protective equipment would be required for a particular job, a qualified person must consider this information as part of the risk assessment."

The samples are analyzed in accordance with the requirements of the WorkSafeBC Occupational Health and Safety Regulation utilizing an Olympus Delta Classic Handheld XRF Analyzer using Soil Mode. Soil Mode, also known as Metals in Light Element Matrix Mode, works by calibrating lead against the light element backscatter called the "compton peak" and reports our lead results in parts per million (PPM). The XRF analyzer has a detection range of between 2 and 3 millimetres in depth, which would negate any interference from other building materials behind the painted surface being analyzed.

The use of our XRF analyzer is in full compliance with WorkSafeBC requirements, as follows:

- Operators of the XRF analyzer have been Level 1 certified in its operation and safety, meeting the requirements set jointly by Natural Resources Canada and Health Canada in accordance with International Standard ISO 20807:2004 and Health Canada's Safety Code 34.
- An intra-laboratory quality assurance program is conducted where reference standards of known values are analyzed daily to confirm the XRF analyzer is within tolerance. A daily blank is also analyzed to confirm the XRF analyzer's window is not contaminated.
- An inter-laboratory quality control program is also utilized where 1 in 10 samples analyzed are sent to an external laboratory for analysis utilizing US EPA Method 6010C (metals and trace elements by inductively coupled plasma-atomic emission spectrometry or ICP-AES).

Lead Construction Materials

A visual inspection was also undertaken in order to determine the presence of construction materials suspected of containing lead.

5.3 PCB CONTAINING MATERIALS, MERCURY, STORED CHEMICALS AND OTHER HAZARDOUS MATERIALS AND SILICA

A visual inspection was undertaken in order to determine the presence of:

- fluorescent light fixtures & high intensity discharge (HID) light fixtures suspected of containing polychlorinated biphenyl (PCB) ballasts or capacitors;
- thermostats, light tubes/bulbs, and associated equipment suspected of containing mercury;
- stored chemicals (including ozone depleting substances, mould, and rodent/bird droppings/carcasses) suspected of being toxic, flammable, explosive, or a bio-hazard; and
- building materials suspected of containing silica in crystalline and non-crystalline forms.

6.0 INSPECTION RESULTS

6.1 ASBESTOS CONTAINING MATERIALS AND POTENTIAL ASBESTOS CONTAINING MATERIALS

The following is a general description of fibrated building materials including **asbestos containing** and potential **asbestos containing** materials at the subject facility (see Appendix C for Laboratory Asbestos Bulk Sample Reports):

a) **Skate Planking, Vinyl Cove, and Associated Adhesives**

- The skate planking and associated adhesives located in several areas of the building have been sampled and identified as non-asbestos. However, upon removal in Mezzanine Goal Crease Room 122, the skate planking must be considered as an **asbestos contaminated** material due to the direct contact with the **asbestos containing** paper residue on the wood floor beneath.
- The vinyl cove and associated adhesives located in several areas of the building have been sampled and identified as non-asbestos.

b) **Paper Backed Sheet Floorings** - The paper backed sheet flooring residue (concealed beneath non-asbestos skate planking) located in Mezzanine Goal Crease Room 122 has been sampled and identified as **asbestos containing**. The paper backed sheet flooring located in Concession 112 and/or Concession Storage Room 113 has been sampled and identified as non-asbestos.

Unsampled paper backed sheet floorings that may be located beneath the non-asbestos skate planking, non-asbestos paper backed sheet flooring, and/or cabinets in Concession 112, Concession Storage Room 113, and/or other areas, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

Risk Assessment: The paper backed sheet floorings and residue can be described as a friable **asbestos containing** or potential **asbestos containing** material in which the **asbestos** fibres are, for the most part, considered to be safely enclosed beneath a vinyl wear surface. In its present undisturbed condition, it does not pose a hazard to building occupants or workers required to work in close proximity.

However, the Mezzanine Goal Crease Room 122 has damaged and/or exposed paper residue on the wood floor beneath non-asbestos skate planking that requires remedial action (see Section 7.1).

- c) **Ceramic Floor and Wall Tile Grouts & Mortars/Adhesives** - The ceramic floor and wall tile grouts and mortars/adhesives located in some areas of the building, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

Risk Assessment: The grouts and mortars/adhesives can be described as non-friable potential **asbestos containing** materials in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos cement-like and/or elastomeric matrix. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

- d) **Filling Compounds on Gypsum Board** - The filling compounds and/or filling compound residue on gypsum board and adjoining building materials located in many areas of the building have been sampled and identified as **asbestos containing** and non-asbestos.

Unsampled filling compounds on gypsum board and adjoining building materials, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

As well, unsampled filling compound residue on floors (that may be concealed beneath flooring materials, plumbing fixtures, cabinetry, mouldings, millwork, and other building materials), not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

Risk Assessment: The filling compounds and filling compound residue can be described as friable **asbestos containing** or potential **asbestos containing** materials in which the **asbestos** fibres are considered to be safely encapsulated beneath a liberal coat of paint. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

- e) **Multi-Layered Exterior Stucco and Wall Construction Paper** - The multi-layered stucco and wall construction paper located on some exterior walls of the building have been sampled and identified as non-asbestos.
- f) **2' x 4' Suspended Ceiling Tiles** - The various types of 2' x 4' suspended ceiling tiles in the building have been sampled and identified as non-asbestos.
- g) **Spray Applied Insulation** - The spray applied insulation in many areas of the building has been sampled and identified as non-asbestos.
- h) **Loose Fill Vermiculite Insulation** - Loose fill vermiculite insulation potentially located within the cavities of exterior and former exterior concrete block walls of the building, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise. **Note:** In speaking with site personnel in the past, they had mentioned encountering a loose fill "white ball" type of insulation, likely perlite, which is a non-toxic non-asbestos product. Drilling of concrete block walls to confirm, was not conducted at this time.

Risk Assessment: The loose fill vermiculite insulation can be described as a friable potential **asbestos containing** material in which the **asbestos** fibres are considered to be concealed and safely enclosed within the wall cavities, and in its present undisturbed condition does not pose a hazard to building occupants or workers required to work in close proximity.

- i) **Mechanical Insulations and Insulating Cements** - The insulations located on chiller piping and tanks have been identified as non-asbestos foam insulation beneath a non-asbestos jacket (all original asbestos containing insulations and insulating cements have been previously removed). The insulations on the straight lengths of mechanical and rain water leader piping systems have been identified as non-asbestos fibreglass insulation. The insulating cement at fittings of some mechanical and rain water leader piping systems located in some areas of the building have been sampled and identified as non-asbestos.
- j) **Mastics on Joints of Ductwork** - The mastic on joints of ductwork located in several areas of the building including wall cavities and ceiling spaces has been sampled and identified as **asbestos containing**. In some instances, the ductwork is insulated with a non-asbestos foil-faced fibreglass insulation that is adhered with a non-asbestos non-fibrated adhesive.

Risk Assessment: The mastic can be described as a non-friable **asbestos containing** material in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos asphaltic or elastomeric matrix. In its present undisturbed condition, it does not pose a hazard to building occupants or workers required to work in close proximity.

- k) **Gasket and Packing Materials at Valves and Flanges** - The flange gaskets and/or gasket residue at the 2 main pumps located in Ice Plant (Engine Room) 126 have been sampled and identified as **asbestos containing**. Gaskets at flanges of the chiller piping system have been identified as non-asbestos rubber or neoprene.

Gaskets and packing materials that may be located at older valves and flanges of the mechanical piping system in concealed spaces such as wall cavities, ceiling spaces, pipe chases, and void spaces, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

Risk Assessment: The gasket and packing materials are common building products that prior to application, can be described as non-friable **asbestos containing** or potential **asbestos containing** materials in which the **asbestos** fibres are considered to be either safely encapsulated within a non-asbestos compound or encapsulated within a non-asbestos sealant, and do not pose a hazard to building occupants or workers required to work in close proximity. Although non-friable prior to use, many differing woven and compressed gasket and packing materials become friable after a heated and/or compressed service application.

Therefore, prior to unprotected trades performing maintenance on the pumps involving the flange gaskets, they should be removed by a qualified asbestos abatement contractor in their entirety (see Section 7.1).

- l) **Pipe Thread Compounds at Threaded Fittings of Piping Systems** - The differing colours of pipe thread compounds (some mixed with Teflon tape) at threaded fittings of sprinkler, natural gas, and mechanical piping systems and associated equipment located at the building have been sampled and identified as non-asbestos, with the exception of the retrofit grey and dark grey at fittings of natural gas and mechanical piping systems in Boiler Room 130 and exterior (from Boiler Room 130 to gas meter).

Risk Assessment: The aforementioned pipe thread compounds can be described as non-friable **asbestos containing** materials in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos putty-like or elastomeric matrix. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

- m) **Hot Water Tanks** - The hot water tanks located in Boiler Room 128 and Boiler Room 130 have been identified as having non-asbestos fibreglass insulation beneath the metal casings.
- n) **Through Hole Penetration Firestop Grout/Putties/Caulkings** - The grey firestop grout, grey firestop putties, and red firestop caulking located at through hole penetrations and ends of conduit at the building have been sampled and identified as non-asbestos.
- o) **Coating on Underside of Metal Sink** - The coating on the underside of metal sink located in Concession 112 has been sampled and identified as **asbestos containing**.

Risk Assessment: The coating on the underside of metal sink can be described as a non-friable **asbestos containing** material in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos asphaltic or elastomeric matrix. In its present undisturbed condition, it does not pose a hazard to building occupants or workers required to work in close proximity.

- p) **Adhesives (Concealed behind Wall Mirrors)** - The adhesives that may be concealed behind wall mirrors located in a few areas of the building, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise.

Risk Assessment: The adhesives can be described as non-friable potential **asbestos containing** materials in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos elastomeric matrix. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

- q) **Sealants and Caulkings in and/or around Interior and Exterior Windows, Doors, and Skylights**
 - The sealants in interior windows at Skate Shop 115 and Office 116 have been sampled and identified as **asbestos containing**.
 - The caulking at perimeters of interior metal door frames in the building have been sampled and identified as non-asbestos.
 - The caulking at and around the metal flashings at skylights has been sampled and identified as **asbestos containing**.

To avoid damage or compromising the building envelope, sealants and caulking at windows, windows of doors, and skylights, not specifically sampled and identified as non-asbestos, must be considered as **asbestos containing** until such time as laboratory analysis determines otherwise, as follows:

- Sealants and/or sealant residue in some interior windows and windows of doors
- Sealants in exterior windows, windows of doors, and skylights
- Caulking concealed around exterior window and door frames

Risk Assessment: The sealants and caulking can be described as non-friable **asbestos containing** or potential **asbestos containing** materials in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos elastomeric or sealant-type matrix. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

r) **Roofing and Rooftop Materials**

- The roofing membrane, felts, mastics, and vapour barrier on Lower North Rooftop Ex2 have previously been sampled and identified as non-asbestos, and has subsequently been removed and replaced in 2015. The newer roofing system is not suspected of containing asbestos.
- The roofing membrane, felts, mastics, and vapour barrier on Main Upper Rooftop Ex3 have previously been sampled and identified as non-asbestos, and has subsequently been removed and replaced in 2006. The newer roofing system is not suspected of containing asbestos.
- The roofing membrane, felts, mastics, and vapour barrier on Lower South Rooftop Ex4 have previously been sampled and identified as non-asbestos, and has subsequently been removed and replaced in 2008. The newer roofing system is not suspected of containing asbestos.
- The roofing membrane, felts, mastics, and vapour barrier on Lower Southeast Rooftop Ex5 (Boiler Room 130 addition) are not suspected of containing asbestos.
- The caulking and mastics at roof hatch, patches, vents, water circulator, penetrations, perimeter metal flashings, etc. on the rooftops have been sampled and identified as non-asbestos, with the exception of the caulking at and around the metal flashing at skylights (see item q) above).

- s) **Cementitious Drain Pipe - Asbestos containing** cementitious drain pipe may have been utilized as underground drain pipe at and/or around the building.

Risk Assessment: The cementitious drain pipes can be described as a non-friable potential **asbestos containing** material in which the **asbestos** fibres are considered to be safely encapsulated within a non-asbestos cement-like matrix. In their present undisturbed condition, they do not pose a hazard to building occupants or workers required to work in close proximity.

6.2 LEAD AND POTENTIAL LEAD CONTAINING PAINTS AND LEAD CONSTRUCTION MATERIALS

The visual inspection and/or analytical results determined the following (see Appendix D for Laboratory Lead in Paint/Glazing Bulk Sample Reports):

a) **Paints Containing Lead**

- paints/primers containing **lead** were used on interior and exterior surfaces including concrete, concrete block walls (including painted lettering), wood beams, walls, ceilings, mouldings/trim, stairs, benches, shelves, cabinets, cupboards, bleachers, metal framing of wood benches, gypsum board surfaces, drain pipes, metal conduit, wood doors, metal doors and frames, metal window frames, metal poles, indoor metal ladder, structural steel components, mechanical insulations, piping, pumps, motors, large rectangular metal tank, and metal fencing at the building (some of which is in a deteriorated condition and flaking - see Section 7.2), with the exception of the following items listed in item b) below,
- glazing finishes containing **lead** were used on ceramic wall tiles in the shower areas of the 5 Dressing Rooms, and
- paint/primer likely containing **lead** were used on the metal casings of the hot water tanks and metal expansion tanks in the building, and perimeter metal roof flashings and metal wall cladding at the building.

b) **Paints Considered to be Non-Lead Containing**

- newer white paint considered to be non-lead containing were used on wood walls in Open Rink Area 121,
- off-white glazing finish considered to be non-lead containing was used on ceramic floor tiles in the shower areas of the 5 Dressing Rooms,
- blue paint considered to be non-lead containing was used on the east metal door of Storage Room 108,
- green paint considered to be non-lead containing was used on the mechanical piping system in Ice Plant (Engine Room) 126,

- brown paint considered to be non-lead containing was used on exterior wood wall trim at the building,
- cream paint considered to be non-lead containing was used on concrete block walls of the Boiler Room 130 addition at the building,
- cream paint considered to be non-lead containing was used on the metal ladder of Lower North Rooftop Ex2 at the building, and
- beige/cream paint considered to be non-lead containing was used on stucco surfaces at the building.

c) **Lead Construction Materials**

- none present.

6.3 POLYCHLORINATED BIPHENYL (PCB) CONTAINING MATERIALS

The visual inspection determined that there are several fluorescent and high intensity discharge (HID) light fixtures at the building that are not suspected of having PCB containing ballasts/capacitors.

6.4 MERCURY

The visual inspection determined that there is one wall mounted thermostat in Dressing Room (2) 106 of the building that contains mercury. There are also approximately two hundred seventy (270) fluorescent light tubes and bulbs at the building (including some in storage) that contain mercury. It should be noted that there are several LED replacement tubes and bulbs in indoor and outdoor light fixtures at the building that do not contain mercury.

6.5 STORED CHEMICALS AND OTHER HAZARDOUS MATERIALS

The following list of materials were present at the facility at time of inspection (including items that would be retained for ongoing use):

- containers of paint, cleaners, solvents, petroleum products, and rodent poison/traps,
- containers with ammonia, corrosive liquids, and brine in Ice Plant (Engine Room) 126,
- motors and pumps bearing petroleum products (including residue on floor, raised bases, and other surfaces),
- several fire extinguishers,
- batteries in emergency lighting and fire alarm panel, and household batteries in storage,
- compressors and piping with suspect ozone depleting substances (CFC's) in refrigerators, coolers, freezer, and water fountains (some of which appear to be newer, but may still contain CFC's), and
- a few areas with visible rodent droppings in Furnace Room, and likely other areas of the building.
- piping containing natural gas leading to heating equipment,

6.6 SILICA

All concrete, cement, grout, mortar, and any other cementitious building materials are suspected of containing silica in crystalline and non-crystalline forms.

7.0 RECOMMENDATIONS

7.1 ASBESTOS CONTAINING MATERIALS AND POTENTIAL ASBESTOS CONTAINING MATERIALS

As stated in the Risk Assessment portions of Section 6.1, for the most part, accessible asbestos and potential asbestos containing materials are in good condition and do not pose a hazard to building occupants or workers required to work in close proximity. However, there are a couple of areas with damaged, deteriorated, delaminating, and/or exposed asbestos containing materials, and a small amount of debris, therefore requiring abatement in order to negate the hazard related to damaged/exposed asbestos containing materials, as follows:

Loc.#	Room Name	Description of Required Remedial Action
121	Open Rink Area	Damaged gypsum board ceiling at the underside of Mezzanine Goal Crease Room 122.
122	Mezzanine Goal Crease Room	Damaged and exposed paper residue is present on the wood floor beneath non-asbestos skate planking. Either the non-asbestos skate planking should be securely fastened to the floor (without lifting the skate planking) and caulk all edges and seams to serve to enclose the asbestos paper residue, or completely remove the paper residue and decontaminate the skate planking.

Prior to initiating renovations, maintenance, or service activities that would involve disturbing asbestos or potential asbestos containing building materials, or if it becomes necessary to either cut, drill, abrade, or otherwise disturb these building materials, additional project specific site investigation and destructive sampling in accordance with WorkSafeBC **Occupational Health and Safety Regulation 20.112** must be conducted. Where asbestos containing building materials are to be impacted by the work, the work must be performed by a qualified hazardous materials abatement contractor in accordance with the WorkSafeBC Occupational Health and Safety Regulation. Disposal of asbestos containing materials must be performed in accordance with the BC Ministry of Environment - Environmental Management Act - Hazardous Waste Regulation.

7.2 LEAD AND POTENTIAL LEAD CONTAINING PAINTS AND LEAD CONSTRUCTION MATERIALS

Lead based paints on building materials may remain in place as long as they are in a stable condition in which the lead is considered to be safely encapsulated within the paint. However, there are numerous areas with small to moderate quantities of lead based paints on concrete, wood, and metal surfaces that are in a deteriorated condition and flaking/delaminating from the base substrate as well as small amounts of debris on ground, therefore requiring abatement in order to negate the potential hazard related to damaged lead based paints, as follows:

Loc.#	Room Name	Areas Requiring Remedial Action
101	Main Lobby and Concourse	Small amounts of flaking/delaminating paint on exterior metal window frame
114	Office	Small amount of flaking/delaminating paint on exterior metal window frame
121	Open Rink Area	Small amounts of flaking/delaminating paint on concrete block walls (near northeast and southeast corners) and on metal doors (to Main Lobby and Concourse 101)

Loc.#	Room Name	Areas Requiring Remedial Action
126	Ice Plant (Engine Room)	Flaking/delaminating paint on concrete floor, raised concrete and metal equipment bases, and mechanical piping and in-line vessel

Lead based paints that are in good repair (stable condition) do not pose a hazard to building occupants or the environment.

Where lead or potential lead based paints and/or primers are affected by a project, the work must be performed by qualified City staff or contractor in accordance with the WorkSafeBC Occupational Health and Safety Regulation and the WorkSafeBC publication entitled Safe Work Practices for Handling Lead.

Where the base substrate material is to be removed in conjunction with lead paint removal, the base substrate and lead based paints and/or primers should be removed intact by the contractor, in accordance with the contractor's risk assessment and site specific work procedures. The workers conducting the work and workers in close proximity to the work being performed, should be protected with personal protective equipment as determined by the contractor's risk assessment and site specific work procedures.

Lead containing paints which remain attached to wood, concrete, and/or other building materials must be labelled as lead based paints (LBP) for transporting to a licensed/approved disposal site or recycling facility. A licensed/approved facility receiving the waste must be informed of the lead content of these materials and be agreeable to receiving these materials. Prior to acceptance of waste with lead paints at a licensed/approved disposal facility, the contractor generating the waste must ensure that all waste materials containing LBPs are sampled intact, fastened directly to the base substrate, and representative of the waste stream created by demolition. If deemed necessary by the site receiving the waste, the contractor shall have the representative sample analyzed utilizing a Toxicity Characteristic Leachate Procedure for lead (TCLP lead) test to determine the potential for soil and/or groundwater contamination.

If the lead paints are to be separated or removed from the building materials by means of sanding, scraping, abrading, blasting, etc., more stringent work procedures would apply. The removed lead paints, depending on lead concentrations and leachate results, may become a Hazardous Waste and therefore must be disposed of in accordance with the BC Ministry of Environment - Environmental Management Act - Hazardous Waste Regulation.

Where affected by a project, the lead in bells of drain pipe, lead sleeves, and lead roof jacks must first be removed, and be recycled or disposed of, in accordance with the BC Ministry of Environment - Environmental Management Act - Hazardous Waste Regulation.

7.3 POLYCHLORINATED BIPHENYL (PCB) CONTAINING MATERIALS

Not applicable (none present).

7.4 MERCURY

Where affected by a project, the mercury containing light tubes and bulbs must first be removed, and be relocated for future use, recycled or disposed of, in accordance with the BC Ministry of Environment - Environmental Management Act - Hazardous Waste Regulation.

7.5 STORED CHEMICALS AND OTHER HAZARDOUS MATERIALS

Stored Chemicals

Prior to a project that affects the listed materials, stored chemicals and ozone depleting substances within refrigeration equipment must first be removed, and be retained for future use, recycled, or disposed of, in accordance with the BC Ministry of Environment - Environmental Management Act - Hazardous Waste Regulation.

Natural Gas

Where affected by a project, the natural gas that is contained in some piping must be shut off and purged by Fortis BC or a qualified trades person prior to work that would affect the gas.

7.6 SILICA

Where cementitious building materials that are suspected of containing silica in crystalline form are directly impacted by a project (i.e. drill, cut, or abrade), the work should be performed in a controlled manner to avoid the release of crystalline silica dust. Cutting, drilling, or otherwise disturbing these building materials must be performed by a qualified City staff or contractor's trained personnel in accordance with the WorkSafeBC Occupational Health and Safety Regulation.

8.0 APPLICABLE LEGISLATION AND GUIDELINES

Applicable legislation and guidelines referenced, include the following:

- Occupational Health and Safety Regulation, WorkSafeBC;
- Safe Work Practices for Handling Asbestos (2017 Edition), WorkSafeBC;
- Safe Work Practices for Handling Lead (2017 Edition), WorkSafeBC;
- Environmental Management Act - Hazardous Waste Regulation, BC Ministry of Environment; and
- Transportation of Dangerous Goods, Government of Canada.

9.0 OWNER'S AND ABATEMENT CONTRACTOR'S RESPONSIBILITIES

For renovation or demolition project planning, the remediation of hazardous building materials, contract specifications, quality control, and final acceptance of the work remain the responsibility of the Owner. In order to ensure that the Owner has acted in a responsible manner, and to ensure regulatory board compliance, it is recommended that specifications be prepared and the abatement work be performed by a qualified and properly insured (with proof of necessary asbestos inclusion rider) Hazardous Materials Abatement Contractor. As well, the abatement contractor upon completing the work shall have their "Qualified Person" inspect the worksite in its entirety to confirm that asbestos and other hazardous building materials have been properly removed, then promptly provide the Owner with a signed Letter of Completion. Project Documentation should also be provided including, but not necessarily limited to, a Notice of Project for work involving Asbestos and/or Lead, Risk Assessment, Exposure Control Plan, and Site Specific Work Procedures, Worker Respirator Fit Test Forms/Logs and Training Acknowledgement Forms, Certification of DOP Testing of HEPA Filtered Equipment used on site, Air Sample Results, Material Safety Data Sheets (MSDS) for products used on site, Transportation Waybills, and Waste Manifest Forms. City Project Managers must ensure that all abatement documentation and records received are uploaded and stored on the Q drive under the folder named Hazardous Materials Management/Abatement Records in a timely manner.

Ref: 19200N-HBMA-MPA

Appendix A

Introduction to Hazardous Building Materials

A.1 ASBESTOS CONTAINING MATERIALS AND POTENTIAL ASBESTOS CONTAINING MATERIALS

"Asbestos" is a generic term that describes a variety of naturally occurring mineral silicates that separate into fibres. Asbestos fibres are incombustible, possess high tensile strength, yet remain flexible, and have outstanding thermal and electrical insulating properties. Asbestos fibres also have excellent acoustical properties, and good chemical resistance. These unique physical properties are the reason asbestos became a popular ingredient or component in a wide variety of industrial and commercial building products.

Respiratory diseases such as asbestosis, lung cancer, and mesothelioma have been associated with occupational exposure to asbestos fibres in shipbuilding, mining, milling, fabricating and construction industries where asbestos products were manufactured or used. Most of the medical knowledge concerning the adverse health effects associated with the inhalation of asbestos fibres has come from the study of workers who were routinely exposed to high levels of airborne asbestos fibres over extended time periods. A latency period of between 10 and 35 years is common between initial exposure and recognizable symptoms of asbestos related disease. Medical evidence also indicates that cigarette smoking greatly enhances the disease potential of asbestos exposure.

In the past, asbestos containing building materials were used extensively in the construction of public and commercial buildings. Asbestos was commonly used in floor tiles, sheet flooring, gypsum board filling compound, acoustic plaster, acoustic ceiling tiles, thermal and electrical insulation, fireproofing, cement pipe, cement sheeting, insulation on boilers pipes and ducts, firedoor liners, textiles, coatings, mastics, and roofing materials.

Certain types of asbestos containing materials are considered more hazardous than others. The term "friable" refers to a material that when dry can be easily crumbled, pulverized, or reduced to powder by hand pressure. "Friable" may also describe a previously non-friable material that has deteriorated or becomes broken or damaged by mechanical force. The asbestos fibres in "non-friable" materials are bound within a matrix, or are mixed with binder agents, and do not become airborne as easily as friable materials. In general the more friable an asbestos containing material is, the greater the potential for airborne fibre release.

The mere presence of asbestos containing materials in a building does not necessarily mean that the health of the building occupants is endangered. Intact asbestos containing materials that are not damaged or disturbed are not likely to release asbestos fibres into the air, and therefore do not pose a health risk. Asbestos containing materials may, however, become hazardous as a result of damage, deterioration, or a physical disturbance such as renovations or maintenance activities.

The hazards associated with asbestos can be eliminated by preventing the occurrence of airborne asbestos fibres. A Hazardous Building Materials Management Program is designed to ensure that the day to day operations and maintenance of the building is performed in a manner that avoids the release of asbestos fibres into the air, and ensures proper control and cleanup if asbestos containing materials are inadvertently disturbed.

The principal objective of a Management Program is to incorporate a plan of education, training, surveillance, and safe work practices to maintain asbestos containing materials in good condition, while preventing the exposure of custodial and maintenance personnel, contracted trades, and building occupants to asbestos fibres.

Conscientious administration of the Program can control the release of asbestos fibres until the asbestos containing materials at the facility are removed during a scheduled maintenance, renovation, or demolition project.

A.2 LEAD AND POTENTIAL LEAD CONTAINING PAINTS/COATINGS AND OTHER BUILDING MATERIALS

Lead is a soft, bluish-grey metal that is pliable and corrosion-resistant. Until the 1980s, lead was used in paint because it increased durability, made colours more vibrant, and helped paint dry faster. Lead-containing paint is still used for the yellow lane dividers on roads and highways, and there is no restriction on lead in industrial coatings. Lead-containing paints and coatings do not present a hazard if they are left intact. The health risk occurs when they chip, peel, or are otherwise damaged. When lead-containing materials are disturbed (e.g., scraped or sanded), lead dust can be released into the work environment and be inhaled or ingested by workers and other people.

WorkSafeBC has adopted the federal Ministry of Health definition under the Hazardous Products Act and defines lead-containing surface coating material as a paint or other similar material that dries to a solid film that contains over 90 PPM (90 mg/kg or 90 µg/g or 0.009%) dry weight of lead.

A.3 POLYCHLORINATED BIPHENYL (PCB) CONTAINING BALLASTS

The commercial production of PCBs started in 1929 but their use has been banned or severely restricted in many countries since the 1970s and 1980s because of the possible risks to human health and the environment.

As PCBs are resistant to acids and bases as well as to heat, they have been used as an insulating material in electric equipment, such as light ballasts and capacitors, transformers, and also in heat transfer fluids and lubricants. PCBs have also been used in wide range of products such as plasticizers, surface coatings, inks, adhesives, flame-retardants, paints, and carbonless duplicating paper.

PCBs present in light fixture ballasts/capacitors do not mean that there is a health risk to building occupants as long as they are not damaged to cause leaking. However, PCB or potential PCB containing ballasts/capacitors in light fixtures should be removed from the fixtures once they are no longer functioning properly so that they are not at risk of rusting and/or deteriorating to a condition that would cause leaking of the PCB fluid which is packed within a viscous non-PCB potting fluid inside the outer metal casing of the ballast/capacitor.

The hazards associated with absorbing or ingesting PCB containing materials can be eliminated by preventative maintenance that assures that older light ballasts/capacitors are removed soon after they are no longer functioning properly, and replaced with new non-PCB containing ballasts/capacitors which are commercially available and labelled as such.

A.4 MERCURY

Mercury switches (thermostats), still available today, have one or more sets of electrical contacts in a sealed glass vial which contains a bead of mercury. The vial may also contain air, an inert gas, or a vacuum. Gravity is constantly pulling the drop of mercury to the lowest point in the vial. When the switch is tilted in the appropriate direction, the mercury touches a set of contacts, thus completing the electrical circuit through those contacts. Tilting the switch the opposite direction causes the mercury to move away from that set of contacts, thus breaking that circuit.

Mercury in thermostats that remain in place do not pose a risk to building occupants as long as the glass vial is not damaged. However, since mercury is a poisonous heavy metal, devices containing mercury switches must be treated as a hazardous waste for recycle.

Fluorescent light tubes have been around for many years and more recently compact fluorescent light bulbs (CFLs). They use a different method than incandescent bulbs to produce light, which makes them energy-efficient. They are low-pressure, mercury vapour lamps that produce invisible ultraviolet (UV) rays.

When the lamp is turned on, the mercury vaporizes inside the lamp and becomes 'excited' by the high voltage electricity. The UV then 'excites' the phosphor coating inside the lamp, which emits the light you see.

Mercury vapour in fluorescent light tubes and bulbs that remain in place do not pose a risk to building occupants as long as the glass tube is not damaged. However, since mercury is a poisonous heavy metal, fluorescent tubes and bulbs must be treated as a hazardous waste for recycle.

A.5 STORED CHEMICALS AND OTHER HAZARDOUS MATERIALS

Products such as paint, cleaners, petroleum products, garden chemicals, rodent poison, pool chemicals, batteries, automotive tires, refrigerators, freezers, smoke/heat detectors, and natural gas are common building products and consumables which are widely utilized in residential and commercial buildings to the present day. In an undisturbed condition, these products and consumables, following manufacturer's instructions, WHMIS, and/or safety data sheets, do not pose a hazard to building occupants.

Instructions with some of the above listed products and consumables indicate that once their service life has ended, they should be properly recycled or disposed of.

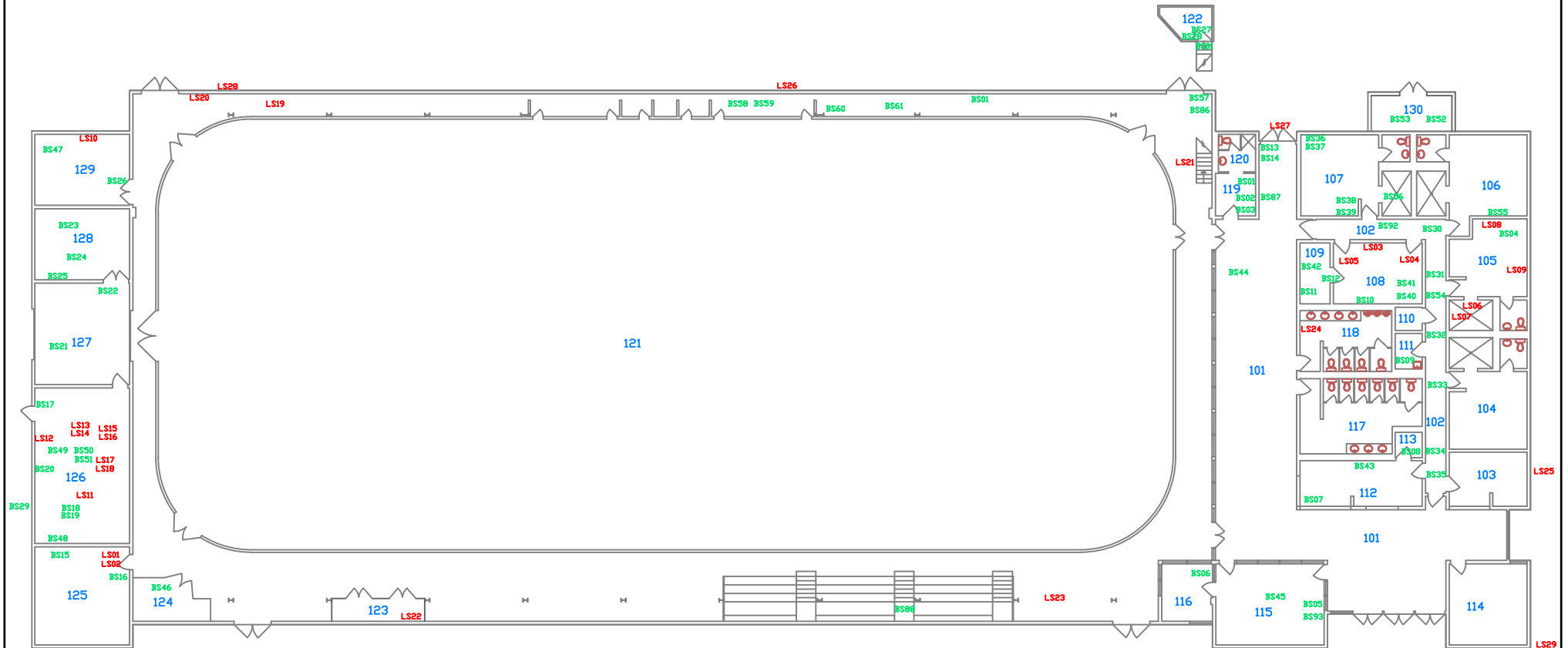
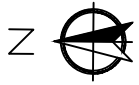
A.6 SILICA

Silica is the basic component of sand and rock. The best-known and most abundant type of crystalline silica is quartz. Some common silica-containing materials include: Concrete, concrete block, cement, mortar, masonry, brick, granite, sand, fill dirt, top soil, asphalt containing rock or stone, abrasive used for blasting.

Construction workers may be exposed to silica when working with or disturbing these materials. When silica dust builds up in your lungs, you are at risk of developing a serious lung disease called silicosis, which can lead to death. Silicosis is not curable, but it is preventable. The hazards associated with silica can be prevented by utilizing proper personal protective clothing and respirators, and work area enclosure to contain airborne dust.

Appendix B

Floor Plans



LEGEND:

BS = Asbestos Bulk Sample Locations
LS = Lead Sample Locations
X = Location Number



CLIENT: City of New Westminster

PROJECT NAME: HBMA Sample Locations

LOCATION: Moody Park Arena
701 8th Avenue
New Westminster, BC

FLOOR: Ground Floor

DATE:
2019/06/24

DRAWN BY:
MS

ASTECH PROJECT #:
19200N

CHECKED BY:
RK

SCALE:
NTS

DRAWING NUMBER:
1 of 2



LEGEND:

BS = Asbestos Bulk Sample Locations
LS = Lead Sample Locations
X = Location Number



CLIENT: City of New Westminster

PROJECT NAME: HBMA Sample Locations

LOCATION: Moody Park Arena
701 8th Avenue
New Westminster, BC

FLOOR: Rooftop

DATE:
2019/06/24

DRAWN BY:
MS

ASTECH PROJECT #:
19200N

CHECKED BY:
RK

SCALE:
NTS

DRAWING NUMBER:
2 of 2

Appendix C

Laboratory Asbestos Bulk Sample Reports



ASBESTOS BULK SAMPLE REPORT

Date: June 21, 2019

Client: CITY OF NEW WESTMINSTER

Location: **Moody Park Arena**
701 - 8th Avenue
New Westminister, BC

Comments: Prior to February 2012:

- 1) Analysed as per WCB Analytical Method 0205.
- 2) WCB defines asbestos containing material as 1% or more asbestos.
- 3) Quantitation limit for asbestos analysis is 1%. **Due to the change in the definition of asbestos from 1% to 0.5%, samples analyzed prior to February 2012 with non-asbestos results are no longer useable and therefore must be re-sampled prior to disturbance of the material.**
- 4) Sample results report fibre composition only.
- 5) Sample(s) will be disposed of after 90 days, unless the client requests otherwise.

Commencing February 2012:

- 1) Asbestos (bulk) by PLM analyzed as per NIOSH 9002 Issue 2.
- 2) Workers' Compensation Board of British Columbia (WCB) defines asbestos containing material as 0.5% or more asbestos, with the exception of Vermiculite Attic Insulation which is defined as "any asbestos".
- 3) Samples will be disposed of after 90 days, unless the Client requests otherwise.

Sample(s) Collected on January 11, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS01	Ground Floor - Referee Dressing Room 119	Paint Filling Compound on Gypsum Board (Ceiling)	1: White 2: White	100% Non-Fibrous	None Detected
19200N BS02	Ground Floor - Referee Dressing Room 119	Cove Base Adhesive	1: Brown	3% Cellulose 97% Non-Fibrous	None Detected
19200N BS03	Ground Floor - Referee Dressing Room 119	Flooring Adhesive	1: Black	3% Cellulose 97% Non-Fibrous	None Detected
19200N BS04	Ground Floor - Dressing Room (3) 105	Pipe Thread Compound (at Fitting of Sprinkler Piping)	1: Beige	3% Glass 2% Non-Fibrous 95% Non-Fibrous	None Detected

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS05	Ground Floor - Skate Shop 115	Sealant (in East Interior Metal-Framed Window)	1: Grey	92% Non-Fibrous	8% Chrysotile
19200N BS06	Ground Floor - Office 116	Sealant (in East Interior Metal-Framed Window)	1: Grey	92% Non-Fibrous	8% Chrysotile
19200N BS07	Ground Floor - Concession 112	Sheet Flooring Wear Surface	1: Mosaic Beige	100% Non-Fibrous	None Detected
		Paper Backing	2: Grey	70% Cellulose 20% Glass 10% Non-Fibrous	None Detected
19200N BS08	Ground Floor - Concession Storage Room 113	Paint Filling Compound on Gypsum Board (Ceiling)	1: Beige 2: Grey	97% Non-Fibrous	3% Chrysotile
19200N BS09	Ground Floor - Maintenance Room 111	Pipe Thread Compound (at Fitting of Sprinkler Piping)	1: Off-White	1% Cellulose 99% Non-Fibrous	None Detected
19200N BS10	Ground Floor - Storage Room 108	Spray Applied Insulation (Ceiling)	1: White & Grey	99% Glass 1% Non-Fibrous	None Detected
19200N BS11	Ground Floor - Furnace Room 109	Pipe Thread Compound (at Fitting of Natural Gas Piping)	1: Off-White	5% Cellulose 95% Non-Fibrous	None Detected
19200N BS12	Ground Floor - Furnace Room 109	Caulking (around South Interior Metal Door Frame)	1: Grey	15% Glass 85% Non-Fibrous	None Detected
19200N BS13	Ground Floor - Lobby and Concourse 101	Cove Base	1: Black	100% Non-Fibrous	None Detected
19200N BS14	Ground Floor - Lobby and Concourse 101	Cove Base Adhesive	2: Cream	100% Non-Fibrous	None Detected

Analyst(s): Jesse James

Sample(s) Collected on January 16, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS15	Ground Floor - Electrical Room 125	Adhesive Residue (on East Concrete Block Wall)	1: Beige	100% Non-Fibrous	None Detected
19200N BS16	Ground Floor - Electrical Room 125	Caulking (around South Interior Metal Door Frame)	1: Grey	5% Glass 95% Non-Fibrous	None Detected
19200N BS17	Ground Floor - Ice Plant (Engine Room) 126	Caulking (around North Exterior Metal Door Frame)	1: Grey	5% Glass 95% Non-Fibrous	None Detected
19200N BS18	Ground Floor - Ice Plant (Engine Room) 126	Pipe Thread Compound (at Fitting of Mechanical Piping)	1: Blue	2% Cellulose 98% Non-Fibrous	None Detected
19200N BS19	Ground Floor - Ice Plant (Engine Room) 126	Pipe Thread Compound (at Fitting of Mechanical Piping)	1: Grey	2% Cellulose 98% Non-Fibrous	None Detected

Sample	Location	Description	Layer: Colour	Non-Asbestos		Asbestos	
				%	Type	%	Type
19200N BS20	Ground Floor - Ice Plant (Engine Room) 126	Firestop Grout (at North Wall Penetration of Mechanical Piping)	1: Grey	1 %	Cellulose	None Detected	
				99 %	Non-Fibrous		
19200N BS21	Ground Floor - Zamboni Room 127	Floor Coating	1: Grey	100 %	Non-Fibrous	None Detected	
19200N BS22	Ground Floor - Zamboni Room 127	Caulking (around East Interior Metal Door Frame)	1: Grey	2 %	Cellulose	None Detected	
				98 %	Non-Fibrous		
19200N BS23	Ground Floor - Boiler Room 128	Spray Applied Insulation (Ceiling)	1: White & Grey	99 %	Glass	None Detected	
				1 %	Non-Fibrous		
19200N BS24	Ground Floor - Boiler Room 128	Spray Applied Insulation (Ceiling)	1: White & Grey	99 %	Glass	None Detected	
				1 %	Non-Fibrous		
19200N BS25	Ground Floor - Boiler Room 128	Paint Pipe Thread Compound (at Fitting of Natural Gas Piping)	1: Yellow 2: Grey	1 %	Cellulose	None Detected	
				99 %	Non-Fibrous		
19200N BS26	Ground Floor - Workshop 129	Paint Caulking (around South Interior Metal Door Frame)	1: Black 2: Grey	5 %	Glass	None Detected	
				95 %	Non-Fibrous		
19200N BS27	Ground Floor - Mezzanine Goal Crease Room 122	Paper Backed Sheet Flooring Residue (beneath Skate Planking)	1: Grey	5 %	Cellulose	85% Chrysotile	
				10 %	Non-Fibrous		
19200N BS28	Ground Floor - Mezzanine Goal Crease Room 122	Paint Filling Compound on Gypsum Board (West Wall)	1: Beige 2: White	100 %	Non-Fibrous	None Detected	
19200N BS29	Exterior Ex1	Firestop Putty (at North Wall Penetration of Electrical Cable Conduit)	1: Grey	10 %	Cellulose	None Detected	
				90 %	Non-Fibrous		

Analyst(s): Jesse James

Sample(s) Collected on January 18, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos		Asbestos	
				%	Type	%	Type
19200N BS30	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Medium Fissures)	1: White 2: Beige	70 %	Cellulose	None Detected	
				25 %	Glass		
				5 %	Non-Fibrous		
19200N BS31	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Medium Fissures)	1: White 2: Beige	70 %	Cellulose	None Detected	
				25 %	Glass		
				5 %	Non-Fibrous		
19200N BS32	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Medium Fissures)	1: White 2: Beige	70 %	Cellulose	None Detected	
				25 %	Glass		
				5 %	Non-Fibrous		

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS33	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Large Fissures)	1: White 2: Beige	70% Cellulose 25% Glass 5% Non-Fibrous	None Detected
19200N BS34	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Large Fissures)	1: White 2: Beige	70% Cellulose 25% Glass 5% Non-Fibrous	None Detected
19200N BS35	Ground Floor - Corridor 102	Paint 2' X 4' Ceiling Tile (Large Fissures)	1: White 2: Beige	70% Cellulose 25% Glass 5% Non-Fibrous	None Detected

Analyst(s): Lillian Fan

Sample(s) Collected on May 17, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS36	Ground Floor - Dressing Room (1) 107	Skate Planking (East Side)	1: Black	100% Non-Fibrous	None Detected
19200N BS37	Ground Floor - Dressing Room (1) 107	Skate Planking Adhesive	2: Black	1% Cellulose 99% Non-Fibrous	None Detected
19200N BS38	Ground Floor - Dressing Room (1) 107	Cove Base	1: Black	100% Non-Fibrous	None Detected
19200N BS39	Ground Floor - Dressing Room (1) 107	Cove Base Adhesive	2: Cream	100% Non-Fibrous	None Detected
19200N BS40	Ground Floor - Storage Room 108	Skate Planking	1: Black	100% Non-Fibrous	None Detected
19200N BS41	Ground Floor - Storage Room 108	Skate Planking Adhesive	2: Beige	100% Non-Fibrous	None Detected
19200N BS42	Ground Floor - Furnace Room 109	Caulking (at Joint of Ductwork)	1: Grey	100% Non-Fibrous	None Detected
19200N BS43	Ground Floor - Concession 112	Coating (on Underside of Metal Sink)	1: Gold	1% Cellulose 97% Non-Fibrous	2% Chrysotile
19200N BS44	Ground Floor - Lobby and Concourse 101	Skate Planking Adhesive	1: Beige	2% Cellulose 98% Non-Fibrous	None Detected
19200N BS45	Ground Floor - Skate Shop 115	Carpet Adhesive	1: Brown	100% Non-Fibrous	None Detected
19200N BS46	Ground Floor - Storage Room 123	Skate Planking	1: Grey & Black	100% Non-Fibrous	None Detected
19200N BS47	Ground Floor - Workshop 129	Insulating Cement (Pipe Elbow)	1: Off-White	60% Glass 5% Cellulose 35% Non-Fibrous	None Detected
19200N BS48	Ground Floor - Ice Plant (Engine Room) 126	Firestop Putty (at Covering End of Electrical Conduit at Floor Penetration near West Wall)	1: Grey	5% Cellulose 95% Non-Fibrous	None Detected

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS49	Ground Floor - Ice Plant (Engine Room) 126	Flange Gasket (on Pump 2)	1: Black/Grey	70% Non-Fibrous	30% Chrysotile
19200N BS50	Ground Floor - Ice Plant (Engine Room) 126	Flange Gasket (on Pump 2)	1: Black/Grey	70% Non-Fibrous	30% Chrysotile
19200N BS51	Ground Floor - Ice Plant (Engine Room) 126	Flange Gasket (on Pump 2)	1: Green	20% Cellulose 5% Glass 75% Non-Fibrous	None Detected

Analyst(s): Jessica Young

Sample(s) Collected on May 22, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS52	Ground Floor - Boiler Room 130	Pipe Thread Compound (at Fitting of Mechanical Piping within Boiler)	1: White	100% Non-Fibrous	None Detected
19200N BS53	Ground Floor - Boiler Room 130	Pipe Thread Compound (at Fitting of Mechanical Piping at Top Pressure Relief Valve of Hot Water Tank)	1: Blue	2% Cellulose 98% Non-Fibrous	None Detected
19200N BS54	Ground Floor - Corridor 102 (above Suspended Ceiling)	Duct Mastic (behind Non-Asbestos Foil-Faced Fibreglass Insulation)	1: Black	80% Non-Fibrous	20% Chrysotile
19200N BS55	Ground Floor - Dressing Room (2) 106	Paint Firestop Caulking (at West Wall Pipe Penetration)	1: White 2: Red	3% Cellulose 97% Non-Fibrous	None Detected
19200N BS56	Ground Floor - Dressing Room (1) 107	Paint Filling Compound on Gypsum Board (Ceiling)	1: Beige 2: Grey	97% Non-Fibrous	3% Chrysotile
19200N BS57	Ground Floor - Open Rink Area 121	Paint Filling Compound on Gypsum Board (Ceiling at Underside of Mezzanine Goal Crease Room, at East Wall)	1: White 2: Off-White	100% Non-Fibrous	None Detected
19200N BS58	Ground Floor - Open Rink Area 121	Flooring Adhesive (beneath Skate Planking at East Side)	1: Brown	100% Non-Fibrous	None Detected
19200N BS59	Ground Floor - Open Rink Area 121	Floor Levelling Compound (beneath Skate Planking at East Side)	2: Grey	100% Non-Fibrous	None Detected
19200N BS60	Ground Floor - Open Rink Area 121	Skate Planking (Smooth at East Side Walkway)	1: Black	100% Non-Fibrous	None Detected
19200N BS61	Ground Floor - Open Rink Area 121	Skate Planking (Rough at East Side Walkway)	1: Black	100% Non-Fibrous	None Detected

Analyst(s): Jessica Young

Sample(s) Collected on May 24, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos		Asbestos	
				%	Type	%	Type
19200N BS62	Exterior - Lower South Rooftop Ex4	Mastic (on South Metal Exhaust Vent)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS63	Exterior - Lower South Rooftop Ex4	Mastic (on East Metal Exhaust Vent)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS64	Exterior - Lower South Rooftop Ex4	Mastic (on Southeast Metal Exhaust Vent)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS65	Exterior - Lower South Rooftop Ex4	Firestop Putty (at Northeast Metal Exhaust Vent)	1: Grey	10 %	Cellulose	None Detected	
				90 %	Non-Fibrous		
19200N BS66	Exterior - Lower South Rooftop Ex4	Mastic (on Metal Roof Access Hatch)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS67	Exterior - Lower South Rooftop Ex4	Caulking (on East Metal Exhaust Vent)	1: Red	100 %	Non-Fibrous	None Detected	
19200N BS68	Exterior - Lower South Rooftop Ex4	Caulking (on North Metal Perimeter Flashing)	1: Grey	100 %	Non-Fibrous	None Detected	
19200N BS69	Exterior - Lower South Rooftop Ex4	Caulking Patch (North Wall)	1: Clear	100 %	Non-Fibrous	None Detected	
19200N BS70	Exterior - Lower South Rooftop Ex4	Mastic (at North Wall Penetration of Metal Exhaust Vent)	1: Black	3 %	Cellulose	None Detected	
				97 %	Non-Fibrous		
19200N BS71	Exterior - Lower South Rooftop Ex4	Caulking (on West Skylight Metal Flashing)	1: Brown	95 %	Non-Fibrous	5 %	Chrysotile
19200N BS72	Exterior - Lower South Rooftop Ex4	Mastic (on West Metal Skylight Flashing)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS73	Exterior - Lower South Rooftop Ex4	Caulking (on Northwest Metal Wall Flashing)	1: Brown	100 %	Non-Fibrous	None Detected	
19200N BS74	Exterior - Lower Southeast Rooftop Ex5	Mastic Patch (on West Wall)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS75	Exterior - Lower Southeast Rooftop Ex5	Mastic Patch (on West Wall)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS76	Exterior - Lower Southeast Rooftop Ex5	Mastic Patch (on West Wall)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS77	Exterior - Lower Southeast Rooftop Ex5	Caulking (on Southwest Metal Perimeter Flashing)	1: Brown	100 %	Non-Fibrous	None Detected	
19200N BS78	Exterior - Lower North Rooftop Ex2	Mastic (on Northwest Metal Exhaust Vent)	1: Black	1 %	Glass	None Detected	
				99 %	Non-Fibrous		
19200N BS79	Exterior - Lower North Rooftop Ex2	Mastic (on Southwest Metal Exhaust Vent)	1: Black	100 %	Non-Fibrous	None Detected	
19200N BS80	Exterior - Lower North Rooftop Ex2	Caulking (on North Metal Exhaust Vent)	1: Brown	100 %	Non-Fibrous	None Detected	
19200N BS81	Exterior - Lower North Rooftop Ex2	Caulking (on Water Circulator)	1: Black	100 %	Non-Fibrous	None Detected	
19200N BS82	Exterior - Lower North Rooftop Ex2	Caulking (on North Metal Perimeter Flashing)	1: Clear	100 %	Non-Fibrous	None Detected	
19200N BS83	Exterior - Main Rooftop Ex3	Caulking (on Centre West Exhaust Vent)	1: Dark Brown	100 %	Non-Fibrous	None Detected	

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS84	Exterior - Main Rooftop Ex3	Caulking (on Southwest Exhaust Vent)	1: Dark Brown	100% Non-Fibrous	None Detected
19200N BS85	Exterior - Main Rooftop Ex3	Caulking (on Northwest Exhaust Vent)	1: Red	100% Non-Fibrous	None Detected

Analyst(s): Jessica Young

Sample(s) Collected on May 24, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS86	Ground Floor - Open Rink Area 121	Paint Filling Compound on Gypsum Board (Ceiling at Underside of Mezzanine Goal Crease Room, at West Side)	1: White 2: Grey	97% Non-Fibrous	3% Chrysotile

Analyst(s): Jessica Young

Sample(s) Collected on June 20, 2019

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
19200N BS87	Ground Floor - Lobby and Concourse 101	Caulking (at Electrical Penetration on North Wall outside of Referee's Dressing Room)	1: Red	5% Glass 95% Non-Fibrous	None Detected
19200N BS88	Ground Floor - Open Rink Area 121	Insulating Cement (on Elbow of Rain Water Leader)	1: Beige	60% Cellulose 5% Glass 35% Non-Fibrous	None Detected
19200N BS89	Exterior - Lower South Rooftop Ex4	Caulking (on West Metal Skylight Flashing)	1: Brown	3% Glass 97% Non-Fibrous	None Detected
19200N BS90	Exterior - Lower South Rooftop Ex4	Caulking Patch (on North Peak of West Skylight)	1: Black	3% Glass 97% Non-Fibrous	None Detected
19200N BS91	Exterior - Lower South Rooftop Ex4	Caulking Patch (at North end of Vertical Skylight)	1: Black	3% Glass 97% Non-Fibrous	None Detected
19200N BS92	Ground Floor - Corridor 102	Paint Gypsum Board Filling Compound Residue (on East Wall)	1: Beige 2: Grey	97% Non-Fibrous	3% Chrysotile
19200N BS93	Ground Floor - Skate Shop 115	Paint Gypsum Board Filling Compound Residue (South Wall)	1: Dark Grey 2: Grey	97% Non-Fibrous	3% Chrysotile

Analyst(s): Jessica Young

Sample(s) Collected on October 30, 2017

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
18808BS01	Boiler Room 130 (accessed from Exterior Southeast Corner)	Pipe Thread Compound (at Fitting of Natural Gas Piping at Valve of HWT #1)	1: Grey	99% Non-Fibrous	1% Tremolite [Partly Removed]
18808BS02	Boiler Room 130 (accessed from Exterior Southeast Corner)	Pipe Thread Compound (at Fitting of Mechanical Piping at Front Hot Water Outlet of HWT #1)	1: Grey	99% Non-Fibrous	1% Tremolite [Partly Removed]
18808BS03	Boiler Room 130 (accessed from Exterior Southeast Corner)	Pipe Thread Compound (at Fitting of Mechanical Piping at Capped Hot Water Outlet on Top of HWT #3)	1: Dark Grey	99% Non-Fibrous	1% Tremolite [Partly Removed]
18808BS04	Boiler Room 130 (accessed from Exterior Southeast Corner)	Pipe Thread Compound (at Fitting of Mechanical Piping at Pressure Relief Valve of HWT #2)	1: Beige & Green	25% Cellulose 75% Non-Fibrous	None Detected

Analyst(s): Brittany Ford

Sample(s) Collected on November 1, 2017

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
18808BS05	Exterior - Rooftop Ex5 (of Southeast Boiler Room)	Caulking (at Joint of Metal Exhaust Vent)	1: Brown	100% Non-Fibrous	None Detected
18808BS06	Exterior - Rooftop Ex5 (of Southeast Boiler Room)	Mastic Residue (on Metal Exhaust Vent)	1: Black	2% Cellulose 2% Glass 96% Non-Fibrous	None Detected

Analyst(s): Jesse James

Samples Collected on February 25, 2015

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
13829BS01a	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Membrane	1: Black	75% Synthetic 25% Non-Fibrous	None Detected
13829BS01b	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Mastic	2: Black	2% Cellulose 2% Glass 96% Non-Fibrous	None Detected
13829BS01c	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Felt	3: Black	60% Synthetic 40% Non-Fibrous	None Detected
13829BS01d	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Mastic	4: Black	2% Cellulose 2% Glass 96% Non-Fibrous	None Detected

Sample	Location	Description	Layer: Colour	Non-Asbestos	Asbestos
				% Type	% Type
13829BS01e	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Felt	4: Black	60% Synthetic 40% Non-Fibrous	None Detected
13829BS02	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Mastic (beneath Donna Conna)	5: Black	2% Cellulose 2% Glass 96% Non-Fibrous	None Detected
13829BS03a	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Mastic (beneath Foam Insulation)	6: Black	2% Cellulose 2% Glass 96% Non-Fibrous	None Detected
13829BS03b	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Roofing Vapour Barrier (beneath Foam Insulation)	7: Brown & Black	90% Cellulose 10% Non-Fibrous	None Detected
13829BS04	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Paint Wall Stucco (Outer Layer) (West Area)	1: Pink 2: White	100% Non-Fibrous	None Detected
13829BS05	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Wall Stucco (Inner Layer) (West Area)	3: Grey	2% Cellulose 98% Non-Fibrous	None Detected
13829BS06	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Paint Wall Stucco (Outer Layer) (Centre Area)	1: Pink 2: White	100% Non-Fibrous	None Detected
13829BS07	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Wall Stucco (Inner Layer) (Centre Area)	3: Grey	2% Cellulose 98% Non-Fibrous	None Detected
13829BS08	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Paint Wall Stucco (Outer Layer) (East Area)	1: Pink 2: White	100% Non-Fibrous	None Detected
13829BS09	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Wall Stucco (Inner Layer) (East Area)	3: Grey	2% Cellulose 98% Non-Fibrous	None Detected
13829BS10	Exterior - Rooftop - Roof 2.1 (Southeast) Ex4	Wall Construction Paper	1: Brown	95% Cellulose 5% Non-Fibrous	None Detected

Analyst(s): Jesse James



American Industrial Hygiene Association (AIHA) Bulk Asbestos Proficiency Analytical Testing (BAPAT)
Astech Consultants Ltd. Laboratory Participant ID# 200542

Sample Submitted by Client on April 9, 2009

Bulk Sample # 8478BS01 : **Main Floor - Open Rink Area 121**
 Sample Type : Gypsum Board Filling Compound (Upper Wall at Northeast End)
 Result : **1 - 5% Chrysotile Asbestos**

Samples Collected on May 3, 2006

Bulk Sample # 5730BS01 : **Exterior - Rooftop - Roof 2.1 (Southeast) Ex4**
 Sample Type : Roof Membrane and Mastic
 Result : 20 - 40% Synthetic Fibres
 : 1 - 10% Cellulose Fibres
 : 1 - 10% Glass Fibres
 : No Asbestos Fibres Observed

Bulk Sample # 5730BS02 : **Exterior - Rooftop - Roof 2.2 (Northeast) Ex2**
 Sample Type : Roof Membrane and Mastic
 Result : 20 - 40% Synthetic Fibres
 : 1 - 10% Cellulose Fibres
 : 1 - 10% Glass Fibres
 : No Asbestos Fibres Observed

Bulk Sample # 5730BS03 : **Exterior - Rooftop - Roof 2.2 (Northeast) Ex2**
 Sample Type : Two-Ply Organic Felt and Vapour Barrier
 Result : 30 - 50% Cellulose Fibres
 : No Asbestos Fibres Observed

Bulk Sample # 5730BS04 : **Exterior - Rooftop - Roof 2.2 (Northeast) Ex2**
 Sample Type : Wall Stucco
 Result : No Asbestos Fibres Observed

Bulk Sample # 5730BS05 : **Exterior - Rooftop - Roof 4.1 (Main) Ex3**
 Sample Type : Roof Membrane and Mastic
 Result : 20 - 40% Synthetic Fibres
 : 1 - 10% Cellulose Fibres
 : 1 - 10% Glass Fibres
 : No Asbestos Fibres Observed

Samples Collected on May 18, 2006

Bulk Sample # 5730BS06 : **Exterior - Rooftop - Roof 2.1 (Southeast) Ex4**
 Sample Type : Wall Stucco
 Result : No Asbestos Fibres Observed

Sample Collected on June 1, 1999

Bulk Sample # 2352BS01 : **Corridor 102**
 Sample Type : Floor Adhesive (Black)
 Result : No Asbestos Fibres Observed

Samples Submitted by Beatty Floors Limited on May 13, 1999

Bulk Sample # 2334BS01 : **East Side Walkway (of Open Rink Area 121)**
 Sample Type : Asphaltic Skate Planking
 Result : 1 - 10% **Chrysotile Asbestos**
 : 20 - 40% Cellulose Fibres

[Removed]

Bulk Sample # 2334BS02 : **Dressing Room (3) 105**
 Sample Type : Asphaltic Skate Planking
 Result : 50 - 70% Cellulose Fibres
 : No Asbestos Fibres Observed

Samples Collected Prior to June 1997

Bulk Sample # 1943BS01	: Staff Room Corridor 102	
Sample Type	: Gypsum Board Filling Compound	
Result	: 1 - 10% Chrysotile Asbestos	
Bulk Sample # 1824BS11	: Main Floor Skate Shop 115	
Sample Type	: Gypsum Board Filling Compound (Ceiling)	[Mostly Removed]
Result	: 1 - 10% Chrysotile Asbestos	
Bulk Sample # 610BS04	: Main Floor Ammonia Plant 126	
Sample Type	: Chiller Insulation	[Removed]
Result	: 70 - 90% Chrysotile Asbestos	
Bulk Sample # 610BS05	: Main Floor Boiler Room 128	
Sample Type	: Tank Insulation	
Result	: No Asbestos Fibres Observed	
Bulk Sample # 610BS06	: Main Floor Boiler Room 128	
Sample Type	: Insulating Cement (Elbow)	
Result	: No Asbestos Fibres Observed	
Bulk Sample # 462BS41	: Main Floor Boiler Room 128	
Sample Type	: Boiler Tank Insulation	
Result	: 30 - 50% Glass Fibres	
	: Less than 1% Cellulose Fibres	
	: No Asbestos Fibres Observed	
Bulk Sample # 462BS42	: Main Floor Boiler Room 128	
Sample Type	: Spray Applied Insulation	
Result	: 60 - 80% Glass Fibres	
	: No Asbestos Fibres Observed	
Bulk Sample # 462BS43	: Main Floor Arena Open Area 121	
Sample Type	: Roof Drain Insulation	
Result	: 50 - 70% Glass Fibres	
	: 1 - 10% Cellulose Fibres	
	: No Asbestos Fibres Observed	
Bulk Sample # 462BS44	: Main Floor Janitor's Closet 111	
Sample Type	: Water Regulator Pipe Elbow	
Result	: 40 - 60% Glass Fibres	
	: 1 - 10% Cellulose Fibres	
	: No Asbestos Fibres Observed	
Bulk Sample # 462BS45	: Main Floor Ammonia Plant 126	
Sample Type	: Circulating Pump Pipe Elbow	[Removed]
Result	: 30 - 50% Chrysotile Asbestos	

Appendix D

Laboratory Lead in Paint/Glazing Bulk Sample Reports



LEAD BULK SAMPLE REPORT

Date: June 21, 2019
Client: CITY OF NEW WESTMINSTER
Location: **Moody Park Arena**
701 - 8th Avenue
New Westminister, BC

Comments: 1) Analyzed by X-Ray Fluorescence (XRF) with direct read PPM.
2) Sample results report lead only.
3) Health Canada defines lead-containing surface coating material as a paint or other similar material that dries to a solid film that contains over 90 PPM (90 mg/kg or 90 μ g/g or 0.009%) dry weight of lead.
4) Samples will be disposed of after 90 days, unless the Client requests otherwise.
5) < means less than, > means more than.

Samples Collected on January 16, 2019

Sample	Location	Description	Colour	Lead
				PPM
19200N LS01	Ground Floor - Electrical Room 125	Paint on Primer (on South Metal Door Frame)	Black & Red	336 PPM
19200N LS02	Ground Floor - Electrical Room 125	Paint (on South Metal Door)	Red	156 PPM

Analyst(s): Trevor Shendruk

Samples Collected on January 18, 2019

Sample	Location	Description	Colour	Lead
				PPM
19200N LS03	Ground Floor - Storage Room 108	Paint (on East Concrete Block Wall)	Cream	109 PPM
19200N LS04	Ground Floor - Storage Room 108	Paint (on East Wood Door)	Brown	160 PPM
19200N LS05	Ground Floor - Storage Room 108	Paint (on East Metal Door)	Blue	68 PPM

Sample	Location	Description	Colour	Lead
				PPM
19200N LS06	Ground Floor - Dressing Room (3) 105	Glazing Finish (on Ceramic Floor Tile)	Off-White	40 PPM
19200N LS07	Ground Floor - Dressing Room (3) 105	Glazing Finish (on North Ceramic Wall Tile)	White	5,550 PPM
19200N LS08	Ground Floor - Dressing Room (3) 105	Paint (on East Concrete Block Wall)	Beige	287 PPM
19200N LS09	Ground Floor - Dressing Room (3) 105	Paint (on Wood Bench)	Blue	269 PPM
19200N LS10	Ground Floor - Workshop 129	Paint (on East Concrete Block Wall)	Green	112 PPM
19200N LS11	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Concrete Floor)	Grey	527 PPM
19200N LS12	Ground Floor - Ice Plant (Engine Room) 126	Paint (on North Concrete Block Wall)	White	598 PPM
19200N LS13	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Raised Concrete Base for Mechanical Equipment)	Black	1,593 PPM
19200N LS14	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Mechanical Piping)	Blue	3,478 PPM
19200N LS15	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Mechanical Piping)	Red	1,088 PPM
19200N LS16	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Main Pump at Centre of Room)	Silver	4,434 PPM
19200N LS17	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Mechanical Piping)	Green	82 PPM
19200N LS18	Ground Floor - Ice Plant (Engine Room) 126	Paint (on Mechanical Piping)	Yellow	7,522 PPM
19200N LS19	Ground Floor - Open Rink Area 121	Paint (on East Structural Steel Column)	Red	71,500 PPM
19200N LS20	Ground Floor - Open Rink Area 121	Paint (on East Concrete Block Wall)	Grey	252 PPM
19200N LS21	Ground Floor - Open Rink Area 121	Paint (on Wood Stairs to Mezzanine Goal Crease Room 120)	Yellow	46,900 PPM
19200N LS22	Ground Floor - Open Rink Area 121	Paint (on West Wood Wall)	White	< 9 PPM
19200N LS23	Ground Floor - Open Rink Area 121	Paint (on Concrete Floor)	Black	750 PPM
19200N LS24	Ground Floor - Men's Washroom 118	Paint (on Gypsum Board Ceiling)	White	225 PPM
19200N LS25	Exterior Ex1	Paint (on South Concrete Block Wall)	Light Brown	184 PPM
19200N LS26	Exterior Ex1	Paint (on East Concrete Block Wall)	Cream	382 PPM
19200N LS27	Exterior Ex1	Paint (on Southeast Metal Door)	Blue	268 PPM
19200N LS28	Exterior Ex1	Paint (on East Wood Wall Trim)	Brown	< 9 PPM

Sample	Location	Description	Colour	Lead
				PPM
19200N LS29	Exterior Ex1	Paint (on West Metal Fence)	Green	56,400 PPM

Analyst(s): Trevor Shendruk

Samples Collected on May 24, 2019

Sample	Location	Description	Colour	Lead
				PPM
19200N LS30	Exterior - Lower North Rooftop Ex2	Paint (on Metal Ladder)	Cream	< 8 PPM
19200N LS31	Exterior - Lower North Rooftop Ex2	Paint (on South Steel Beam)	Grey	1,222 PPM

Analyst(s): Jessica Young

Sample(s) Collected on October 30, 2017

Bulk Sample # 18808LS01 : Boiler Room 130 (accessed from Exterior Southeast Corner)
 Sample Type : Paint (Cream) (on Rear Concrete Block Wall) (Addition)
 Result : <6 PPM

Analyst: Matthew Spearman

Sample Collected on February 25, 2015, was digested in accordance with EPA Analytical Method 3051 modified and analyzed in accordance with EPA Analytical Method 200.15.

Bulk Sample # 13829LS01 : Exterior - Rooftop - Roof 2.1 (Southeast) Ex4
 Sample Type : Paint (Beige) (on Stucco Wall)
 Result : 89.6 mg/kg

Appendix E

Asbestos and Potential Asbestos Containing Materials Inventory Spreadsheet

Loc.#	Room Name	Paper Backed Sheet Flooring	Ceramic Tile Grout and Mortar/Adhesive	Filling Compounds on Gypsum Board, Concrete, and/or Block	Loose Fill Vermiculite Insulation within Cavities of Concrete Block Walls	Massics on Joints of Concrete Block	Gasket and Packing Materials at Valves and Flanges	Coating on Underside of Metal Sinks	Adhesives (concealed behind wall mirrors)	Window Putties and Caulkings at Windows, Doors and Skylights	Miscellaneous (pipe thread compounds, Cement Drain Pipes, etc.)	Comments
	MAIN FLOOR											
101	Main Lobby and Concourse									sealant residue (potential) in 11 interior metal-framed windows and windows of 4 interior metal doors (adjoining Open Rink Area 121) (although non-ACM foam seals and/or silicone caulking are visible)		
102	Corridor			160 lin.ft. (residue on walls 2" above T-bar ceiling)		96 lin.ft. (above T-bar ceiling)						
103	Staff Room			150 sq.ft.								
104	Dressing Room 4		50 sq.ft. (potential) on floor 220 sq.ft. (potential) on walls	52 sq.ft.					3 sq.ft. (potential)			
105	Dressing Room 3		50 sq.ft. (potential) on floor 220 sq.ft. (potential) on walls	52 sq.ft.					3 sq.ft. (potential)			
106	Dressing Room 2		50 sq.ft. (potential) on floor 220 sq.ft. (potential) on walls	52 sq.ft.					3 sq.ft. (potential)			
107	Dressing Room 1		50 sq.ft. (potential) on floor 220 sq.ft. (potential) on walls	52 sq.ft.					3 sq.ft. (potential)			1 NAB tag on non-asbestos pipe insulation.
108	Storage Room											
109	Furnace Room					70 lin.ft.						
110	Electrical Room					6 lin.ft.						1 NAB tag on non-asbestos pipe insulation.
111	Maintenance Room					11 lin.ft.						5 NAB tags on non-asbestos pipe insulation.
112	Concession	192 sq.ft. (potential) concealed beneath non-asbestos skate planking, non-asbestos paper backed sheet flooring, and/or cabinets		270 sq.ft.				1 sink				1 NAB tag on non-asbestos pipe insulation.

Loc.#	Room Name	Paper Backed Sheet Flooring	Ceramic Tile Grout and Mortar/Adhesive	Filling Compounds on Gypsum Board, Concrete, and/or Block	Loose Fill Vermiculite Insulation within Cavities of Concrete Block Walls	Massics on Joints of Ductwork	Gasket and Packing Materials at Valves and Flanges	Coating on Underside of Metal Sinks	Adhesives (concealed behind wall mirrors)	Window Putties and Caulkings at Windows, Doors and Skylights	Miscellaneous (pipe thread compounds, Cement Drain Pipes, etc.)	Comments
113	Concession Storage Room	28 sq.ft. (potential) concealed beneath non-asbestos skate planking and/or non-asbestos paper backed sheet flooring		30 sq.ft.					3 sq.ft. (potential)			
114	Office			250 sq.ft.								
115	Skate Shop			85 lin.ft. (residue on walls approx. 2" above T-bar ceiling)						sealant in 8 interior metal-framed windows (adjoining Lobby and Concourse 101) sealant in windows of 2 interior wood doors (adjoining Lobby and Concourse 101)		
116	Office			44 lin.ft. (residue on walls approx. 2" above T-bar ceiling)						sealant in 7 interior metal-framed windows (adjoining Skate Shop 115 and Open Rink Area 121) sealant in window of 1 interior wood door (adjoining Skate Shop 115)		
117	Woman's Washroom			320 sq.ft.					17 sq.ft. (potential)			
118	Men's Washroom			220 sq.ft.					11 sq.ft. (potential)			
119	Referee Dressing Room		70 sq.ft. (potential) on walls and Floor	non-ACM, however, potential 32 lin.ft. of residue on walls may still be present at or above ceiling)					3 sq.ft. (potential)	sealant residue (potential) in 1 interior metal-framed window (adjoining Open Rink Area 121)		
120	Referee Washroom/Shower			non-ACM, however, potential 32 lin.ft. of residue on walls may still be present at or above ceiling)								
121	Open Rink Area			6,800 sq.ft. (at Goal Crease Room 122 and behind upper wood walls)							1 air handling unit with potential caulking/sealants at joints and/or penetrations (inaccessible due to height)	10 NAB tags on non-asbestos pipe insulation.
122	Mezzanine Goal Crease Room	60 sq.ft. of paper residue beneath non-ACM skate planking		non-ACM						non-ACM rubber seal in 1 interior window		
123	Equipment Storage Room											
124	Equipment Storage Room											
125	Electrical Room											

Loc.#	Room Name	Paper Backed Sheet Flooring	Ceramic Tile Grout and Mortar/Adhesive	Filling Compounds on Gypsum Board, Concrete, and/or Block	Loose Fill Vermiculite Insulation within Cavities of Concrete Block Walls	Mastics on Joints of Ductwork	Gasket and Packing Materials at Valves and Flanges	Coating on Underside of Metal Sinks	Adhesives (concealed behind wall mirrors)	Window Putties and Caulkings at Windows, Doors and Skylights	Miscellaneous (pipe thread compounds, Cement Drain Pipes, etc.)	Comments
126	Ice Plant (Engine Room)						~60 gaskets at flanges of 2 large pumps (new and old mixed)					
127	Zamboni Room											
128	Boiler Room											
129	Workshop											
130	Boiler Room										~10 fittings of older grey and dark grey pipe thread compounds at fittings of mechanical and natural gas piping. Newer blue and white pipe thread compounds at fittings of mechanical and natural gas piping is non-ACM.	4 NAB tags on non-asbestos pipe insulation.
199	Inaccessible Wall Cavities and Ceiling Spaces				Loose fill vermiculite insulation (potential) within exterior concrete block walls, including former exterior west wall of Boiler Room 130 (qty unknown)	qty unknown						

Loc.#	Room Name	Paper Backed Sheet Flooring	Ceramic Tile Grout and Mortar/Adhesive	Filling Compounds on Gypsum Board, Concrete, and/or Block	Loose Fill Vermiculite Insulation within Cavities of Concrete Block Walls	Massics on Joints of Ductwork	Gasket and Packing Materials at Valves and Flanges	Coating on Underside of Metal Sinks	Adhesives (concealed behind wall mirrors)	Window Putties and Caulkings at Windows, Doors and Skylights	Miscellaneous (pipe thread compounds, Cement Drain Pipes, etc.)	Comments
	EXTERIOR											
Ex1	Main Building									sealants and caulking (potential) in and around 16 metal-framed windows (some covered behind wood) sealants (potential) in windows of 6 metal doors	~6 fittings of pipe thread compound at fittings of retrofit natural gas piping from Boiler Room 130 to gas meter.	
Ex2	Lower North Rooftop											
Ex3	Main Upper Rooftop											
Ex4	Lower South Rooftop									100 lin.ft. of caulking at and around metal flashing at skylights 400 sq.ft. of sealant (potential) in skylights		
Ex5	Lower Southeast Rooftop											
Ex6	Underground										potential (concealed) cement drain pipes (qty unknown).	

Appendix F

Representative Photographs



Photograph 1: Main Lobby and Concourse 101 - Flaking/Delaminating Lead Paint on Exterior Metal Window Frame



Photograph 2: Ice Plant (Engine Room) 126 - Flaking/Delaminating Lead Paint on Concrete Floor



Photograph 3: Ice Plant (Engine Room) 126 - Flaking/Delaminating Lead Paint on Metal Base at Motor near West Wall



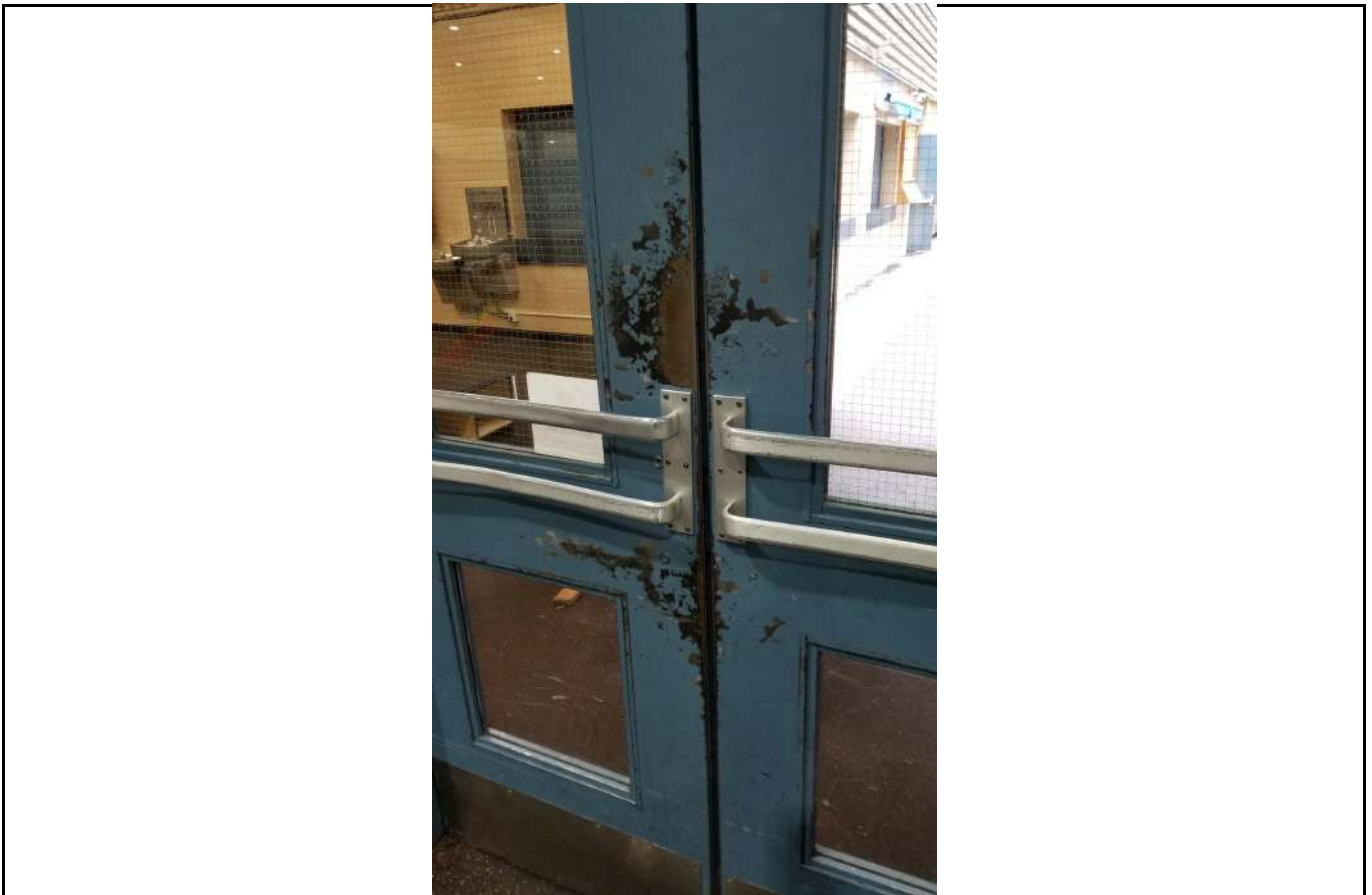
Photograph 4: Ice Plant (Engine Room) 126 - Flaking/Delaminating Lead Paint on Metal Piping above Pump at Centre of Room



Photograph 5: Ice Plant (Engine Room) 126 - Flaking/Delaminating Lead Paint on Raised Concrete Bases at Centre of Room



Photograph 6: Open Rink Area 121 - Flaking/Delaminating Lead Paint on Concrete Block Wall (near Northeast Corner)



Photograph 7: Open Rink Area 121 - Worn/Delaminating Lead Paint on South Metal Doors



Photograph 8: Open Rink Area 121 - Damaged Asbestos Containing Filling Compound and Lead Paint on Gypsum Board Ceiling at Underside of Mezzanine Goal Crease Room 122, and Flaking/Delaminating Lead Paint on Concrete Block Wall