

# **JASEL ENGINEERING INC.**

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## **INVESTIGATION AND REPORT**

January 22, 2020

To: Terry Fink - Town of Lakeshore  
From: James Smith - JASEL Engineering Inc.  
CC: Louis Smith - JASEL Engineering Inc.  
Re: Air Conditioning Report for the Rock Arena

JASEL Project No.: 2019-050

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### **1.0 PROJECT DESCRIPTION:**

The purpose of this Investigation and report is to assess and recommend how to Air Condition the existing Rock arena (Rink No.1) of the Lakeshore Multi-Use Recreational Facility, known at the Atlas Tube Centre.

The Town of Lakeshore requested that the Air Conditioning Report address the following issues and concerns:

1. The consultant will present a written assessment report on the strength and weakness of the integrated air handling system at the Atlas Tube Centre. The report would address the ability of the present air handling system to provide air conditioned air to the Rock Arena. The Consultant's Report would establish a rationale to use the present air handling system or to investigate alternative systems.
2. If the Consultant's position is to recommend the existing air handling system, the following information must be provided in a final report to the Manager of Recreation & Leisure four weeks after the awarding of the above project:
  - a. The impact on the present air handling system
  - b. The projected capital cost of the project
  - c. The projected annual operating cost of the project
  - d. Structural interior and exterior designs
  - e. Construction schedules, noting the most effective time of the year for installation.

3. If the Consultant is not recommending the existing air handling system, two alternative air handling systems must be presented to air condition the Rock Arena. The Consultant will recommend a preferred air handling system with clear rational, four-six weeks after the awarding of the above project. The report will be supported with the following information:
  - a. The impact on the present air handling system
  - b. The projected capital cost of the project
  - c. The projected annual operating cost of the project
  - d. Structural interior and exterior designs
  - e. Construction schedules, noting the most effective time of the year for installation.

## **2.0 PURPOSE:**

It is our understanding that the intent and reason to provide an air conditioning cooling system for the Rock Arena are for two (2) purposes:

1. to provide a suitable indoor environment for a 3000 person event during the summer months. These events could include but not limited to school graduations, art shows, and / or concert type events.
2. Assist in cooling the indoor environment to support the ice installation during the month of August.

## **Air Conditioning Load Calculations**

Cooling Load Calculations have been performed using a computer mode; of the arena based upon existing architectural drawings and it has been determined that 210 Tons of cooling is required.

The air conditioning calculations are based upon a 3000 person occupant load where the activity level of each individual is low.

Please refer to Appendix A for a copy of the Air Conditioning load calculations computer printer outs.

### **3.0 INVESTIGATION**

Jasel Engineering Inc. performed on site review of the Rock arena and appropriate mechanical and electrical rooms servicing the Rock Arena.

#### **Existing Air Handling Unit AHU-1**

The existing air handling unit is a unit manufactured by Concepts and Designs Inc. and is a 13,000 CFM indoor desiccant dehumidification unit with glycol heating coil dedicated to the Rock area. The desiccant wheel uses direct fired natural gas heater to remove the moisture form the desiccant wheel.

Note - This unit only services the Rock Arena space.

Please refer to Appendix B for a copy of the original shop drawings for this AHU-1.

#### **Strengths and Weaknesses of the existing AHU System**

The existing AHU is a desiccant dehumidification unit with outside air ventilation and glycol heating capabilities.

The main strength of this AHU, and for a Rural community rink, the desiccant dehumidification is excellent design to help control the indoor environment relative humidity.

However, the only weakness for this existing AHU system is that it does not have the ability to provide future cooling as there is no spare space in the AHU to add any form of cooling coil.

Also, the existing supply ductwork would not meet the appropriate requirements to allow for air conditioning cold ductwork and if we would consider to use the existing ductwork, the entire duct insulation would need to be removed and replaced. This would involve exposing all ductwork that is in the ceiling space of the change rooms and covered up with walls.

Therefore, based upon the fact that the AHU cannot accept a cooling coil and the supply ductwork concern, we **do not recommend to reuse the existing AHU** to provide cooling of the Rock Arena.

### **Site Observations**

Based upon our site review, the following issues or concerns are noted that will need to be dealt with in some manner in order to provide air conditioning to the Rock Arena:

1. Existing Structural framing of the roof structure

The existing structural steel support frame for the building is a "Pre-Engineered" system and typically there is no significant additional structural capacity to ADD equipment, ductwork and or piping.

Also, based upon the general concept of the building, adding rooftop equipment would not be aesthetically pleasing and therefore will not be considered for any option for the report.

2. Existing electrical service

The existing electrical service is a 2,000 amp 600 volt service and the expected electrical load due to air conditioning is approximately 600 amps or 30% of the existing service size.

The new air conditioning load could occur at the same time that the ice surfaces are being made and therefore the overall electrical service needs to be confirmed if it can handle the additional electrical load for air conditioning at the same time ice is being made. Further details are required on this item.

3. Integration into the existing building automation controls.

All new equipment must be integrated in the building automation system to ensure it is properly operated and monitored.

4. The increase in operating and maintenance costs for the new air conditioning equipment.

As with all new mechanical equipment, there will be an increase in operating expenses and maintenance expenses to the facility if air conditioning is added to the arena.

Trying to determine and predict the operating costs for an air conditioning system is a very difficult assignment as it is based upon actual hours of operation and how the system will be used.

5. Low headroom on the south side of the building.
6. Noise level of the new equipment.

### **3.0 PROPOSED OPTIONS FOR CONSIDERATION:**

#### **Option 1: Rooftop HVAC Unit – not considered as this is not a Feasible Option**

Estimated Cost: unknown

#### **Option2: Chilled Water System with One (1) Indoor Air Handling Unit**

##### **Description of Work:**

- Cooling to be provided by the use of an outdoor air cooled chiller that would be located on grade on the west side
- Air distribution will require a new indoor air handling unit complete with fans, filters and cooling coil

Note – there is no available space for the unit and we have allowed for taking over the conference room in the middle of the track level to create this new room

- Unit to be located on the North side of the space as there is low headroom on the south side of the space.
- New High level supply and return ductwork to be added from the location of the new unit.
- Chilled water Piping and insulation from the outdoor chiller to the new indoor AHU
- Provide new glycol chemical treatment
- Provide new outdoor air intake vent through north wall / roof
- Provide power to equipment
- Provide building automation controls to the new equipment
- Create new mechanical room for the AHU
- Create new conference room in another location in the site (to be determined)

**Advantages:**

- Equipment does not require to be in the space
- Reuse of room

**Disadvantages:**

- Taking over the existing conference and finding location of a new conference room
- Overhead ductwork through out the space
- One (1) chiller does not have equipment redundancy – two chillers will cost more to install

**Cost Breakdown:**

Cost Breakdown	Estimated Cost
Chiller	\$205,000
Concrete pad	\$20,000
Air Handling Unit	\$150,000
Pumps / Piping / Installation	\$285,000
Sheet Metal / Venting	\$225,000
Piping and duct Insulation	\$75,000
Electrical	\$120,000
Controls	\$50,000
Mechanical room Revisions	\$20,000
New conference Room	\$50,000
Sub-total	\$1,200,000
10% contingency	\$120,000
Engineering Fees 6%	\$72,000
<b>Total</b>	<b>\$1,392,000</b>

**Schedule of Work:**

Description	Number of Weeks
Design	8
Tender and Award	6
Construction	24
Commissioning	2
<b>TOTAL NUMBER OF WEEKS</b>	<b>40</b>

**Option 3: Direct Expansion (DX) cooling system with Indoor Fan Coil Units and Outdoor air cooled condensers**

**Description of Work:**

- Addition of new indoor fan coil units suspended and or placed on custom support stands with their Dx coils
- Units to be located at a high level throughout the space
- Units can operate with ductwork, minimum ductwork
- Multiple outdoor pieces of equipment located on the south side for new Condensers
- Provide refrigerant piping to location of new equipment.
- Provide power to new units
- Provide building automation controls to the new equipment
- Note – reuse of the main air handling is required to provide ventilation air to the space

**Advantages:**

- Redundancy using multiple pieces of equipment in case of failure.
- Equipment does not require ductwork
- Multiple pieces of equipment
- Low indoor noise from fan coil units
- Phased use of indoor cooling units to minimize electrical load

**Disadvantages:**

- Multiple pieces of equipment
- Not integrate cooling and ventilation system
- Equipment may be difficult to service
- The building structure may not be able to handle the weight of the new equipment and therefore supports stands may be required
- Outdoor condensers located on south side may need landscape shield to avoid seeing the condensers

**Cost Breakdown:**

Cost Breakdown	Estimated Cost
Fan Coil and condenser Equipment Cost	\$425,000
Piping / Installation	\$500,000
Sheet Metal	\$75,000
Insulation	\$40,000
Electrical	\$150,000
Controls	\$50,000
Wall Repair	\$25,000
Landscaping / concrete pads	\$60,000
Sub-total	\$1,325,000
10% contingency	\$132,500
Engineering Fee 6%	\$79,500
<b>Total</b>	<b>\$1,537,000</b>

**Schedule of Work:**

Description	Number of Weeks
Design	8
3 week Tender and 3 week Award	6
Construction	14
Commissioning	2
<b>TOTAL NUMBER OF WEEKS</b>	<b>30</b>

Please see Appendix D for the Option 3 Equipment Details



#### **4.0 RECOMMENDATION:**

Option 3 is the recommended option.

Due to the multiple pieces of equipment, with minimum ductwork and reusing the existing AHU-1 for the ventilation air, least impact to the space, we believe this option is the most feasible.

#### **5.0 IMPLEMENTATION STRATEGY:**

The implementation strategy upon project approval would be to:

1. Design
2. Approval to proceed to tender
3. Tender,
4. Award contractor with Town of lakeshore approval
5. Construction phase.

Air conditioning would benefit the building for mid June to handle graduation ceremonies and mid August to handle when ice will be made at the arena.

Considering 30 week project duration, if we start February 1, 2020, we will not be able to meet the June date and we will very close to meet the August time when ice will be made.

Otherwise, it may be best to allow for 2021 season for air conditioning.

We hope that the above report is helpful in your planning needs and if you have any questions or concerns, please do not hesitate to contact our office.

Yours truly,

**JASEL Engineering Inc.**

**James Smith, P. Eng.**

