FINAL REPORT

Facility Condition Assessment Summerland Arena & Curling Club Complex

8820 Jubilee Road East, Summerland BC, V0H 1Z5

Submitted to:
The District of Summerland
13211 Henry Ave., Box 159
Summerland, BC V0H 1Z0
Attention: Lori Mullin,
Director of Community Services

Submitted by:
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Date: July 13, 2022
Project No.: 20211925

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EXECUTIVE SUMMARY

Stephenson Engineering Ltd. (Stephenson) was retained by the District of Summerland to perform a Facility Condition Assessment (FCA) in accordance with Stephenson's proposal dated November 23, 2021 of the property located at 8820 Jubilee Road East, Summerland, BC.

The building provides approximately 5,300 sqm (57,000 sqft) gross floor area (GFA) according to information provided by the client and was constructed circa 1976 and is situated on a Site covering approximately 1.20 hectares (2.97 acres) of land. The building is a two story steel framed structure building with concrete footings, concrete foundation walls, concrete masonry unit walls, and concrete slab on grade. The building is used as an ice arena and curling rink.

1.1. DEFINED GENERAL TERMS

The common abbreviations noted below may or may not appear in the report and may not be all inclusive:

ABS: Acrylonitrile butadiene styrene

ACM: Asbestos containing material(s)

BUR: Built-up roof

CFL: Compact fluorescent light

CIP: Cast-in-place

CMU: Concrete masonry unit

CPT: Carpet tile

CRT: Capital reserve table

CT: Ceramic tile

EPDM: Ethylene propylene diene terpolymer

FCA: Facility Lifecycle Assessment

GFCI: Ground fault circuit interrupter

GFA: Gross floor area

GWB: Gypsum wall board

HID: High intensity discharge

HPS: High pressure sodium

HVAC: Heating, ventilation and air conditioning

IGU: Insulated glazing unit

LED: Light emitting diode

PCA: Property condition assessment

PCB: Polychlorinated biphenyl

PEX: Cross-linked polyethylene

PVC: Polyvinyl chloride

RTU: Roof top unit

SBS: Styrene-butadiene-styrene

SF: Square foot

SM: Square metre

SOG: Slab-on-grade

VCT: Vinyl composite tiles

CRV: Current Replacement Value- this was developed using information provided by "RS Means Square Foot Costs 2019" using similar building types to those being reviewed in this project. The estimate is obtained using a Dollar per Square Foot ($/ft^2) formula; the square foot area being the GFA of the building represented in square foot (ft^2). The final price is presented in today's Canadian Dollars (CAN$) with a 20% estimating contingency and a location factor applied. The cost includes all of the major systems of the building: structural; architectural; mechanical; electrical.

FCI: Facility Condition Index is an industry standard asset management tool which measures the "constructed asset's condition at a specific point in time" (US Federal Real Property Council, 2008). It is a functional indicator resulting from an analysis of different but related operational indicators (such as building repair needs) to obtain an overview of a building's condition as a numerical value.

It was developed by the US Navy to assess conditions of vessels and strategically prioritize renewal spending. FCI was first utilized as an index for determining building condition in the early 1990's by the US National Association of College and Universities and quickly became the standard for post secondary institutions across North America. Recently condition index measures have been adopted by the US Federal Real Property Council, American Public Works Association, Council of Ontario Universities, Federation of Canadian Municipalities (through their infraguide publications), Health Authorities, Education Ministries and Social Housing Authorities throughout North America.

FCI is obtained by aggregating the total cost of any needed or outstanding repairs, renewal or upgrade requirements at a building obtained from our Capital Reserve Table (CRT) compared to the

Current Replacement Value (CRV) of the building components. It is the ratio of the "deferred needs" to "replacement value" expressed in percentage terms. Land Value is not considered when evaluating FCI.

$$FCI = \frac{\text{Sum of Outstanding deferred maintenance}}{\text{Current Replacement Value of an Asset}} x100$$

The lower the value of FCI, the better condition that a building is in. Currently industry benchmarks indicate the following subjective condition rating for facilities with various ranges of FCI:

Good	<5%
Fair	5-10%
Poor	10-30%
Critical	>30%

Utilizing FCI provides a professional method of measurement to determine the relative condition index of a single building, group of buildings, or if desired, a total portfolio. As FCI increases, the assets will experience:

- Increased risk of component failure
- Increased facility maintenance and operating costs
- Greater negative impacts to staff and residents.

1.2. Summary of Findings

A cursory summary of findings of this FCA is provided below. However, details are not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. To assess the physical condition of the site components and building, a Site Representative was interviewed and a visual site review was conducted. No destructive or non-destructive testing was conducted. No calculations were performed to confirm the adequacy of the original design.

Based on the findings of this FCA, the following conclusions are made:

- **Architectural**

The site and the building were developed circa 1976 with additions completed circa 1985. The vehicle access to the building is located at the south side of the property, off Jubilee Road. The pavements throughout the drive lanes and parking lot are asphalt. Based on the visual assessment, there is approximately 123 surface parking spots with no underground parking.

The exterior cladding was reviewed visually from grade level. The building envelope is primarily clad with vinyl siding, corrugated metal siding, and painted CMU walls along the building elevations. Exterior wall insulation was concealed and not directly reviewed but assumed to be provided with a combination of rigid and batt insulation along with a polyethylene vapour barrier. Windows consists of insulated glazing units set in aluminum and vinyl frames, with both sliding and fixed panes. The main entry doors and secondary doors are aluminum storefront doors in aluminum frames. Both entry doors are provided with a door activator. Painted metal utility doors and an overhead coiling door are also provided.

Interior floor finishes are generally vinyl sheet, carpet and painted/sealed concrete floors. Interior walls are GWB finished with paint, painted CMU and shower stalls area finished with ceramic tiles. The ceilings in the building are mostly painted GWB with a textured finish, acoustic ceiling tile in metal grid, and painted wood panel, except for the arena which is finished with a reflective insulation sheet.

The roof is a sloped metal corrugated system along with sections of flat roof system with built up roofing membrane covered with gravel. Water is drained from roof surfaces through internal roof drains. A prefinished metal fascia and soffit is provided along the perimeter of the building.
A cursory review was performed regarding the accessibility and barrier free compliance of the building. Generally, the building appears not to be fully barrier-free compliant with current standards for the interior circulation and washrooms.

The architectural components are in overall acceptable condition. Immediate action items with respect to the Fire Rating Code Study for storage room under bleacher areas is required. Capital expenditures with respect to site component, exterior walls, exterior windows, exterior doors, fascia & soffits, interior walls, interior doors & windows, ceilings, flooring, fixtures, barrier free, roofing, etc., are anticipated within the evaluation period. Additional investigation is recommended with Drainage Study (including Wastewater study), barrier free study and water test for active roof leak.

A detailed description of Site and building systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

- **Structural**

The foundation system is generally concealed by architectural flooring, wall and ceiling finishes; therefore, the foundation was not directly inspected at the time of the assessment and partial drawings provided. Based to our observations made on site, the building sub-structure consists of a system of CIP concrete spread and pad type footings and foundation walls supporting the load bearing walls and steel columns. The superstructure encompasses CMU bearing walls and steel columns and trusses. The roof is comprised of structural roof purlins, which are in turn supported by structural steel beams and trusses. Suspended floors appear to be wood floors framed with

plywood decking. The bleachers are wood framed construction. No significant cracking or excessive deflection heaving or settlement was observed that could indicate structural distress.

The structural components are in overall acceptable condition. Immediate action items with respect to structural study for the Slab on-grade have been identified. Capital expenditure with respect to Slab on-grade cracks repairs, repair interior walls, and Repair CMU walls are anticipated within the evaluation period. No additional investigation is recommended at this time.

A detailed description of the Site and building structural systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

- Mechanical

Domestic water is supplied from the local service provider. Sanitary waste is disposed to the municipal mains. Storm water is drained via gutters, downspouts and surface drainage to the municipal storm water drainage system. Domestic water distribution piping is generally copper where observed. Sanitary drainage pipes in wet wall rooms are generally ABS plastic or hub less cast iron where observed. Below grade sanitary drainage pipes assumed to be cast iron. Domestic hot water for the Summerland Arena and RCMP buildings is provided by three gas-fired tankless water heaters, two hot water tanks which are located throughout the building and refrigeration heat recovery system by means of heat exchangers in Compressor/Ammonia room.

The building is not sprinklered. Dry chemical fire extinguishers are located throughout the occupied spaces, Class K extinguishers in the Commercial Kitchen and Concession, Commercial Range Hoods have built-in chemical fire suppression systems.

Heating to the building is provided by a combination of hydronic, gas fired, electric forced air flow, baseboard and radiant heaters. Comfort cooling and ventilation are provided for the Banquet Room and Curling Lounge by air handling units. Refrigeration plant for the ice rink is located in the north part of the building. The refrigeration evaporative condenser is located adjacent to the mechanical room on elevated platform adjacent to the building emergency generator. Refrigeration ventilation and emergency exhaust is accomplished by the use of dedicated roof top exhaust fan and intake louvers located in the north wall of the compressor room. In general, the visual review of the premises revealed that the mechanical equipment and systems have had routine maintenance, and where equipment has failed it has been repaired and/or replaced.

Refrigeration Ice Plant is an Ammonia plant with an enhanced evaporative condenser. Regular maintenance is performed within the plant that are observed to be in adherence to the latest CSA-B-52 safety code for Class T Compressor/Ammonia machine rooms.

The ammonia refrigeration plant was modified in 2011/2012 to include a heat recovery system serving both the arena hydronic heaters and adjacent RCMP building. The Town is planning on a future facility upgrade adding a pool/recreation facility. The current heat recovery system is not capable of capturing all of the existing rejected heat at this time. The current refrigeration system heat recovery can be expanded and modified to use up to 100% of the available heat. The excess heat availability from the arena was determined from existing Heat Reclaim Flow Diagram, our

experience and existing Evaporator, which rejects some excessive heat to atmosphere during wintertime (refer to picture#35 from site). The exact amount of the wasted heat and the way of utilization of this heat shall be determined during the detailed mechanical design stage with new compressors, chillers etc. being considered. Note: this heat can be used for different purposes, including future pool building or future snow/ice melting pit for ice rinks resurfacing, which can be considered during future building upgrade/renovation.

When the new facility is designed there are opportunities to capture more of the refrigeration plant energy. The refrigeration plant consists of two (2) tube and shell flooded evaporators. One serving the arena floor and the other the curling rinks. Two open drive Mycom compressors of differing sizes operate in parallel based on demand connected to a common suction header. Discharge from the compressors goes to an evaporative condenser and heat recovery plate and frame condenser. Both condensers connect to one high pressure receiver serving both chillers. Due to the current age of the ice plant chillers, it is recommended to annually inspect the chiller barrel tube sheet and plan for replacement before end of life.

The mechanical components are in overall well-maintained condition. Capital expenditures with respect to sanitary waste piping, washroom accessories replacement, heating, cooling and ventilation system, compressors, oil separators and pumps for Ammonia refrigeration plant, and leak protection are anticipated within the evaluation period.

A detailed description of the Site and building mechanical systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

- **Electrical**

The electrical service to the building is supplied from an underground ducts on the Northwest side of the building by the local electric utility provider. Mechanical equipment in the compressor/Ammonia room are fed through a main voltage feed at 600 V, provided with electrical safety switches and motor starters for each component and backed up by the emergency generator. Interior transformers step down the incoming voltage at 3-phase, 4 wire for plug loads throughout the building. Secondary electrical distribution is accomplished by distribution switchboards and panels rated at 600Y/347 V and 208Y/120 V, 3-Phase, 4-Wire located close to the equipment utilization locations in utility spaces or service rooms throughout the building.

Interior lighting throughout the building includes a combination of fluorescent T-8 and T-12 fixtures and suspended LED lighting over hockey arena area and curling rink, all controlled by lighting control switch banks at entrance locations. The events area on second floor has recessed LED and pot light fixtures. Some incandescent fixtures are installed in storage rooms below the bleachers. Exterior site lighting primarily consists of soffit, wall packs and parking area pole fixtures. Site lighting is primarily halide fixtures controlled by a photocell. A single stage fire alarm control panel is located in the main electrical room connecting to various fire alarm devices including pull stations, heat detectors and bells. Communications and security systems includes telephone, internet, and cable services with cabling existing in various ages on installation. The communications infrastructure is located in the main electrical room and second floor closet and

supports connectivity of devices throughout the facility. For security, door contacts are present on exterior doors. There is no CCTV or access control systems installed throughout the facility. The building is equipped with gas detectors (Carbon Monoxide, Ammonia, CO4, NH3 and others), emergency lighting battery packs and halogen/LED exit signs throughout.

In general, the visual review of the property indicates that the electrical equipment and systems are in acceptable condition with maintenance recommended to document and ensure functionality of the installed systems.

Testing of the entire system - complete infrared scanning of switchboards and panels, emergency lighting, fire alarm and emergency generator to be done, as part of routine maintenance, on a monthly and annual basis subject to code and regulations and, all found deficiencies shall immediately be rectified. There are no current (2021) annual fire alarm test reports stored at the main fire alarm panel or filed maintenance documentation and it was noted that testing is current with reports to be submitted by fire alarm maintenance company. There are limited electrical drawings reflecting the current electrical power distribution, fire alarm systems and communications. It is recommended to update site records to maintain accurate record of installation for safety and maintenance purposes.

The electrical components are in overall acceptable condition. Immediate action with respect to replacement of legacy emergency battery packs and remote heads has been identified. Capital expenditures with respect to the primary electrical distribution, emergency generator, electrical subpanels, ice plant control panel, interior and exterior lighting, lighting controls, exit signs, public address and music systems, electronic scoreboard, and the intrusion security system are anticipated within the evaluation period. Additional investigation is recommended with respect to an Arc Flash Hazard Analysis to ensure safety of personnel operating close to energized electrical equipment.

A review of the electrical components of the ASHRAE 2019 report was completed as part of the assessment. In addition, the building peak energy power usage for a twelve month period staring in January 2021 was provided for review. The building peak load within the year was 260kW. This represents a capacity of 40% of the building service size. The electrical systems recommendation noted in the energy report will provide opportunity to reduce power consumption and improve the overall energy metric of the building. This includes changing to energy efficient LED lighting fixtures throughout and overlaying with automatic lighting controls including daylight harvesting, time and occupancy based controls. In addition, dimming of lighting fixtures on the exterior during building vacancy at night will provide additional energy improvement. This approach is recommended to be implemented as part of the overall building energy improvement scheme.

- **Hazard Materials**

Given the year of original construction of each building (~1976), hazardous building construction materials such as asbestos-containing materials (ACMs) and/or polychlorinated biphenyls (PCBs) may be present.

- Immediate and Capital Reserve Summary

Immediate investigation / action items identified pertain to Fire Rating Code Study for storage rooms under bleacher areas, installation of exhaust fan for chemical storages, fire protection Assessment and replace emergency lighting. Deficiencies and Capital Reserve Items have been identified within the 25 Year time frame of this report with respect to architectural, structural, mechanical, and electrical component systems. The Immediate Repairs and Capital Reserve Analysis are included in Appendix C.

1.3. Opinions of Probable Costs

The following tables summarize our opinion of budgets for capital expenditures above the threshold value of ($3,000) over the (25 Year) evaluation period that is identified by this report. Expenditures that are expected to be managed as part of normal operations are not shown. The budgets assume a prudent level of ongoing maintenance.

Table 1: Summary of Immediate and Capital Reserve Expenditures (uninflated)

Section	Description	Immediate	Reserve Years 1 to 5 (2023 to 2027)	Reserve Years 6 to 10 (2028 to 2032)	Reserve Years 11 to 25 (2033 to 2047)	25-Year Reserve Total
3.0	Architectural	$305,000	$1,473,100	$460,400	$547,540	$2,481,040
4.0	Structural	$0	$21,000	$1,330,000	$0	$1,351,000
5.0	Mechanical	$15,600	$632,200	$46,100	$16,000	$694,300
6.0	Electrical	$24,300	$786,300	$150,800	$43,000	$980,100
TOTALS		$344,900	$2,912,600	$1,987,300	$606,540	$5,506,440

Note: Immediate (2022) expenditures are not included in the Capital Reserve totals.

Table 2: Summary of Capital Reserve Expenditures per year (uninflated)

Year 1	Year 2	Year 3	Year 4	Year 5
$1,404,200	$519,900	$192,200	$384,500	$411,800

Year 6	Year 7	Year 8	Year 9	Year 10
$18,000	$40,000	$431,600	$78,100	$1,419,600

Year 11	Year 12	Year 13	Year 14	Year 15
$0	$0	$21,200	$0	$113,800

Year 16	Year 17	Year 18	Year 19	Year 20
$64,000	$21,600	$145,300	$0	$47,000

Year 21	Year 22	Year 23	Year 24	Year 25
$167,880	$0	$17,760	$0	$8,000

FCI Calculation:

The following is the FCI calculation for the subject building:

$$FCI = \frac{\$5{,}506{,}440}{\$19{,}376{,}000} x100$$

$FCI = 28.42\%$, a score of poor based on the FCI Index.

We estimate that the overall useful life of the facility is 85 years (Structural systems). Since the building was constructed in 1976, about 39 years of useful life remains assuming that all life cycle replacements and maintenance items outlined in this report are completed in a timely manner. Since the building received a poor FCI score, the Municipality may want to consider the cost option comparisons between a replacement facility versus major renovations, particularly if functionality and program requirements have changed over the time.

Soft costs (include design fees, legal fee, financing, and other pre- and post-construction expenses) is not included in the FCI calculation above. It may be in the range of approximately 10% for a similar size facility but will depend on various variables such as the new site conditions and the specific requirements of the new program and design.

2. INTRODUCTION

2.1. Background

Stephenson Engineering Ltd. (Stephenson) was retained by the District of Summerland to perform a Facility Condition Assessment (FCA) in accordance with Stephenson's proposal dated November 23, 2021 of the property located at 8820 Jubilee Road East, Summerland, BC.

The building provides approximately 5,300 sqm (57,000 sqft) gross floor area (GFA) according to information provided by the client and was constructed circa 1976 and is situated on a Site covering approximately 1.20 hectares (2.97 acres) of land. The building is a two story steel structure building with concrete footings, concrete foundation walls, concrete masonry units walls, and concrete slab on grade. The building is used as an ice arena and curling rink.

2.2. Objectives

The objective of the FCA was to document the Site conditions at the time of the Site reconnaissance and, based on available sources of information and observations of surface conditions during the Site reconnaissance, to identify the exterior site improvements as well as the building structure, envelope, interior finishes, mechanical systems, electrical systems, fire/life safety systems, conveyance devices and visually obvious signs of non-compliance with respect to building code and barrier free accessibility. The objective of this report was also to develop a cost benefit assessment of repair/remediation plans versus planning for full facility replacement.

2.3. Methodology

The FCA was conducted in general accordance with the American Society for Testing and Materials (ASTM) "Standard Guide for Property Condition Assessments: Baseline Property Condition Process E 2018-15", as locally applicable and as stated in our Mandate and Report Resources in Appendix A.

Deviations and exceptions from the aforementioned ASTM are included in this report under section 2.4 ("Deviations from the Guide"). Limitations to our work are provided in Appendix B ("Limitations and Use of the Report").

Site Escort and general building information was provided by Mike Fetterer, Facilities Coordinator (hereafter referred to as the "Site Representative"). Site reconnaissance was conducted by Dayoo Kim, M.Arch. of Stephenson, Bryan Lord, C.E.T and Artem Pravednikov, mechanical designer of AMEGroup, and Ndumiso Mangena, P.Eng. of AES Engineering on February 15, 2022. The FCA was completed by Dayoo Kim, M.Arch. and reviewed by Lawrence McSorley, Architect, AAA of Stephenson. The weather at the time of assessment was 1° sunny with no conditions limiting access to Site. An additional slab inspection was conducted by Brian Levy, P.Eng of Stephenson on June 2, 2022.

The scope of work did not include sampling or testing to identify the potential presence of hazardous building construction materials such as asbestos-containing materials (ACMs), lead-based paints (LBPs), polychlorinated biphenyl (PCB)-containing electrical equipment or other hazardous materials.

2.4. Deviations from the Guide

The FCA was conducted and this report prepared in accordance with the scope of work outlined in accordance with Stephenson's proposal dated November 23, 2021 and executed by the Client on December 09, 2021.

The deviations from the ASTM used as a reference to complete the FCA and report for this project were as follows:

- The term "Point of Contact" has been replaced with "Site Representative"

2.5. Evaluation Criteria

The FCA was completed in general accordance with Site Representative stated scope of work as documented in Request for Proposal (RFP) (hereafter referred to as the "RFP"). The scope of the FCA was limited to identifying components, systems and potential concerns by visual examination of surface features and operating practices, and from available documented information sources. Only those items identified as being above the specified Capital Threshold will be addressed in the Capital Reserve Table. The Condition Rating system (CR) used throughout this report is based on the RFP:

Code	Description
1	**Critical Unsafe-** high risk of injury or critical system failure.
2	**Poor-** does not meet requirements, has significant deficiencies. May have high operating / maintenance costs.
3	**Marginal-** meets minimum requirements, has significant deficiencies. May have above average operating / maintenance costs.
4	**Acceptable-** meets present requirements, minor deficiencies. Average operating/maintenance costs.
5	**Good-** meets all present requirements. No deficiencies.
6	**Excellent-** as new/state of the art, meets present and foreseeable requirements.

The capital expenditures identified with respect to deficiencies or deferred maintenance shall be identified by the following categories ("Cat X"):

Category	Description
A	Code & Safety
B	Repair & Maintenance
C	Capital Expenditure
D	Modernization / Improvements
E	Other

Items identified with a CR rating of 1 and/or Cat A, shall be treated as "Immediate" action items, considered to have conditions that include deficiencies that require action in the next 60 to 90 days. Items identified with a CR of 2 or 3 and/or Cat B shall be considered to have conditions that include deficiencies that can be addressed within the next five years (2022 to 2026 in the Capital Reserve Table). Preventative Maintenance (PM) items may have been identified. These PM items are items anticipated to be required to maintain specific components/systems through to the end of their Expected Useful Life (EUL) and are considered to have CR of 4 or better that can be addressed at any time within the 25 year evaluation period (2022 to 2046 in the Capital Reserve Table).

Other non-urgent conditions identified with a CR of 4 to 6, are prioritized by their identification as Cat B to Cat E and are included in the Capital Reserve Table in an appropriate year. For items with no observed or reported deficiencies, a lifecycle replacement (LCR) cost estimate has been provided in the Capital Reserve Table spreadsheet in the year equal to the year of original installation plus that component's EUL. For example, if an item with no observed or reported deficiencies is nearing or has surpassed its EUL in the next 5 years (i.e., 2022 to 2026), an LCR cost estimate will be provided in the Lifecycle Plan spreadsheet in year 2026.

For similar components that have been replaced/installed at different times but where the age difference is equal to or less than 20% of the component's EUL, the average install year has been used in calculating the next lifecycle replacement event (i.e., for similar vinyl floor tile installed in 2009 versus 2011, each having a 20 year EUL, an average install year of 2010 has been used to calculate a single lifecycle replacement event in 2030). For this study additions occurred in 1992 and 1997, the year 1994 was used as the average install year for both.

No building material sampling or testing was conducted as part of this assessment.

2.6. Recommendations for Additional Investigation

RAI.1) Site drainage study.

RAI.2) Barrier-Free Study.

RAI.3) Water test.

RAI.4) Ventilation Assessment.

RAI.5) Arc Flash Hazard Analysis.

2.7. Desktop Data Collection

- IRFP-2021-27 – Summerland Arena & Curling Club Complex Facility Condition Assessment, prepared by District of Summerland, dated November 2, 2021.
- Asset management policy, prepared by the District of Summerland.
- Parks & Recreation Master Plan, prepared by LEES Associates, dated June 20, 2018.
- Anhydrous Ammonia Exposure Control Plan, prepared by the District of Summerland, dated January 27, 2022.
- Arena Floor Plans (Blueprint), prepared by McElhanney Surveying and Engineering Ltd., dated March,1975.
- Energy study report, prepared by BES Building Energy Solutions Ltd., dated December 17, 2019.
- Electrical Master Plan, prepared by the District of Summerland, dated September 2008.
- Master Drainage Plan, Prepared by Urban System, dated June 2009
- Sanitary Sewer Drawing (Key plan & Septic tank details), Prepared by McElhanney Surveying and Engineering Ltd., dated June 1975.
- Sanitary Service Drawing, prepared by unknown.
- Subdivision and Development Servicing by Law, prepared by District of Summerland, dated October 25, 1999.
- Zoning Bylaw, prepared by District of Summerland, dated December 14, 2020.
- Summerland Climate Action Website and Resources, prepared by District of Summerland
- Water Master Plan 2008, prepared by District of Summerland.
- Official Community Plan, prepared by District of Summerland.
- MMCD Design Guidelines and supporting documents, prepared by District of Summerland.

2.8. Outstanding Information

No outstanding information.

2.9. Building and Fire Code Compliance Overview

The Site Representative reported that they were not aware of any outstanding work orders, building code violations or infractions, building ordinances or municipal health and fire safety by-laws violations. However, building code violations were observed in the storage rooms under bleacher areas at the time of the site.

2.10. Evidence of Mould

No evidence of mould was observed or identified.

2.11. Outline of the Report

The report that follows this section contains a summary description of the Site and building systems/components along with a detailed listing and description of systems/components. Furthermore, current, imminent or anticipated deficiencies above the Capital Threshold (if any) and excluding normal operating maintenance are presented with a CR, including a description of the risk/consequence of deferral, probability of imminent/anticipated failure and/or a further description of any failure if it has already occurred.

A more detailed Capital Reserve Table is presented in Appendix C outlining the specific systems/components, EUL, Install Date, Remaining Useful Life (RUL), replacement event type, basis of estimate and specific years for Capital Reserve planning.

2.12. Mandate and Report Resources

Please refer to Appendix A for the report General Purpose, Scope of Work and Reliance for this project and for additional resources related to the assumptions used in preparing this report such as:

Operating and Maintenance Items; and,

Discussions of Overall Concepts and Terminology.

3. SITE DESCRIPTION

3.1. Site Location and Setting

Stephenson was retained by the District of Summerland, to perform a FCA in accordance with Stephenson's proposal dated November 23, 2021 of the property located at 8820 Jubilee Road East, Summerland, BC. The building is a two story steel framed structure building with concrete footings, concrete foundation walls, concrete masonry units walls, and concrete slab on grade. The building is used as an ice arena and curling rink.

3.2. Site Physical Description

Table 3: Building Physical Description

Site Area	1.20 hectares (2.97 acres)
Number of Buildings on Site	1
Building (s) Footprint	5,538m^2 (59,610 ft^2)
Levels Above Grade	2
Levels Below Grade	0
Date of Building Construction	1976
Date of Major Renovations	1985: Addition of Service buildings 1997: Upgrading of Exterior walls (Vinyl siding, metal flashing, soffit, and fascia) 2002: Replacement of roof membrane (Built-Up Roofing / Flat section) 2018: Upgrading LED interior lighting
Percentage Site Coverage by Building(s)	45%
Percentage Site Coverage by Landscaped/Grassed/Bare Ground Areas	2%
Percentage Site Coverage by Paved or Other Sealed Surface Materials	53%

General view of the Site building.

Site plan including the building.

4. ARCHITECTURAL

The site and the building were developed circa 1976 with additions completed circa 1985. The vehicle access to the building is located at the south side of the property, off Jubilee Road. The pavements throughout the drive lanes and parking lot are asphalt. Based on the visual assessment, there is approximately 123 surface parking spots with no underground parking.

The exterior cladding was reviewed visually from grade level. The building envelope is primarily clad with vinyl siding, corrugated metal siding, and painted CMU walls along the building elevations. Exterior wall insulation was concealed and not directly reviewed but assumed to be provided with a combination of rigid and batt insulation along with a polyethylene vapour barrier. Windows consists of insulated glazing units set in painted aluminum and vinyl frames, with both sliding and fixed panes. The main entry doors and secondary doors are aluminum storefront doors in aluminum frames. Both entry doors are provided with a door activator. Painted metal utility doors and an overhead coiling door are also provided.

Interior floor finishes are generally vinyl sheet, carpet and painted/sealed concrete floors. Interior walls are GWB finished with paint, painted CMU and shower stalls area finished with ceramic tiles. The ceilings in the building are mostly painted GWB with a textured finish, acoustic ceiling tile in metal grid, and painted wood panel, except for the arena which is finished with a reflective insulation sheet.

The roof is a sloped metal corrugated system along with sections of flat roof system with Built up roofing membrane covered with gravel. Water is drained from roof surfaces through internal roof drains. A Prefinished metal fascia and soffit is provided along the perimeter of the building. A cursory review was performed regarding the accessibility and barrier free compliance of the building. Generally, the building appears not to be fully barrier-free compliant with current standards for the interior circulation and washrooms.

The architectural components are in overall acceptable condition. Immediate action items with respect to the Fire Rating Code Study for storage room under bleacher areas is required. Capital expenditures with respect to site component, exterior walls, exterior windows, exterior doors, fascia & soffits, interior walls, interior doors & windows, ceilings, flooring, fixtures, barrier free, roofing, etc., are anticipated within the evaluation period. Additional investigation is recommended with Drainage Study (including Wastewater study), barrier free study and water test for active roof leak.

A detailed description of Site and building systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

A01.0 SITE

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A01.1	**Site Servicing**	**Water**: Water is provided by the local service provider. **Sanitary Sewer**: Sanitary sewer is disposed to the municipal sewer mains. **Electrical**: power is fed to the building from the local service pole-mount electrical transformer and into the building through underground conductors.	**4**	**-**	No concerns observed or reported.
A01.2	**Parking Lots & Drive Aisles**	**~1976:** The parking lot and drive aisles are finished with asphalt pavement.	**3**	**C**	The asphalt pavements are observed to be in marginal condition, having developed many longitudinal cracks caused by freeze thaw and areas with alligator cracks as a result of partial failure of surface. A full replacement cost has been included in the capital reserve table.
A01.3	**Parking Lot Markings**	**~2019:** Parking stalls are marked with painted lines in the parking areas. Barrier-free stalls with signage are provided.	**3**	**C**	Markings are generally visible but show signs of deterioration in localized areas, and are anticipated to require repainting within the timeframe of this report.
A01.4	**Concrete Sidewalks/Pads**	**~1976:** CIP concrete sidewalks at the front elevation of the Hockey rink and curling club entrances. A concrete pad is provided at the exterior doors service and overhead doors.	**3**	**C**	The concrete pads are observed in marginal condition. Cracks and some settlement were observed at the time of assessment. Due to age a full replacement is recommended. (See Note 4B).
A01.5	**Parking Bumpers**	**~2019:** Precast concrete parking bumpers are provided in front of the main entrance and barrier free parking stalls.	**3**	**B**	Some broken parking bumpers were observed at the time of the site. No other concerns or reported. Repair work is recommended. (See Note 4A).
A01.6	**Guardrail/Handrail**	**~1976:** Painted metal handrails are provided at the north elevation of the building.	**4**	**-**	No concerns observed or reported. (See Note 4A).
A01.7	**Site Drainage**	**~1976:** A number of catch basins were identified around the parking lot area.	**3**	**C**	Water ponded was reported in the section of the parking lot between the Curling Club and Hockey Rink entrances reported. We recommend a civil study to investigate

					subsurface condition with a camera and provide a clean out, and review grades prior to repaving the site.
A01.8	**Grassed Areas**	**~1976:** Sodding and trees at the east side of the site.	**4**	**-**	No concerns observed or reported.
A01.9	**Fencing**	**~2010:** Chain link fences are located partially at the north elevation around evaporative condensers and service building.	**4**	**-**	No concerns observed or reported.
A01.10	**Amenities - Signage**	**~2000:** Building mounted metal signs are provided throughout.	**4**	**B**	No concerns observed or reported. (See Note 4A).
A01.11	**Amenities - Furnishing**	**~2010**: One concrete trash receptacle and one metal bench are provided at the main entrance of the building.	**4**	**-**	No concerns observed or reported.
A01.12	**Retaining Walls**	**~2000:** Split face concrete block retaining wall is provided at the main entrance of the building for the planting bed.	**3**	**B**	Broken part was observed at the time of the site. No other concerns or reported. Repair work is recommended. (See Note 4A).
A01.13	**Exterior Stairs**	**~1976:** Painted metal exterior egress stairs with metal railings are provided at the north elevation of the building. **~2000:** Painted wood stair with wood railings is provided at the west elevation of washroom/dressing room facility for the Junior "B" club (the Summerland Steam). One additional wood stair was observed at the entrance of mechanical room located near Zamboni room.	**3/4**	**C**	Rust on the painted metal stair was observed. No other concerns or reported. A cost for the replacement of the painted metal stair is provided in the capital reserve table. (See Note 4B). Painted wood stairs are in acceptable condition. No concerns observed or reported at the time of the site.
A01.14	**Ancillary Building**	**~1985:** A CMU and a wood framed storage buildings are provided in the work yard located the northeast side of the site. One wood framed shed is provided at the north elevation of the building, near evaporative condenser.	**3**	**B**	Faded and chipping paint finishes are observed on the in the wood framed shed and canopies. Repainting is recommended. (See section A02.5).

A02.0 EXTERIOR WALLS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A02.1	**CMU Cladding**	**~1976:** Smooth finish painted CMU walls are provided along all bottom section, and south elevation of the building. Non painted CMU walls are provided in the maintenance shop ancillary Building.	**4**	**C**	The CMU cladding is in a good condition, no concern observed or reported. Minor step cracks on the CMU wall on the north elevation of the building in Ice plant room were observed. A cost for the repair of the CMU wall is combined structural section S06.1.
A02.2	**Metal Cladding**	**~1976:** On the upper section of the east, north and west elevations is clad with prefinished corrugated metal wall panels. **~2010:** Washroom/changeroom facility for the Junior" B" club envelope is clad with prefinished corrugated metal wall panels along all elevations of the building.	**3/4**	**C**	In general, dented panels were observed. A cost for the replacement of the original cladding is provided in the capital reserve table. (See Note 4B).
A02.3	**Vinyl Siding**	**~1997:** Vinyl siding is provided on sone sections of west, south and east elevations of the building.	**3**	**C**	Minor damages observed. A cost for the replacement of the cladding is provided in the capital reserve table. (See Note 4B).
A02.4	**Brick Cladding**	**~1976:** Brick Veneer cladding is provided on sone sections of west and east elevations of the building.	**4**	**-**	No concerns observed or reported.
A02.5	**Exterior Paint**	**~2012:** The exterior CMU walls, wood framed storage building, shed and wood soffit are painted throughout.	**3**	**C**	The condition of Paint on the CMU walls is acceptable, but UV paint damage was observed in the painted wood framed storage building and shed. A cost for repainting is provided in the capital reserve table. (See Note 4B).
A02.6	**Joint Sealers**	**~2000:** Urethane –based sealants are provided at openings, expansion joints and material transitions.	**2**	**C**	The caulking was observed to be cracked or disconnected from the surrounding materials in several locations. (See note 4B).
A02.4	**Louvers**	**~1976: M**etal painted louvers are provided in Ice plant room and mechanical rooms.	**4**	**-**	No concerns observed or reported. (See note 4A).
A02.5	**Insulation**	**~1976:** Concealed, but likely combination of rigid foam insulation and batt.	**4**	**B**	No concerns observed or reported.

A02.6	**Vapour Barrier**	**~1976:** Concealed, but likely, vapour barriers were applied.	**4**	**-**	No concerns observed or reported.

A03.0 EXTERIOR WINDOWS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A03.1	**Exterior Windows**	**~1998:** The window units throughout the building are fixed or sliding aluminium framed windows. The fixed and sliding portions are constructed with double insulated glazed units.	**4**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).

A04.0 EXTERIOR DOORS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A04.1	**Main Entrance Door**	**~2012:** The main entrance to the hocky rink building is located on south elevation. The building entrance is equipped with two pairs of double aluminum storefront door in aluminum frames. One leaf of the doors is equipped with a door activator for barrier free compliance. **2012:** The entrance of Curling lobby is equipped with an aluminum storefront doors in aluminum frames and one leaf is provided with an door activator for barrier free compliance. .	**4**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).
A04.2	**Secondary Doors**	**~1976:** A pair of double aluminum storefront door in aluminum frames are provided for access directly into to the main staircase.	**4**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).

A04.3	**Utility Doors**	**~1976:** Painted metal utility doors in painted metal frames are provided throughout the building	**4**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).
A04.4	**Overhead Doors**	**~1997:** Two commercial motorized prefinished metal sectional overhead doors are provided in the building for the Zamboni and a CMU storage building.	**4**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).

A05.0 FASCIA AND SOFFITS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A05.1	**Fascia**	**~1997:** Prefinished metal fascia is provided in some elevations of the building.	**3**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).
A05.2	**Soffit**	**~1976:** Painted wood soffit is provided along the underside of the 2nd floor overhang in the south elevation.	**3**	**C**	Chipping paint finishes observed. No other concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).

A06.0 INTERIOR WALLS AND PARTITIONS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A06.1	**Fixed Partitions**	**~1976:** Interior partitions are generally painted CMU walls. Some areas are provided with wood stud framed walls with painted wood panels.	**3**	**C**	Some step cracks on CMU walls and minor damages on the wood walls were noted. A cost for localized repairs is combined in structural section S05.1.
A06.2	**Dasher and Spectator Partition Boards**	**~2000:** Spectator partition/Dasher boards are provided around the ice arena. Boards include both solid and glazed sections.	**3**	**C**	No concerns were observed or reported at the time of the assessment. Allowance is provided for EUL replacement. (See Note 4B).
A06.3	**Interior Paint**	**~2010:** CMU and wood panels are generally painted.	**4**	**C**	No concerns observed or reported. (See Note 4B).

A06.4	**Ceramic Tiles**	**~1997:** Ceramic tiles are generally provided in shower rooms.	**3**	**C**	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).

A07.0 INTERIOR DOORS AND WINDOWS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A07.1	**Interior Doors**	**~1976/1997:** Interior doors are generally swinging doors, including: - Single painted wood and metal doors units set in painted metal frames. Some doors are provided with vision lites and aluminum louvers.	**3**	**C**	Some damaged doors were observed. Replacement cost has been included in the capital reserve table. (See Note 4B).
A07.2	**Interior Fire Rated Doors**	**~1976:** Painted metal fire rated doors with painted metal frames for mechanical room, Ice plant room, electrical room, mechanical room and storage rooms, stairs, corridors, wash and change rooms, kitchens Some doors are provided with vision lites	**3**	**C**	No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).
A07.3	**Interior Windows**	**~1976:** Interior windows consist of fixed painted wood framed windows throughout this building.	**3**	**C**	Interior windows in this building are in acceptable condition. No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).
A07.4	**Overhead Doors**	**~2000:** One commercial motorized coiling overhead door is provided in the Zamboni room.	**4**	**C**	Overhead door is in acceptable condition with wear and minor damages. No other concerns observed or reported. It is recommended to be replaced within the evaluation period. (See Note 4B).
A07.5	**Overhead Counter Doors**	**~2012:** Five (5) commercial manual counter overhead doors are provided throughout this building.	**3**	**C**	No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).

A07.6	**Sliding Barn doors**	**~1976:** Two (2) sliding wood doors are provided in dressing room #5 and #6 for access to the curling rink.	**3**	**C**	No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).

A08.0 CEILINGS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A08.1	**Gypsum Board**	**~1997:** Gypsum board ceilings were found in washrooms and in the lobby and mechanical rooms, and ice plant room.	**4**	**-**	Minor localized damages observed that can be repaired at a cost below the capital threshold. (See Note 4A).
A08.2	**Suspended Ceilings**	**~1997:** Lay-in suspended acoustic ceiling tiles in T-bar metal grids are provided in office room, curling lobby, curling lounge, and banquet area.	**3**	**C**	The suspended acoustic ceiling tiles are in acceptable condition with minor water stains. It is recommended to be replaced within the evaluation period. (See Note 4B).
A08.3	**Wood Panels**	**~1976:** Dressing rooms, main lobby, ice plant rooms, Zamboni room, mechanical rooms and storage rooms are finished with painted plywood panel ceilings.	**4**	**C**	No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).
A08.4	**FRP Panels**	**~2010:** FRP ceiling panels are provided in the washroom of the Summerland steam's dressing room.	**4**	C	No concerns observed or reported. Allowance is provided for EUL replacement. (See Note 4B).
A08.5	**Ceiling Paint**	**~2010:** Gypsum board and plywood panel ceilings are finished with paint.	**4**	C	No concerns observed or reported. (See Note 4B).
A08.6	**Reflective insulation**	**~1976:** The ice arena appears to be provided with exposed reflective insulation.	**2**	C	Many damages were observed. Replacement cost has been included in the capital reserve table. (See Note 4B).
A08.7	**Vinyl Faced Insulation Blanket Ceilings**	**~2010:** Vinyl faced insulation blanket ceilings are provided in the curling rink.	**4**	C	No concerns observed or reported. (See Note 4B).
A08.8	**Exposed Fire Spray**	**~1976:** Some ceilings are finished with exposed fire spray applied to the exposed metal structure.	**4**	**-**	No concerns observed or reported.

A08.9	**Exposed Structure**	**~1970:** Exposed wood studs are provided in the storage rooms under bleacher areas.	**1**	**A**	Storage rooms under bleacher areas are not covered with drywall finish and wood structure is exposed. The current condition is a code violation but needs further study. An immediate item is included for a Fire Rating Code Study and the installation of fire rated. (Imm.1)

A09.0 FLOORING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A09.1	**Vinyl Composite Tile (VCT)**	**~1997:** Vinyl composite tile flooring is provided in 2nd floor of the ice arena and the staff kitchen room. **~2020:** Vinyl composite tile flooring is provided in banquet area of 2nd floor.	**3/4**	**C**	Many areas of wear and tear observed in 2nd floor of the ice rink. No other concerns observed or reported elsewhere. Replacement cost has been included and split in two phases in the capital reserve table. (See Note 4B).
A09.2	**Rubber Flooring**	**~2010:** Rubber floorings are provided in players' and referee boxes, main lobby (includes washrooms), office room, corridors, and dressing rooms.	**4**	**C**	Wear and tear observed in many areas. Replacement cost has been included in the capital reserve table. (See Note 4B).
A09.3	**Floor Paint**	**~2010:** Painted concrete floorings are provided in some areas, including: - ice rink arenas, storage rooms, mechanical rooms, electrical room, and ice plant rooms.	**4**	**C**	Some of the paint finishes are peeled off and need to be repainted. Cost has been included in the capital reserve table. (See Note 4B).
A09.4	**Wooden Panels**	**~1997:** Painted wooden panel flooring and risers are provided in bleacher areas.	**4**	**C**	No concerns observed or reported. An allowance for the localized periodic repair is provided in the capital reserve table. (See Note 4B).
A09.5	**Ceramic Tiles**	**~1997:** Ceramic tiles are provided in shower rooms. **~2010:** Ceramic tiles are provided in some areas, including: washrooms of curling lobby and lounge,	**4**	**C**	No concerns observed or reported. Replacement cost has been included in the capital reserve table. (See Note 4B).

		elevator hall, staircase to the curling lounge, concession, kitchen of banquet area.			
A09.6	**Laminate Flooring**	**~1997:** Laminate Flooring was observed in broadcast room. **~2010:** Some sections of banquet area are finished with Laminate Flooring.	**4**	**C**	Wear and tear observed in broadcast room. No other concerns observed in banquet area. Replacement for laminate flooring installed in 2010 cost has been included in the capital reserve table. (See Note 4B).
A09.7	**Hardwood Decking Boards**	**~1976:** Hardwood decking boards are used as a trench cover in the Ice arena and curling rink.	**4**	**C**	The hardwood decking boards are in acceptable condition. Most of the paint finishes are peeled off and need to be repainted. No other concerns observed or reported. (See **Note 4B**).
A09.8	**Carpet**	**~1997:** Carpet flooring is provided in some sections of broadcast room. **~2010:** Carpet flooring is provided in some areas, including: coach room in the Summerland steam's dressing room, banquet area, curling lounge and south section of curling rink.	**2/4**	**C**	Stained and worn-out carpet flooring was observed in broadcast room. Replacement of carpet in broadcast room can be completed at a cost below the capital threshold. (See Note 4A). Replacement cost for carpet installed in 2010 has been included in the capital reserve table. (See Note 4B).

A10.0 FIXTURES

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A10.1	**Counter/Cabinets**	**~1997:** Fixed counter/cabinets includes a combination of laminate wood cabinets with plastic laminate counters in washrooms, concession room, staff kitchen room and the Summerland steam's dressing room.	**4**	**C**	Wear and tear observed. Replacement is expected within the timeframe of this report. (See Note 4B).
A10.2	**Fixed Benches**	**~1976:** Fixed benches includes a combination of painted wood benches with metal frames in the dressing rooms, and wood benches in the main lobby.	**4**	**C**	No concerns observed or reported. (See Note 4B).

		~2010: Plastic foldable fixed seats are provided in some sections of the hockey arena bleacher area.			
A10.3	**Railings**	**~1976:** Post and wall mounted painted metal handrails are installed on the 2nd floor of the ice arena. Wooden handrail is provided along the staircases in spectator seating area and staircase to access the mezzanine level. **~2010:** Post mounted glass railings are provided near broadcast room.	**2/4**	**C**	Some post caps of glass railings were missing. Repair work recommended. No other concerns observed or reported. Replacement cost for original railings has been included in the capital reserve table. (See Note 4B).
A10.4	**Lockers**	**~1976:** Metal wire mesh lockers are provided in dressing room #5 and #6. **~2010:** Wood athletic lockers are installed in the Summerland steam's changing room. Forty-three (43) Full size metal lockers are provided in the curling lobby and officials change rooms of the hockey arena.	**4**	**C**	No concerns observed or reported. Replacement cost has been included and split in three phases in the capital reserve table. (See Note 4B).
A10.5	**Washrooms Accessories**	**~2010:** The building is provided with standard washroom accessories that include: soap and paper towel dispensers, garbage receptacles, mirrors, coat hooks and grab bars.	**4**	**C**	No concerns observed or reported. (See Note 4B).
A10.6	**Toilet Partitions**	**~1976:** Metal toilet partitions are generally provided in the men and women washrooms. Painted wood partitions are in the Summerland Steam's change room.	**4**	**C**	No concerns observed or reported. (See Note 4B).
A10.7	**Residential Appliances**	**~2010:** Residential grade washer, and two dryers' are provided in the Summerland steam's dressing room. A range/oven is provided in the upper level kitchen of the Curling Club.	**4**	**C**	No concerns observed or reported. (See Note 4B).
A10.8	**Commercial Appliances**	**~2010:** Commercial grade fryers, stove, ovens are provided in the concession room and the curling lounge.	**4**	**-**	Commercial Appliances are owned by the tenant. No concerns observed or reported.

A10.9	**Scoreboards**	~**2010:** One electronic scoreboard is provided on the north side wall of the ice arena.	**4**	**C**	No concerns observed or reported. (See Note 4B).
A10.10	**Wayfinding**	~**2010:** Fire diagrams are posted throughout the building. Numbers and adhesive vinyl signs are provided on doors for room identification.	**4**	**-**	No concerns observed or reported. (See Note 4A).
A10.11	**Window coverings**	~**1994:** White roller blinds are provided in Board Room and mezzanine office. Aluminum mini blinds are provide in on the second floor and main floor of the Curling Club.	**4**	**C**	No concerns observed or reported. (See Note 4A).
A10.12	**Protective Netting**	**2010:** Protective netting is provided on the upper sections of the Spectator partition/Dasher boards.	**4**	**-**	No concerns observed or reported.
A10.13	**Hook Racks**	~**1976:** The towel/coat racks are provided in the change rooms.	**3**	**B**	No concerns observed or reported. (See Note 4A).
A10.14	**Display Cases**	~**1997:** Wooden display cases are provided in the lobby.	**4**	**C**	No concerns observed or reported. (See Note 4B).

A11.0 BARRIER-FREE REQUIREMENTS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A11.1	**Parking**	Two (2) accessible parking stalls are provided at the northeast entrance of the building.	**3**	**D**	The parking stalls are provided with pavement markings and one vertical sign. but marking is faded. We have not run a full code review, but only 2 stalls are not compliant with current standards. The van accessible stall is missing the loading zone striping and the vertical sign.
A11.2	**Access Route and Building Entrance**	The access route from the parking lot to the main entrance of the building is barrier free.	**4**	**-**	No concerns observed or reported. The main entrance is provided with automated doors.
A11.3	**Interior Circulation**	The interior circulation in the building section is generally not barrier free.	**2**	**D**	Interior circulation is mostly compliant; however, we recommend a lower counter be provided in the concession area and curling ticket box, and to provide clearly

					identified designated wheelchair spaces in the spectator/bleacher areas with ramp or elevator access. Detectable warnings were missing at the top and bottom of stairs in both the Ice arena and Curling lounge. The elevator access to the Curling lounge and Banquet area (second floor) is provided, but does not serve the upper level of the bleachers of the Hockey Rink. (See Note 4C).
A11.4	**Washrooms**	The washrooms and changerooms in the building do not fully meet barrier free requirements. No designated barrier free stall signage is provided.	**2**	**D**	The washrooms and changerooms are not fully compliant to the barrier free requirements due to restricted space for circulation and maneuverability with wheelchairs; insulated drainpipes are not provided creating possible hazard for users, wrong door hardware (knobs not levers) and not sufficient grab bars/arrangement and incorrect mounting heights of washroom accessories Providing unisex washroom to both the Hockey and Curling sections of the building is likely required (See Note 4C)

R01.0 ROOFING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
R01.1	**Metal Roof System**	**~1976:** The roofing system of the sloped sections is observed to sloped metal roof system. **~1985:** A roof of wood framed storage building is finished with a corrugated metal roof system.	**2**	**C**	Active leaks noted and overall deterioration of roof noted. It is recommended to divide into two phases according to the year of installation and replace them after 1 year and 3 years respectively. (See Note 4B).
R01.2	**BUR Roof**	**~2002:** The flat roof sections (South section of building and Zamboni room) are finished with an BUR roofing membrane with pea gravel cover for UV protection.	**4**	**C**	No concerns observed or reported. The flat roof is expected to require replacement within the timeframe of this report. (See Note 4B).
R01.3	**Asphalt shingles**	**~1985:** A roof of CMU storage building is finished with an asphalt shingle.	**4**	**C**	No concerns observed or reported. The roof has surpassed its estimated useful life and will require replacement within the timeframe of this report. (See Note 4B).

R01.4	**Roof gutters and downspouts**	**~1976:** Prefinished metal downspouts and gutters are provided at the center, and east and west sides of the roof. **~2002:** Internal roof drain is provided for the Flat roof.	**2/4**	**C**	An active water leak was observed around the metal trench gutter installed in the middle of the sloped roofs. No other concerns observed or reported. An allowance is provided in the capital reserve table for the water study and for the associated repairs. The cost of repairs will rely solely on the results of the study. (RAI.3 & See Note 4B).
R01.5	**Cap Flashing**	**~2002:** Prefinished metal cap flashing is installed on the flat roof perimeter.	**4**	**C**	No concerns observed or reported. (See Note 4B).
R01.6	**Roof Hatch**	**~2012:** A metal roof hatch is provided to access the flat roof.	**4**	**-**	No concerns observed or reported.
R01.7	**Roof Ladder**	Not present.	**-**	**-**	N/A
R01.8	**Roof Railing**	**~2000:** Painted metal roof railing is provided around the roof hatch.	**4**	**-**	No concerns observed or reported.

A99.0 OTHER (STAIRS AND CONVEYANCE DEVICES)

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A99.1	**Elevators**	**~1970:** The hydraulic elevator is provided in the building.	**3**	**D**	No concerns observed or reported. The elevator is not barrier free compliant. Replacement of cab and control renovation are recommended. (See Note 4B).

NOTES:

4A) The cost associated with repairs/replacement of this item is expected to fall below the Capital Threshold; as such, no costing has been included in the Capital Reserve Table.

4B) This component will pass its EUL within the evaluation period and should be replaced.

4C) An allowance for barrier free upgrades has been provided in the capital reserve table. However, the actual cost will be dependent on the outcome of the barrier free study.

IMMEDIATE ITEMS IDENTIFIED:

Imm.1) Code study for storage room under bleacher (Installation of Fire rated gypsum Board decking).
No other immediate items identified.

CAPITAL RESERVE ITEMS IDENTIFIED:

A01.2) Parking Lot, Asphalt Paving.
A01.3) Parking Lot, Pavement Marking.
A01.13) Exterior Stair.
A02.2) Cladding, Metal.
A02.3) Cladding, Viny.
A02.4) Exterior painting.
A02.5) Joint Sealers.
A03.1) Exterior Windows, Aluminum.
A04.1) Exterior Doors, Automatic Entrance-Pair.
A04.2) Secondary Doors.
A04.3) Exterior Utility Doors.
A04.4) Overhead door.
A05.1) Fascia, Aluminium.
A05.2) Exterior Soffits.
A06.2) Spectator Protection Boards.
A06.3) Wall finishes, Interior Paint.
A06.4) Wall finishes, tiles.
A07.1) Interior Doors.
A07.2) Interior Doors, Fire.
A07.3) Interior Windows.
A07.4) Interior overhead door.
A07.5) Roll-up Doors-Counter.
A07.6) Interior sliding barn Doors.
A08.2) Suspended ceiling tiles.
A08.3) Wood ceiling panels.
A08.4) FRP Ceiling Panels.
A08.5) Ceiling Finishes, Paint.
A08.6) Reflective Insulation.
A08.7) Vinyl faced insulation blankets.
A09.1) Floor Finishes, Resilient Flooring.
A09.2) Floor Finishes, Rubber Flooring.
A09.3) Floor paint.
A09.4) Wood panel floor.
A09.5) Ceramic tile floor.

A09.6) Laminate floor.
A09.7) Hardwood decking boards.
A09.8) Floor Finishes, Carpet.
A10.1) Fixed Casework.
A10.2) Fixed benches.
A10.3) Metal & glass railings.
A10.4) Lockers.
A10.5) Washroom Accessories.
A10.6) Toilet partitions.
A10.7) Appliances Replacement.
A10.9) Scoreboards.
A10.11) Window covering.
A11.3) Barrier-Free – interior circulation.
A11.4) Barrier-Free – washroom.
R01.1) Roof, Sheet Metal.
R01.2) Roof, SBS.
R01.3) Roof, asphalt shingles.
R01.4) Roof Gutters and Downspouts.
R01.5) Roof – cap flashing.
A99.1) Elevator - Replace cab & control renovation.
No other Capital Reserve Items above the threshold identified.

RECOMMENDED ADDITIONAL INVESTIGATION:

RAI.1) Site drainage study.
RAI.2) Barrier Free Study.
RAI.3) Water Study.
No other recommended additional investigations identified.

Photo #A1: Longitudinal and alligator cracks caused by freeze thaw and age of surface in the parking lot area.

Photo #A2: Current condition of the parking stall marking.

Photo #A3: Crack on Concrete apron.

Photo #A4: Exterior cladding, windows, door - southwest elevation.

Photo #A5: Damages of vinyl siding.

Photo #A6: Step crack on the concrete block wall.

Photo #A7: Typical overhead door.

Photo #A8: Ancillary Building and Chain rink fence and Hockey Rink egress stair.

Photo #A9: Main Entrance Doors.

Photo #A10: Lobby of Hockey Rink.

Photo #A11: Ice Sheet in Hockey Arena.

Photo #A12: Interior finishes of corridor inside of Rink.

Photo #A13: 2nd floor of Ice arena. Buckets were observed in the water leak area.

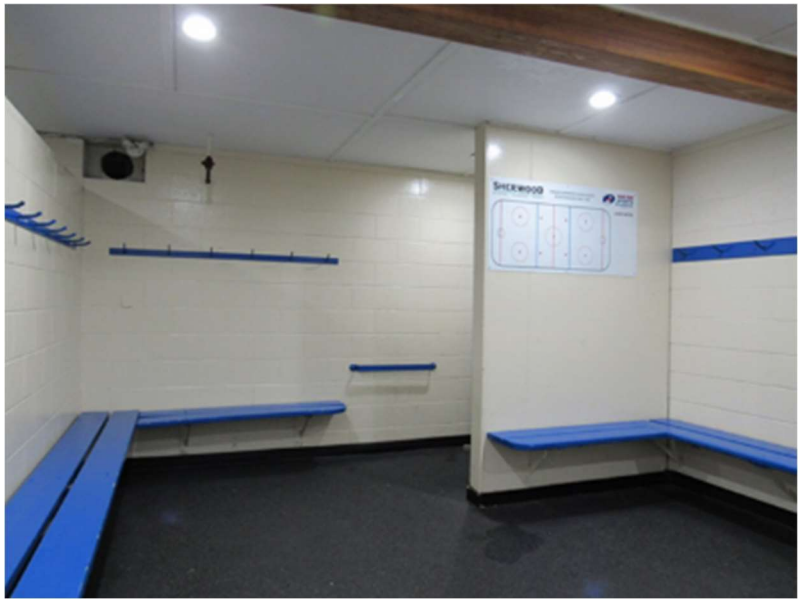

Photo #A14: Interior finishes and fixtures of dressing room 2.

Photo #A15: Typical interior finishes and fixtures of dressing room for the Summerland Steam.

Photo #A16: Typical interior finishes of washroom in main floor.

Photo #A17: Storage under bleacher area after a fire. All storage areas should be covered by Gypsum Board.

Photo #A18: Typical interior finishes of Elevator Hall of Curling Club.

Photo #A19: Curling rink.

Photo #A20: Interior finishes of the curling lobby.

Photo #A21: Interior finishes of the curling lounge.

Photo #A22: Overview of Zamboni Room.

Photo #A23: Slopped metal roof. An active water leak was observed around the metal trench gutter. Localized repair areas also observed.

Photo #A24: Flat roof with BUR.

Photo #A25: Dented metal downspout.

Photo #A26: Elevator cabin.

5. STRUCTURAL

The foundation system is generally concealed by architectural flooring, wall and ceiling finishes; therefore, the foundation was not directly inspected at the time of the assessment and partial drawings provided. Based to our observations made on site, the building sub-structure consists of a system of CIP concrete spread and pad type footings and foundation walls supporting the load bearing walls and steel columns. The superstructure encompasses CMU bearing walls and steel columns and trusses. The roof is comprised of structural roof purlins, which are in turn supported by structural steel beams and trusses. Suspended floors appear to be wood floors framed with plywood decking. The bleachers are wood framed construction. No significant cracking or excessive deflection heaving or settlement was observed that could indicate structural distress.

The structural components are in overall acceptable condition. No immediate action items have been identified. Capital expenditure with respect to Slab on-grade cracks repairs, repair interior walls, and Repair CMU walls are anticipated within the evaluation period. No additional investigation is recommended at this time.

A detailed description of the Site and building structural systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

S01.0 FOUNDATIONS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S01.1	**Footings**	**~1976:** Concealed, but according to site representative and drawing provided, consist of CIP spread and pad type footings.	**4**	**-**	No concerns observed or reported.
S01.2	**Foundation Walls**	**~1976:** Concealed, but assumed to be CIP concrete foundation around the building perimeter.	**4**	**-**	No concerns observed or reported.

S02.0 FLOORS ON GRADE

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S02.1	**Slab on Grade**	**~1976:** The main floor consists of concrete floating slab-on-grade.	**4**	**C**	Some cracks running from side to side and ice built-up around the concrete slab were observed. Additional slab inspection for the hocky arena and curling link was conducted on June 2nd, 2022, and the following comments were reported on it. • The slabs are original (circa 1976) and were poured with fiber-reinforced concrete. • 5-inch slab thickness. • Top and bottom reinforcing steel consisting of 6/6 – 6x6 welded wire mesh. • Slab in on 4-mil poly on top of granular fill. • Pyrotenax electric heating cables are embedded in the granular fill below the slab. • The brine lines are original, including original steel headers.

					• The slab at the hockey arena is fairly flat, with slight high (Southwest) and low spots (Northwest) shown. • The slab at the curling arena is a bit less flat, but not enough to impact ice surface. • Both slabs appear to be in overall acceptable condition and the slabs could maybe last another 10 years with continued maintenance. • At the hockey arena, there is some hairline cracking (generally 1 mm or less), some small localized popouts, and a section where the reinforcement is exposed. • At the curling rink, there is generally more crazing and some localized popouts as well. • It was observed that sealant was injected into most of the slab popouts. • There is some corrosion on the header pipes – It is suggested replacing these with PVC headers when the chillers are replaced.

S03.0 SUSPENDED FLOOR AND STAIRS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S03.1	**Suspended Floors**	**~1976:** 2nd floor consists of a suspended metal framed structure and CMU bearing walls with plywood decking for some areas.	**4**	**-**	No concerns observed or reported.
S03.2	**Stairs/bleachers**	**~1976:** Six stairs in the building are comprised of wood stringers, steps and risers. Wood stairs and bleacher structure. Wood ramp is provided in Ice plant room.	**4**	**-**	The interior stairs and bleachers elements appear to be in overall acceptable condition with no uneven risers.

S04.0 ROOF STRUCTURES

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S04.1	Framing	~**1976:** Roof purlins, structural steel beams and trusses.	4	-	No concerns observed or reported.
S04.2	Decking	~**1976:** Concealed, but likely provided by metal decking.	4	-	Some rust may be present due to age and condition of the metal roof. No other concerns observed or reported.

S05.0 INTERIOR WALLS AND COLUMNS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S05.1	Interior Walls	~**1976:** Mostly concealed, but likely provided with where not CMU block. wood studs	4	C	No concerns observed or reported. But it is recommended to have the space inspected in storage room under bleacher area in order to establish the degradation of the wood members due to the fire that could have resulted in loss of structural properties. Allowance for this work has been included in A08.9. Allowance for repairing cracks observed in some CMU walls is included in CRT. (See Note 5B).
S05.2	Interior Columns	~**1976:** Mostly concealed, but likely provided with steel columns and CMU columns and pilasters	4	-	No concerns observed or reported.

S06.0 EXTERIOR WALLS AND COLUMNS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT

S06.1	**Exterior Walls**	**~1976:** Load bearing CMU walls.	**4**	**C**	Minor step cracks on the CMU walls. Localized repairs recommended. No other concerns observed or reported. (See Note 5B).
S06.2	**Exterior Columns**	**~1976:** Exterior Steel columns and CMU Pilasters are provided on the perimeter exterior walls.	**4**	**-**	No concerns observed or reported.

S99.0 OTHER

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
S99.1	**Specially Engineered Construction**	**~1997:** Metal and CIP structures for the mechanical equipment on north area of the building.	**4**	**-**	No concerns observed or reported.

NOTES:

5A) The cost associated with repairs/replacement of this item is expected to fall below the Capital Threshold; as such, no costing has been included in the Capital Reserve Table.

5B) Thermal break for slab on grade was combined with structural studies of section S05.1, including one allowance amount for both in capital reserve table as an immediate item for budgeting purposes. Outcome repairs allowance was included in subsequent year.

IMMEDIATE ITEMS IDENTIFIED:

No immediate items identified.

CAPITAL RESERVE ITEMS IDENTIFIED:

S02.1) Replacement of Slab on grade.
S05.1) Interior wall repairs.
S06.1) CMU Wall repairs.
No other Capital Reserve Items above the threshold identified.

RECOMMENDED ADDITIONAL INVESTIGATION:

No recommended additional investigation identified.

Photo #S1: Ice arena roof steel structure.

Photo #S2: Curling rink roof steel structure.

Photo #S3: SOC in hockey arena.

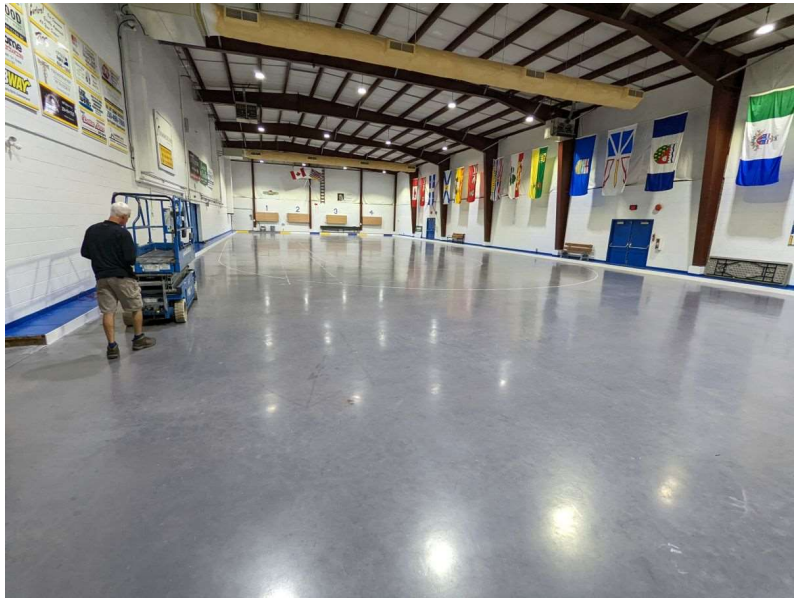

Photo #S4: SOC in curling rink.

Photo #S5: Steel header pipes (Corrosion observed).

Photo #S6: Evidence of localized repair on SOG.

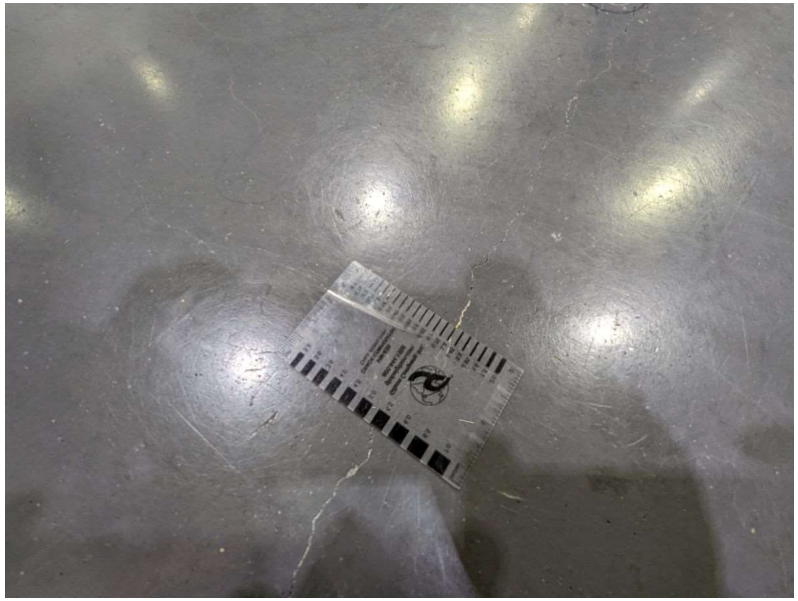

Photo #S7: Hairline crack in hocky arena.

Photo #S8: CMU structural walls.

Photo #S9: Exposed framing in storage room under bleacher areas.

Photo #S10: Exterior Steel columns.

Photo #S11: Metal and CIP structures for the mechanical equipment.

6. MECHANICAL

Domestic water is supplied from the local service provider. Sanitary waste is disposed to the municipal mains. Storm water is drained via gutters, downspouts and surface drainage to the municipal storm water drainage system. Domestic water distribution piping is generally copper where observed. Sanitary drainage pipes in wet wall rooms are generally ABS plastic or hub less cast iron where observed. Below grade sanitary drainage pipes assumed to be cast iron. Domestic hot water for the Summerland Arena and RCMP buildings is provided by three gas-fired tankless water heaters, two hot water tanks which are located throughout the building and refrigeration heat recovery system by means of heat exchangers in Compressor/Ammonia room.

The building is not sprinklered. Dry chemical fire extinguishers are located throughout the occupied spaces, Class K extinguishers in the Commercial Kitchen and Concession, Commercial Range Hoods have built-in chemical fire suppression systems.

Heating to the building is provided by a combination of hydronic, gas fired, electric forced air flow, baseboard and radiant heaters. Comfort cooling and ventilation are provided for the Banquet Room and Curling Lounge by air handling units. Refrigeration plant for the ice rink is located in the north part of the building. The refrigeration evaporative condenser is located adjacent to the mechanical room on elevated platform adjacent to the building emergency generator. Refrigeration ventilation and emergency exhaust is accomplished by the use of dedicated roof top exhaust fan and intake louvers located in the north wall of the compressor room. In general, the visual review of the premises revealed that the mechanical equipment and systems have had routine maintenance, and where equipment has failed it has been repaired and/or replaced.

Refrigeration Ice Plant is an Ammonia plant with an enhanced evaporative condenser. Regular maintenance is performed within the plant that are observed to be in adherence to the latest CSA-B-52 safety code for Class T Compressor/Ammonia machine rooms.

The ammonia refrigeration plant was modified in 2011/2012 to include a heat recovery system serving both the arena hydronic heaters and adjacent RCMP building. The Town is planning on a future facility upgrade adding a pool/recreation facility. The current heat recovery system is not capable of capturing all of the existing rejected heat at this time. The current refrigeration system heat recovery can be expanded and modified to use up to 100% of the available heat. The excess heat availability from the arena was determined from existing Heat Reclaim Flow Diagram, our experience and existing Evaporator, which rejects some excessive heat to atmosphere during wintertime (refer to picture#35 from site). The exact amount of the wasted heat and the way of utilization of this heat shall be determined during the detailed mechanical design stage with new compressors, chillers etc. being considered. Note: this heat can be used for different purposes, including future pool building or future snow/ice melting pit for ice rinks resurfacing, which can be considered during future building upgrade/renovation.

When the new facility is designed there are opportunities to capture more of the refrigeration plant energy. The refrigeration plant consists of two (2) tube and shell flooded evaporators. One serving the arena floor and the other the curling rinks. Two open drive Mycom compressors of differing sizes operate in parallel based on demand connected to a common suction header. Discharge from the compressors goes to an evaporative condenser and heat recovery plate and frame condenser. Both condensers connect to one high pressure receiver serving both chillers. Due to the current age of the ice plant chillers, it is recommended to annually inspect the chiller barrel tube sheet and plan for replacement before end of life.

The mechanical components are in overall well-maintained condition. Capital expenditures with respect to sanitary waste piping, washroom accessories replacement, heating, cooling and ventilation system, compressors, oil separators and pumps for Ammonia refrigeration plant, and leak protection are anticipated within the evaluation period.

A detailed description of the Site and building mechanical systems/components including (if any) current, imminent or anticipated deficiencies above the Capital Threshold and excluding normal operating maintenance are presented below.

M01.0 SITE SERVICES

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M01.1	**Domestic Water Supply**	Domestic water is supplied by municipal mains via a 3" service of an undetermined material, copper water piping in Water service room. A water meter and backflow prevention are present.	**4**	**B**	Leakage in Water service room at 90 deg. elbow, next to strainer. This work can be completed at a cost below the threshold of this evaluation.
M01.2	**Sanitary Sewer**	Sanitary waste is disposed to municipal mains via 6" cast iron line. ABC and cast-iron pipes observed on site.	**4**	**-**	No concerns reported. Maintain as required. Assuming the age of the building - we recommend performing below grade sewer piping study to determine the areas with deficiencies.
M01.3	**Storm Sewer**	Storm water is drained through rainwater leaders to the municipal storm water drainage system. ABC and cast-iron pipes observed on site.	**4**	**-**	Storm drainage issue observed at SW corner (see photo #26). This work can be completed at a cost below the threshold of this evaluation.
M01.4	**Natural Gas**	Gas is supplied into the building by the local service provider via a 2" steel service, upsizing to 2 ½" before entering the building, complete with external shutoff. The gas meter and PRV are located at SW corner of the building.	**4**	**-**	No concerns observed or reported. Maintain as required.

M02.0 PLUMBING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M02.1	**Water Distribution**	Copper domestic water distribution piping is provided.	**4**	**-**	No concerns observed or reported. Maintain as required.
M02.2	**Backflow Prevention**	**~2015:** Backflow prevention device was observed for the building on domestic water service.	**4**	**-**	No concerns observed or reported. Maintain as required.

M02.3	**Domestic Hot Water Heater**	**~2005:** Gas-fired Domestic hot water heater is in the Upstairs Storage Room and serves washrooms in Banquet Hall area. No dielectric couplings are present on the water heater connections. Make: RHEEM RUUD Model: PRO40-38M Capacity: 50 US Gal.	**4**	**C**	Note: Install dielectric couplings if existing unit will stay in place. This work can be completed at a cost below the threshold of this evaluation.
M02.4	**Domestic Hot Water Heater**	**~2005:** Gas-fired Domestic hot water heater is in the Change Room (former trailer – not an official part of the building). Make: RHEEM Commercial Model: N/A Capacity: N/A	**4**	**C**	Concealed location of the unit. We recommend providing proper service access to the unit.
M02.5	**Tankless Domestic Hot Water Heaters**	**~2008 (two heaters):** Tankless gas-fired domestic water heaters connected to building hot water loop and located in small mechanical room (ice resurfacer room) at north part of the building. Make: RINNAI Model: R75-LS1 Capacity: 7.5 GPM.	**4**	**C**	No concerns observed or reported. Replace units at end of expected useful life.
M02.6	**Tankless Domestic Hot Water Heater**	**~2021:** Tankless gas-fired domestic water heater connected to building hot water loop and located in mechanical room (shed) at north part of the building. Make: RINNAI Model: RUR199 Capacity: 11 GPM.	**5**	**C**	No concerns observed or reported. Replace units at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.
M02.7	**Domestic Hot Water Storage Tank**	**~2005:** Hot water storage tank is in the small mechanical room (ice resurfacer room) at north	**4**	**C**	No concerns observed or reported.

		part of the building, serving the domestic hot water requirements for Zamboni. Make: John Wood Model: JW65 Capacity: 119 Gal.			
M02.8	**Domestic Hot Water Storage Tank**	**~2005:** Hot water tank serving the domestic hot water requirements for Curling Lounge Area (washrooms, kitchen). Make: RHEEM RUUD Model: JW65 Capacity: 120 Gal.	**4**	**C**	No concerns observed or reported. Replace units at end of expected useful life.
M02.9	**Domestic Hot Water Storage Tank**	**~2005:** Hot water tank is in the mechanical room at north part of the building, serving the domestic hot water requirements for Arena Change Rooms. Hot water provided by refrigeration heat recovery system via heat exchanger. Make: AO SMITH Model: TJV-120M Capacity: 119 Gal.	**4**	**C**	No concerns observed or reported. Replace units at end of expected useful life.
M02.10	**Waste Water Piping**	ABS wastewater piping is provided where visible.	**4**	**-**	No concerns observed or reported.
M02.11	**Irrigation System**	Irrigation connection is provided for the facility.	**4**	**-**	No backflow prevention device for front entrance irrigation supply. Irrigation piping should be disconnected until backflow prevention system has been installed. This work can be completed at a cost below the threshold of this evaluation.
M02.12	**Washrooms Fixtures**	**~1994/2010:** The facility washroom fixtures include 26 flush valve water closets, 1 flush tank water closets, 4 flush valve urinals, 8 waterless urinals and 15 vitreous China lavatories throughout 7 change rooms and 9 public washrooms.	**4**	**-**	Replacement cost has been included in the capital reserve table. Maintain as required. Note: Some p-traps made of rubber hose. This work can be completed at a cost below the threshold of this evaluation.

M02.13	**Sinks**	One mop sink is present in the Janitor Closet on second floor. One laundry sink is present in the technical room at Curling rink.	**4**	**-**	No concerns observed or reported. This work can be completed at a cost below the threshold of this evaluation.
M02.14	**Sinks**	Twelve single compartment stainless-steel sinks are present at the Change Rooms, Bar and in the Commercial Kitchens.	**4**	**-**	No concerns observed or reported. Maintain as required. This work can be completed at a cost below the threshold of this evaluation.
M02.15	**Sinks**	Three double compartment, stainless-steel Kitchen sinks are present in the Commercial Kitchens and Bar.	**4**	**-**	No concerns observed or reported. Maintain as required. This work can be completed at a cost below the threshold of this evaluation.
M02.16	**Kitchen Hand sink**	Not present.	**-**	**-**	Hand sink required in commercial kitchen and concession. This work can be completed at a cost below the threshold of this evaluation. Existing sink shall be reviewed with local health inspector as there may be some specific requirements.
M02.17	**Sump Pumps**	Not present.	**-**	**-**	N/A

M03.0 HEATING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M03.1	**Boilers**	Not present.	**-**	**-**	N/A
M03.2	**Unit Heaters**	**~1977:** Three double gas-fired radiant tube unit heaters are present in Arena bleachers area. The units' nameplates were inaccessible at the time of the site visit.	**3**	**C**	Combustion air piping disconnect from one double radiant heater. Replace unit at end of expected useful life.
M03.3	**Gas Fired Unit Heaters**	**~1977:** Gas-fired forced flow heaters were observed in the Ice Resurfacer Room area and Curling Rink.	**4**	**C**	No concerns observed or reported.

		No nameplate was observed at the time of the site visit.			
M03.4	**Hydronic Fan Coil Unit Heaters**	**~2011: 5 h**ydronic fan coils (FC-1,2,3,4,5) are present in Arena change rooms. Hydronic heat provided by refrigeration heat rejection system via heat exchanger and P-9 pump. Make: McQuay Model: FTSC-S10, FTSC-S04	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M03.5	**Hydronic Fan Coil Unit Heaters**	**~2011:** 2 **h**ydronic fan coils (FC-6,7) are present in Curling Rink. Hydronic heat provided by refrigeration heat rejection system via heat exchanger and P-9 pump. Make: McQuay Model: FSZH-S30	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M03.6	**Back-up electrical heater**	**~2011:** Back-up inline hydronic electric heater is present in Compressor/Ammonia Room for back-up heat for Arena building heating loop. Make: Caloritech EXCT615F4	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.
M03.7	**Electric Forced Flow Heaters**	**~1977-2008:** Electric wall mount forced flow heaters were observed in the ladies/men washroom, main lobby, stairwell, maintenance shops and storage rooms. No nameplate was observed at the time of the site visit.	**4**	**C**	No concerns observed or reported.
M03.8	**Baseboard Heaters**	**~2005:** Electric baseboard unit heaters are present in washrooms, Banquet area.	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M03.9	**Radiators**	Not present.	**-**	**-**	N/A

M03.10	**Furnace**	One high efficiency gas-fired furnace serves the Change room. The unit's nameplate was inaccessible at the time of the site visit.	**4**	**-**	Concealed location. As per report from site representative- unit scheduled to be replaced in 2022.
M03.11	**Air Handling Unit**	**~2018:** One gas-fired AHU-2 serves the Banquet area at second floor. Make: Engineered Air Model: S350/O Serial: S58211	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.
M03.12	**Air Handling Unit**	**~1992:** One gas-fired AHU-1 serves the Curling Lounge area at second floor. Make: Engineered Air Model: S-400-IVK	**3**	**C**	Unit being installed inside of concealed (attic) space and was not observed at the time of the site visit. The information about the unit was taken from Energy study report.

M04.0 COOLING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M04.1	**Heat pump**	**~2002:** Heat pump is on the roof at SE corner, serving Curling Lounge area (through AHU-1). Make: Lennox Model: HP29-090-3J Serial: 5604G08601	**4**	**C**	No concerns observed or reported. Replace at end of expected useful life.
M04.2	**Condenser**	**~2006:** CU-2 Condenser for the cooling coil in AHU-2 serving the Banquet Hall presents on the roof. Make: York Model: H3CE120A58A	**4**	**C**	No concerns observed or reported. Replace at end of expected useful life.

		Serial: N0H6767910			
M04.3	**Roof top Unit**	**~1992:** Roof top unit (RTU-1) is on the roof, serving the Banquet Hall. Make: York The unit's nameplate was inaccessible at the time of the site visit.	**3**	**C**	As reported on site – unit in poor condition and can provide a bit of extra cooling for the Banquet Hall. No concerns observed or reported. Replace at end of expected useful life.

M05.0 VENTILATION

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M05.1	**Air Distribution**	Air distribution is accomplished by a galvanized metal ductwork system concealed within the ceiling space.	**4**	**-**	No concerns observed or reported. Maintain as required. This work can be completed at a cost below the threshold of this evaluation.
M05.2	**Ventilation**	Ventilation deficiencies were noted throughout the facility. These deficiencies include lack of make-up air for commercial kitchen, lack of outdoor air in some rooms, poor air circulation, poor exhaust, insufficient return air, insufficient/missing exhaust in some room (i.e. dressing rooms), and no ventilation in some other rooms (i.e. chemical storage, Female Dressing room, Ice skating rental room etc.)	**3**	**A, C**	We recommend: 1) performing a ventilation assessment to determine these areas with deficiencies and how to mitigate the issues; 2) installation of make-up air units for commercial kitchens; 3) installation of exhaust fans for chemical storages. In addition, owner to review architectural requirements for these chemical storages. **(RAI.4 & Imm.2).**
M05.3	**Air Outlets & Inlets**	Metal grilles and diffusers are provided throughout the building.	**4**	**B**	No concerns observed or reported. Maintain as required. This work can be completed at a cost below the threshold of this evaluation.
M05.4	**Exhaust Fans**	**~1977:** One roof-mounted exhaust fans serve the Banquet Room and one Curling Lounge. The units' nameplates were not observed at the time of the site visit.	**4**	**C**	No concerns observed or reported. Replace at end of expected useful life.

M05.5	**Exhaust Fan**	**~1977:** Dedicated exhaust fan serves the Ice rink ceiling area at north wall. The units and units' nameplates were not observed at the time of the site visit.	**3**	**C**	No concerns observed or reported. Replace at end of expected useful life.
M05.6	**Exhaust Fans**	**~1977:** Dedicated roof-mounted exhaust fans serve majority of washrooms and change rooms. The unit's nameplate was not observed at the time of the site visit.	**3**	**C**	Bad smell in some change rooms was noticed during the visit. Review exhaust system and replace or modify as necessary to meet requirements.
M05.7	**Exhaust Fans**	**~1995:** Roof-mounted upblast exhaust fans serve the commercial kitchen and concession. The unit's nameplate was not observed at the time of the site visit.	**4**	**C**	No grease traps at exhaust fans observed. We recommend replacing with proper grease exhaust fans. Replace at end of expected useful life.
M05.8	**Exhaust Fan**	**~2005:** High level ammonia alarm and external override switch for roof-mounted emergency exhaust fan is present next to Compressor/Ammonia Room. Make: ASME Engineering Model: PNU245RG Serial: 05F195905	**5**	**C**	No concerns observed or reported. Replace at end of expected useful life.

M06.0 FIRE PROTECTION

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M06.1	**Fire Extinguishers**	**~2018:** Portable dry-type ABC fire extinguishers are provided throughout the building. A Type-K extinguisher are provided in the Commercial Kitchens.	**5**	**C**	Inspections tags show the extinguishers are inspected monthly and annually. Continue to inspect regularly and replace as required.

M06.2	**Sprinklers**	Not present.	**-**	**C**	The cost of the new installation has been included in the Capital Reserve Table.
M06.3	**Chemical Fire Suppression**	**~2009:** A commercial range hoods with built-in chemical fire suppression systems are present in the Commercial Kitchen and Concession. No nameplate was observed at the time of the site visit.	**4**	**C**	Last inspection was made in January 2022. No concerns observed or reported. Replace unit at end of expected useful life.
M06.4	**Fire Stopping**	Fire stopping issues were noted throughout the facility.	**2**	**C**	Compressor/Ammonia Room-lacking fire rated protection. Spray foam observed in wall penetrations, lacking fire rated protection; entering door to be made of steel. Further assessment is recommended to determine all areas with fire stopping deficiencies. **(Imm.3).**
M06.5	**Fire dampers**	Fire dampers were not noted throughout the facility.	**2**	**C**	Multiple transfer air openings missing fire dampers where required. Recommend a fire compartment review of the building an installation of fire dampers at all penetrations. The cost for this work has been included in the section M06.4.

M07.0 CONTROLS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M07.1	**Electric and Electronic Controls**	Analogue manual-controlled thermostat ere observed for unit heaters to control internal temperature. Make: Honeywell and build-in thermostats. Programmable thermostat was observed for AHU-1 to control internal temperature in Curling Lounge.	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.

		Make: ROBERTSHAW Automated direct digital control system serving refrigeration system for Arena and Curling rinks. The building is monitored and controlled by BMS throughout.			

M99.0 OTHER

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
M99.1	**Humidifiers**	Not present.	**-**	**-**	N/A
M99.2	**De-humidifier**	**~2018:** Gas-fired dehumidifier on the roof at the Mezzanine Level serves the facility. Make: MUNTERS Model: A10G Serial: A18GA10G100601	**5**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M99.3	**Commercial Range Hoods**	**~2009:** A commercial range hood with built-in fire suppression systems and grease traps are present in the commercial kitchen and Concession areas.	**4**	**-**	No concerns observed or reported. Replace unit at end of expected useful life.
M99.4	**Dishwasher**	A commercial dishwasher is present in the commercial kitchen. Model: Could not be observed at the time of the site visit.	**3**	**-**	Grease trap was not observed. We recommend installing grease trap on dishwasher drainage piping. This work can be completed at a cost below the threshold of this evaluation.
M99.5	**Toaster**	A commercial toaster is present in the commercial kitchen.	**2**	**-**	No concerns observed or reported. Replace unit at end of expected useful life.

		Model: Could not be observed at the time of the site visit.			
M99.6	**Ammonia Compressors**	**~1977:** Two belt drive ammonia compressors (C-1,2) with motors are present in the Compressor/Ammonia Room serving Arena and Curling Rinks. Make: MYCOM Model: N6B; N4A Serial: 4A2643; 6B4344.	**3**	**C**	No concerns observed or reported. Rebuild compressors as per regular maintenance program.
M99.7	**Compressor cooling pump**	**~2011:** Compressor cooling pump (P-6) is in Compressor/Ammonia Room. Make: Armstrong Model: H64 Flow rate: 18 gpm.	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M99.8	**Plate condenser pump**	**~2011:** Plate condenser pump (P-5) is in Compressor/Ammonia Room. Make: Armstrong Model: 3x3x8 4300 Flow rate: 260 gpm.	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life
M99.9	**High Pressure Receiver**	**~1977:** High pressure receiver (V-3) present in the Compressor/Ammonia Room. Make: CIMCO Model: 9147 Serial: B9502351UN123	**3**	**C**	No concerns observed or reported.
M99.10	**Condenser water tank**	**~2004:** Condenser water tank (T-1) is present in the Compressor/Ammonia Room. The unit's nameplate was not observed at the time of the site visit.	**4**	**-**	No concerns observed or reported. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.

M99.11	**Condenser water pump**	**~2004:** Condenser water pump (P-3) is present in the Compressor/Ammonia Room. Make: Armstrong Model: 4x3x6 4280 Flow rate: 305 gpm	**4**	**-**	No concerns observed or reported. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.
M99.12	**Evaporative condenser**	**~2004:** One Evaporative condenser (EC-1) serves the Refrigeration Plant. Make: BALTIMORE AIRCOIL Model: VC1-N230-MP Serial: U040654601MAD	**4**	**C**	No concerns observed or reported. Replace at end of expected useful life.
M99.13	**Thermal Equalizer**	**~2011:** Thermal Equalizer (TE-1) is present in Compressor/Ammonia Room. Make: Cimco Flow rate: 330 gpm.	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.
M99.14	**Heat Rejection Pump**	**~2011:** Heat rejection pump (P-4) is in Compressor/Ammonia Room, serving refrigeration heat recovery system via HX-4. Make: Armstrong Model: 3x1.5x8 4280 Flow rate: 96 gpm.	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.
M99.15	**Heat Exchanger**	**~2011: H**eat exchanger (HX-4, water to water) is present in Compressor/Ammonia room, serving refrigeration heat recovery system. Make: ALFA LAVAL Model: M6-MFG	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.
M99.16	**Heat Exchanger**	**~2011: H**eat exchanger (HX-3, ammonia to water) is present in Compressor/Ammonia room, serving refrigeration heat recovery system.	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.

		Make: ALFA LAVAL Model: M10-BWFD			
M99.17	**Building heating loop pumps**	**~2011:** Civic and Arena heating loop pumps (P-7,8 (standby),9) are in Compressor/Ammonia Room on the east wall, serving building hydronic heating loop. Make: Armstrong Model: 2x2x10 4300; 2x2x10 4300; 1.5D 4360 Flow rate: 132 gpm; 132 gpm, 47 gpm.	**4**	**C**	No concerns observed or reported. Maintain as required. Replace unit at end of expected useful life.
M99.18	**Cold Brine Pumps**	**~2004:** Cold brine pumps (P-1,2) are present in the Compressor/Ammonia Room. One serving Arena, and one for the Curling rinks. Make: Armstrong Model: 4x3x8 4030; 3x3x10 4030. Flow rate: 100, 30 gpm	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M99.19	**Chillers**	**~2004:** Two brine chillers (HX-1,2) with surge drums (V-1,2) are in the Compressor/Ammonia Room serving Arena and Curling Rinks. Make: Henry Technologies Model: RA-20144-509; FA-20156-290. Serial: C240204B-1; H5772.512346789Y; H6889.5123467890; 33220.651	**4**	**C**	No concerns observed or reported. Recommend annual tube sheet NDT inspections and replace unit at end of expected useful life.
M99.20	**Refrigeration piping and valves**	**~2004:** Refrigeration piping/valves are in the Compressor/Ammonia Room serving Refrigeration plant.	**4**	**C**	No concerns observed or reported. Replace unit at end of expected useful life.
M99.21	**Concrete floor**	**~1977: Co**ncrete floor for Curling and Ice rinks with hot decks are in the building.	**-**	**-**	No concerns observed or reported. The replacement cost for this work has been included in the section S02.1.
M99.22	**Brine Expansion Tanks**	**~2004:** A brine storage tank is present in the Compressor/Ammonia Room.	**4**	**-**	No concerns observed or reported. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.

		No nameplate was observed at the time of the site visit.			
M99.23	**REALice Vortex system**	REALice Vortex system is present in the Ice Resurfacer Room.	**4**	**-**	No concerns observed or reported. Replace unit at end of expected useful life. This work can be completed at a cost below the threshold of this evaluation.
M99.24	**Leak Detection**	Leak detection system was observed in the Chiller Compressor/Ammonia Room.	**5**	**-**	No concerns observed or reported.
M99.25	**Eyewash station**	Eyewash station present next to Compressor/Ammonia Room.	**3**	**-**	Note: Temperature regulation of water supply not present. This work can be completed at a cost below the threshold of this evaluation.
M99.26	**Hose bibs**	**~1977:** Three hose bib connections are present outside of the building.	**4**	**-**	No concerns observed or reported.

NOTES:

6A) The cost associated with repairs/replacement of this item is expected to fall below the Capital Threshold; as such, no costing has been included in the Capital Reserve Table.
6B) This component will pass it's EUL within the evaluation period and should be replaced.

IMMEDIATE ITEMS IDENTIFIED:

Imm.2) Installation new exhaust fan in the chemical storage room.
Imm.3) Fire protection Assessment.
No other immediate items identified.

CAPITAL RESERVE ITEMS IDENTIFIED:

M02.3) Domestic Hot Water Heater replacement.
M02.4) Domestic Hot Water Heater replacement.
M02.5) Tankless Domestic Hot Water Heaters replacement.
M02.6) Tankless Domestic Hot Water Heater replacement.
M02.7) Domestic Hot Water Storage Tank replacement.
M02.8) Domestic Hot Water Storage Tank replacement.
M02.9) Domestic Hot Water Storage Tank replacement.
M02.10) Wastewater piping replacement
M03.2) Unit Heaters replacement.
M03.3) Gas Fired Unit Heaters replacement.
M03.4-5) Hydronic Fan Coil Unit Heaters replacement.

M03.6) Back-up electrical heater replacement.
M03.7) Electric Forced Flow Heaters replacement.
M03.8) Baseboard Heaters replacement.
M03.11) Air Handling Unit replacement.
M03.12) Air Handling Unit replacement.
M03.11) Heat Rejection Pump replacement.
M03.12-13) Heat Exchanger replacement.
M03.17) Air Handling Unit AHU-1 replacement.
M04.1) Chillers replacement.
M04.2) Heat pump replacement.
M04.3) Condenser replacement.
M04.4) Roof top unit replacement.
M05.2) Ventilation assessment.
M05.4-8) Exhaust Fans replacement.
M06.1) Fire extinguishers replacement
M06.3) Chemical fire suppression systems replacement.
M06.4-5) Fire protection assessment.
M99.2) De-humidifier replacement.
M99.6) Ammonia Compressors replacement.
M99.7;8;14;17;18) Pumps replacement.
M99.9) High Pressure Receiver replacement.
M99.12) Evaporative condenser replacement.
M99.13) Thermal Equalizer replacement.
M99.15;16) Heat exchangers replacement.
M99.18) Cold brine pumps replacement.
M99.19) Ammonia chiller for Ice rink replacement.
M99.19) Ammonia chiller for Curling rink replacement.
M99.20) Refrigeration piping/valves replacement.
No other Capital Reserve Items above the threshold identified.

RECOMMENDED ADDITIONAL INVESTIGATION:

RAI.4) Ventilation Assessment.
No other recommended additional investigation identified.

Photo #M1: Gas Meter at SW building corner.

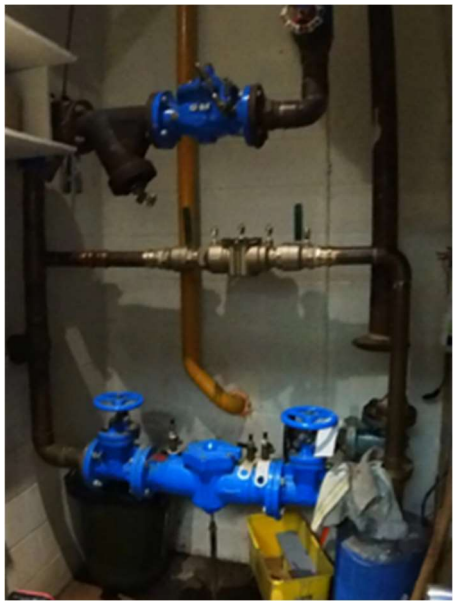

Photo #M2: Domestic Water Service in Room #16.

Photo #M3: Gas-Fired Domestic Water Heaters (one is completely enclosed in Trailer Change Room).

Photo #M4: Typical Gas-Fired and Electrical Unit Heaters (Typical).


Photo #M5: Furnace and It's Enclosure in Trailer Change Room.



Photo #M6: Hot Water Storage Tanks.

Photo #M7: Hydronic Heating Fan coils in Change Rooms and Curling Rink (Typical).

Photo #M8: Thermal Equalizer with Water Pumps and back-up Water Electric Heater.

Photo #M9: Supply, Return, Exhaust Grilles (Typical).

Photo #M10: Ammonia Leak detection with Emergency Exhaust Fan Switch.

Photo #M11: Commercial & Concession Kitchen Hoods with Fire Suppression system (Typical).

Photo #M12: Infrared heaters in Ice Rink area (Typical).

Photo #M13: Evaporative Condenser.

Photo #M14: Chillers with High Pressure Receiver (yellow).

Photo #M15: Compressor (Typical).

Photo #M16: Heat exchangers.

Photo #M17: Condenser Water Pumps.

Photo #M18: Cold Brine Pumps.

Photo #M19: Air Handling Unit AHU-2.

Photo #M20: Roof Top Unit RTU-1.

Photo #M21: Air Handling Unit AHU-1.

Photo #M22: Heat pump for AHU-1.

Photo #M23: Dehumidifier. Supply Gas line is not identified.

Photo #M24: Emergency Ammonia Exhaust Fan.

Photo #M25: Drainage issue at SW building corner.

Photo #M26: Hand Sinks missing in Commercial kitchen and Concession.

Photo #M27: Under Bleachers Non-Ventilated Chemical Storages.

Photo #M28: Concession Range Welded Ductwork up to roof. No Access doors available.

Photo #M29: Typical Exhaust Fans (Upblast - for Ranges, Square box – for Washrooms & Lounges) & Make-up Air Ductwork.

Photo #M30: Condenser Water Tank.

Photo #M31: Eye Wash Station. No temperature water supply mixing valve/sensor observed.

Photo #M32: All Grilles are blocked off at Room #6. Numerous locations where fire sealant missing.

Photo #M33: Supports for Ductwork on the Roof to be fixed.

Photo #M34: Ammonia pipes Penetration through the wall in Compressor/Ammonia Room are sealed. No concerns.

Photo #M35: Excessive heat rejection through Evaporative Condenser.

7. ELECTRICAL

The electrical service to the building is supplied from an underground ducts on the Northwest side of the building by the local electric utility provider. Mechanical equipment in the compressor/Ammonia room are fed through a main voltage feed at 600 V, provided with electrical safety switches and motor starters for each component and backed up by the emergency generator. Interior transformers step down the incoming voltage at 3-phase, 4 wire for plug loads throughout the building. Secondary electrical distribution is accomplished by distribution switchboards and panels rated at 600Y/347 V and 208Y/120 V, 3-Phase, 4-Wire located close to the equipment utilization locations in utility spaces or service rooms throughout the building.

Interior lighting throughout the building includes a combination of fluorescent T-8 and T-12 fixtures and suspended LED lighting over hockey arena area and curling rink, all controlled by lighting control switch banks at entrance locations. The events area on second floor has recessed LED and pot light fixtures. Some incandescent fixtures are installed in storage rooms below the bleachers. Exterior site lighting primarily consists of soffit, wall packs and parking area pole fixtures. Site lighting is primarily halide fixtures controlled by a photocell. A single stage fire alarm control panel is located in the main electrical room connecting to various fire alarm devices including pull stations, heat detectors and bells. Communications and security systems includes telephone, internet, and cable services with cabling existing in various ages on installation. The communications infrastructure is located in the main electrical room and second floor closet and supports connectivity of devices throughout the facility. For security, door contacts are present on exterior doors. There is no CCTV or access control systems installed throughout the facility. The building is equipped with gas detectors (Carbon Monoxide, Ammonia, CO4, NH3 and others), emergency lighting battery packs and halogen/LED exit signs throughout.

In general, the visual review of the property indicates that the electrical equipment and systems are in acceptable condition with maintenance recommended to document and ensure functionality of the installed systems.

Testing of the entire system - complete infrared scanning of switchboards and panels, emergency lighting, fire alarm and emergency generator to be done, as part of routine maintenance, on a monthly and annual basis subject to code and regulations and, all found deficiencies shall immediately be rectified. There are no current (2021) annual fire alarm test reports stored at the main fire alarm panel or filed maintenance documentation and it was noted that testing is current with reports to be submitted by fire alarm maintenance company. There are limited electrical drawings reflecting the current electrical power distribution, fire alarm systems and communications. It is recommended to update site records to maintain accurate record of installation for safety and maintenance purposes.

The electrical components are in overall acceptable condition. Immediate action with respect to replacement of legacy emergency battery packs and remote heads has been identified. Capital expenditures with respect to the primary electrical distribution, emergency

generator, electrical subpanels, ice plant control panel, interior and exterior lighting, lighting controls, exit signs, public address and music systems, electronic scoreboard, and the intrusion security system are anticipated within the evaluation period. Additional investigation is recommended with respect to an Arc Flash Hazard Analysis to ensure safety of personnel operating close to energized electrical equipment.

A review of the electrical components of the ASHRAE 2019 report was completed as part of the assessment. In addition, the building peak energy power usage for a twelve month period staring in January 2021 was provided for review. The building peak load within the year was 260kW. This represents a capacity of 40% of the building service size. The electrical systems recommendation noted in the energy report will provide opportunity to reduce power consumption and improve the overall energy metric of the building. This includes changing to energy efficient LED lighting fixtures throughout and overlaying with automatic lighting controls including daylight harvesting, time and occupancy based controls. In addition, dimming of lighting fixtures on the exterior during building vacancy at night will provide additional energy improvement. This approach is recommended to be implemented as part of the overall building energy improvement scheme.

E01.0 INCOMING SERVICES

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E01.1	**Exterior Transformers**	Power to the building is fed from exterior transformer.	**4**	**-**	No concerns observed or reported. Refer to utility for utility owned transformers for maintenance or replacement.
E01.2	**Conductors**	Underground power conductors from the exterior transformer and into the interior main electrical panel provide power for the building.	**4**	**-**	No concerns observed or reported.

E02.0 DISTRIBUTION EQUIPMENT

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E02.1	**Main Distribution**	**~1976:** One main Square D main switchboard is in the main electrical room. Rating: 600 A, 600 V 3-Phase, 4-Wire	**4**	**C**	Complete thermal scans of switchboard to confirm condition. (See Note 7B). Maintenance: Recommend to schedule scans semi-annually. Complete torquing of mechanical bolts to bussing.
E02.2	**Primary Distribution Disconnection Switches**	**~1976 and various:** Disconnection Switches for mechanical equipment are provided in the Compressor/Ammonia room. Make: Square D and Siemens Rating: 20~400 A, 600 V	**4**	**C**	No concerns observed or reported. (See Note 7B).
E02.3	**Sub Distribution Panels**	**~1976:** One (1) SQUARE D – distribution panel is located in the main electrical room 600Y/347V, 400-A, 3-phase, 4-wire for plant and HVAC systems power. **~1976:** Eight (8) SQUARE D - brand panels are located at various parts of the building. These are	**4**	**C**	Complete thermal scans of switchboard to confirm condition. (See Note 7B). Maintenance: Recommend to schedule scans semi-annually. Complete torquing of mechanical bolts to bussing.

		rated at 208Y/120V, 200-A, 3-phase, 4-wire for plug loads.			
E02.4	**Emergency Generator**	**-2006**: A skin-tight enclosure 350kW packaged Kohler Unit is located on Exterior. Supporting distribution is located in an adjacent shed including a 800A transfer switch. 600/347V 3phase.	**4**	**C**	No concerns observed or reported (See Note 7B). Maintenance: 1. Monthly testing minimum of 1hr 2. Semi Annual Inspection and Testing 3. Annual inspection and testing minimum 2hr
E02.5	**Distribution Transformers**	**~1976:** Three (3) dry type distribution transformers are installed in the electrical room, rated at 15kVA, 75 kVA, and 112.5KVA respectively rated 600-208Y/120 V, 3-phase.	**4**	**C**	Provide Energy Efficient transformers to comply with NRCAN 2019. Transformers have a life span typical of 30 years (See Note 7B). Maintenance: Recommend to schedule scans semi-annually.
E02.6	**Motor Starters**	**~Various:** Motor starters for mechanical equipment are provided in the Compressor/Ammonia Room. Make: Various Rating: Various	**4**	**C**	No concerns observed or reported. (See Note 7B). Maintenance: Recommend to schedule scans semi-annually.
E02.7	**Switchboards**	**~1976:** One main Square D main switchboard is located in the main electrical room. Rating: 600 A, 600 V 3-Phase, 4-Wire	**4**	**C**	Complete thermal scans of switchboard to confirm condition. (See Note 7B). Maintenance: Recommend to schedule scans semi-annually. Complete torquing of mechanical bolts to bussing.
E02.8	**Ice Plant Control Panel**	**~ Various:** Ice plant control panels are provided in Compressor/Ammonia room. No nameplate was observed at the time of the site visit.	**4**	**C**	No concerns observed or reported. (See Note 7B).
E02.9	**Branch Wiring**	**~1976 and various:** Electrical branch circuit wiring is reportedly copper throughout the building.	**4**	**-**	No concerns observed or reported.
E02.10	**Receptacles**	**~1976 and various:** Electrical receptacles are provided throughout the building.	**3**	**B**	No concerns observed or reported. (See Note 7A).
E02.11	**Surge Protection**	Not present.	**-**	**-**	N/A

E03.0 LIGHTING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E03.1	**Interior Lighting**	~**Various:** Interior lighting throughout the building is typically fluorescent T-8, LED pot lights and LED Linear fixtures in various ages of installation.	**4**	**C**	No concerns observed or reported. (See Note 7B).
E03.1	**Interior Lighting**	~**Various:** Suspended LED lighting is installed over the ice surface area in the arena and curling links. LED fixtures are also installed in the second-floor events area	**4**	**D**	The suspended lights are believed to likely outlast their EUL and the costing for replacement is not included in the capital reserve table.
E03.2	**Lighting Controls**	~**1976:** Interior lighting is controlled by in-line voltage switches. Exterior lighting is controlled by switches and combination photocell and timeclock.	**4**	**D**	Recommend providing energy efficient lighting controls to comply with energy codes. This can include but not limited to occupancy sensors, time scheduling and dimmers
E03.3	**Emergency Lighting**	~**Various:** Battery packs with integral lighting heads have been installed throughout the building. They are in various ages of install.	**2**	**A**	Some legacy battery packs and remote heads were observed in the some of the areas i.e. concession. Recommend changing to new as batteries have a limited shelf life. (Imm.3). Maintenance: Complete monthly and annual testing for battery packs for a minimum operation of 30 minutes.
E03.4	**Exit Lighting**	~**1976:** Red letter style Illuminated exist signs are provided at emergency exits and paths of egress.	**4**	**C**	No concerns observed or reported. Recommendation is to change out to universal pictogram running man sign as part of a maintenance cycle (See Note 7B).
E03.5	**Exterior Lighting**	~**Various:** Exterior lighting is provided by soffit and wall mounted light fixtures located around the building perimeter.	**3**	**C**	Old fixtures and insufficient exterior lighting for the area. Replacement cost has been included in Capital Reserve Table for LED units. (See Note 7B).
E03.6	**Site lighting**	~**Unknown:** Two (2) pole mounting light fixtures are located in the parking area. These are owned and maintained by the electrical utility.	**4**	**-**	No concerns observed or reported.

E04.1 GROUNDING

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E04.1	**Grounding**	**~1976:** Concealed, but assumed to be present on major electrical equipment and conduit systems.	4	-	No concerns observed or reported.

E05.1 FIRE ALARM

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E05.1	**Fire Alarm Panel**	**~2016:** The building is outfitted with an Edwards QSC fire alarm control panel located in the main electrical room. An annunciator display panel is located at the principal entry point vestibule. The system is monitored offsite by Omega monitoring inc.	4	C	Ensure panel cover is in place. Recommend replacing unit with an addressable fire alarm panel as part of capital plan coordinated with potential sprinkler upgrades. The cost for this work has been included in the capital reserve table. (See Note 4B). Maintenance: Complete annual fire alarm testing and replacement of field devices as required. Any modifications to fire alarm system to be verified on alterations.
E05.2	**Devices**	**~2016:** Fire detection and alarm devices include heat detectors, pull stations and bells in throughout the building and exterior.	4	-	No concerns observed or reported. This component is expected to perform beyond the timeframe projected for this report. Devices to be replaces as part of annual maintenance or testing.
E05.3	**Devices**	Kitchen hood automatic gas shut off is located in the concession area. Manual shut down pull stations interfacing with the hood suppression are located at kitchen exit points.	4	-	No concerns observed or reported. This component is expected to perform beyond the timeframe projected for this report.
E05.4	**Gas Monitoring System**	**~2010:** Ammonia, CO4, NH3 and carbon monoxide detectors are provided throughout the building.	4	C	No concerns observed or reported. (See Note 7B).

E06.0 COMMUNICATIONS, DATA & SECURITY

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E06.1	**Public Address System**	**~2000:** A public address and music system is provided throughout the building.	**4**	**C**	Head end equipment located adjacent to maintenance office in meeting room. (See Note 7B).
E06.2	**Telephone**	**~1976 and various:** Telephone services are provided by Telus in this building.	**4**	**-**	Cabling installation exits in various ages. No concerns observed or reported.
E06.3	**Communications Systems**	Wireless access points are located thorough the facility.	**4**	**-**	Cabling installation exists in various ages. No concerns observed or reported.
E06.4	**Intrusive Systems**	Motion sensors and door contacts are provided throughout the building. The system is monitored.	**4**	**-**	No concerns observed or reported.
E06.5	**Access Controls**	Not present.	**-**	**-**	N/A
E06.6	**Surveillance Systems**	Not present.	**-**	**-**	N/A

E99.0 OTHERS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
E99.1	**Breaker and Disconnect Switch Testing**	Exercising of disconnect switches and circuit breakers by performing several open-and-close operations.	**-**	**-**	To be performed annually.

NOTES:

7A) The cost associated with repairs/replacement of this item is expected to fall below the Capital Threshold; as such, no costing has been included in the Capital Reserve Table.

7B) This component will pass its EUL within the evaluation period and should be replaced.

IMMEDIATE ITEMS IDENTIFIED:

Imm.4) Change out legacy emergency lighting battery packs.

No other immediate items identified.

CAPITAL RESERVE ITEMS IDENTIFIED:

E02.1) Primary Distribution.
E02.2) Electrical power distribution equipment.
E02.3) Electrical sub distribution panels.
E02.4) Generator.
E02.5) Electrical Transformer, Secondary.
E02.6) Motor starters & accessories.
E02.7) Electrical switchboard.
E02.8) Ice plant control panel.
E03.1) Interior Lighting Upgrade.
E03.2) Interior Lighting controls.
E03.4) Exit signs.
E03.5) Exterior lightings.
E05.4) Gas Monitoring System.
E06.1) Public Address System.
No other Capital Reserve Items above the threshold identified.

RECOMMENDED ADDITIONAL INVESTIGATION:

RAI.5) Arc flash Hazard Analysis.
No other recommended additional investigation identified.

Photo #E1: Mai Electrical Room. (Transformer, switchboard, panels and disconnect.

Photo #E2: Ice Plant Control Panel.

Photo #E3: Sub distribution Main Panel board – 200Y/120V located outside of maintenance room.

Photo #E4: Fire Alarm Annunciator at main entrance.

Photo #E5: Typical change rooms recessed Pot Lights

Photo #E6: Concession Area Surface mounted Fluorescent recessed lighting and Legacy emergency battery pack with heads

Photo #E7: Subpanels in Concession Area 120/208V.

Photo #E8: Suspended LED lights located in the Ice Arena Rink.

Photo #E9: Typical Events area LED recessed lighting and Pot Lights

Photo #E10: Typical fluorescent strip lights in Lobby.

Photo #E11: Red letter style exit sign.

Photo #E12: Typical fire alarm pull station and bell in the building.

Photo #E13: Curling rink suspended LED lighting.

Photo #E14: Typical curling rink lighting control timer and switch bank

	
Photo #E15: Typical soffit mounted exterior lighting in the building- wall mounted units similar.	**Photo #E16:** Roof mounted LED lights installed in every elevation of the building.

Photo #E17: Emergency distribution, transfer switch and panel.

Photo #E18: Packaged Exterior Generator.

8. HAZARDOUS MATERIALS REPORTS

No previous hazardous materials reports were made available for review. Based on the year of the construction of the building outlined in this report (~1976), hazardous building construction materials such as ACMs (asbestos containing materials), and/or PCBs (polychlorinated biphenyls) may be present in the building.

Report Signature Page

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APPENDIX A

Mandate & Report Resources

MANDATE AND REPORT RESOURCES

Authorization

Written Notice of Award of *Facility Condition Assessment Summerland Arena & Curling Club Complex* was provided on December 9, 2021. A FCA of the Site identified in the Introduction section of the report was subsequently conducted. The Site is currently owned and operated by the District of Summerland.

Purpose

The primary objective of the FCA was to visually examine and evaluate the present condition of the property elements, buildings and related structures. The FCA process is being undertaken to assist the District of Summerland in capital planning and evaluating the potential financial liabilities associated with the condition of the site elements, building and related structures on the sites. Stephenson Engineering understands that t will rely on the contents of this report for capital planning.

Scope

The FCA was conducted in general accordance with the American Society for Testing and Materials (ASTM) "Standard Guide for Property Condition Assessments: Baseline Property Condition Process E 2018-15", as locally applicable. The Stephenson Engineering Assessors (identified on the first page of the report) conducted the sites reconnaissance on the date shown. The Site reconnaissance was limited to a walk around the sites, a walk-through of the buildings and interview with personnel listed in the Introduction section of the report (referred to as the "Site Representative" in this report). Copies of selected photographs documenting conditions at the time of the visit are provided throughout the report.

The purpose of the report is to communicate identified physical deficiencies, future capital projects, and the associated opinions of estimated costs where the cost is greater than the Capital Threshold and expected to occur within the time frame used for the report. In accordance with this agreed mandate, assumptions were required to delineate between capital items and routine maintenance. Please refer to the "Operating and Maintenance Item" list below. Also, please refer to the attached "Discussions of Overall Concepts and Terminology" for additional explanation of assumptions used.

The review of the structural elements was limited to a visual review of the accessible, exposed portions of the buildings and related structures during our visit to the building. The roofs, walls, floors and ceilings were visually reviewed to collect information in this regard.

The on site review and reporting of architectural, structural vertical transportation, mechanical, electrical and life safety systems was performed by either a discipline specialists or people having significant past professional expertise in building assessments of similar complexity Our reporting was developed in conjunction with discussions with the Site Representative, owner provided data, and our visual professional observations and conclusions.

It is assumed that each facility complied with national and provincial building codes and/or fire codes at the time of construction, and any gaps with today's codes would be grandfathered. A full code review is not part of the scope of this assessment, only obvious code issues/violation that are visually observed and related to life safety are addressed.

The estimated costs outlined in this report are based on the conditions encountered and observations made during the reconnaissance. Estimates of quantities and areas are based on information supplied, field observations and/or interviews. Item repair/replacement costs are approximate only. Restoration costs are sensitive to local and overall economic factors and therefore, specific quotations from qualified contractors should be obtained when a specific deficiency is addressed, or a capital project is to be implemented.

Operating and Maintenance Items

Stephenson Engineering assumes the following items will be maintained under normal operating budgets and are therefore not included in the Capital Reserve Table.

SITE
- Buried services
- Landscaping

STRUCTURE
- Foundations and footings

ROOF
- Periodic maintenance

WALLS AND WINDOWS
- Local periodic repairs and needle glazing
- Weather-stripping

INTERIORS
- Various common furnishings, specialty equipment
- Small residential appliances

MECHANICAL
- Motors, ductwork and in-duct equipment
- Oil supply systems
- Air inlets and outlets

ELECTRICAL
- Conductors

DISCUSSIONS OF OVERALL CONCEPTS AND TERMINOLOGY

Evaluation Period

The period of evaluation used for this report is 25 years. Capital repairs and replacement that are reasonably expected to be required within this evaluation period and that cost in excess of the Capital Threshold are included in the Capital Reserve Table.

Effective Age

The estimated age of a building component that considers actual age as affected by maintenance history, location, weather conditions, and other factors. Effective age may be more or less than actual age.

Expected Useful Life (EUL)

The average amount of time in years that an item, component or system is estimated to function without material repair when installed new and assuming routine maintenance is practiced.

Site Representative (POC)

Client, client's agent, or client-identified person or persons knowledgeable about the physical characteristics, maintenance, and repair of the subject property.

Remaining Useful Life (RUL)

A subjective estimate based upon observations, or average estimates of similar items, components, or systems, or a combination thereof, of the number of remaining years that an item, component, or system is estimated to be able to function in accordance with its intended purpose before warranting replacement. Such period of time is affected by the initial quality of an item, component, or system, the quality of the initial installation, the quality and amount of preventive maintenance exercised, climatic conditions, extent of use, etc.

Capital Threshold

The Capital Threshold used for this report is ($3,000). This threshold is used to determine whether a capital repair item is to be included in the Capital Reserve Table. Capital repairs identified and estimated to cost less than the threshold, or that will likely to be performed in phases, as a part of routine maintenance as required, at a cost less than the threshold are not included in the Capital Reserve Table.

Costs

Costs presented in this study for future capital repairs and replacement projects are our Opinions of Probable Budgets and are intended to include the work as per the description, taxes, permit fees, contingency and where appropriate, Engineering fees for design, specifications, tendering, project management and construction monitoring. We have generally assumed replacement will occur on a like-for-like basis except where obsolescence or technological advancements logically dictates an upgrade. More accurate costing in the future will require a condition assessment, choice and development of an appropriate repair option, designing and tendering the work to qualified contactors.

Recommended Work

Work that is required due to end of EUL, current condition, obvious visually observed code violation or immediate health risks to keep the facility operating over the evaluation period of this report. This work is considered to be beyond normal or routine maintenance work or

for maintenance procedures that are currently not in force but are strongly recommended to maintain the system under consideration.

Immediate Items

Immediate repairs include deficiencies that require action in the next 60 to 90 days as a result of (I) existing or potentially unsafe conditions, (ii) negative conditions significantly impacting marketability or habitability, (iii) obvious visually observed building code violations, (iv) poor or deteriorated condition of a critical element or system, or (v) a condition that if left "as is" with extensive delay in addressing same, would result in or contribute to critical element or system failure within 12 months or a significant escalation in the repair cost.

Short Term Work (1 to 5 years)

Short term work includes work items that may not warrant immediate attention, but require repairs or replacement that should be undertaken on a priority basis in addition to routine preventive maintenance.

Mid Term Work (6 to 10 years)

Mid term work includes work items that require repair or replacement but do not have significant deficiencies or have not reached their EUL.

Long Term Work (11 to 25 years)

Long term work includes work items that require repair or replacement beyond the evaluation period of this report or those which under our opinion, with periodic scheduled maintenance, replacement can be deferred beyond the evaluation period.

Capital Reserve Analysis

The Capital Reserve Table includes a section that provides the average on an annual basis capital costs per square foot. Replacement Reserves include (i) deficiencies that may not warrant immediate attention, but require repair or replacement that should be undertaken on a priority basis over routine preventive maintenance work and (ii) components or systems that have realized or exceeded their Expected Useful Life (EUL) during the evaluation period (realization of EUL alone does not constitute an immediate repair). Replacement reserve costs are included in Appendix C.

Opinions of probable costs are provided for material physical deficiencies and not for repairs or improvements that could be classified as:

- Cosmetic or decorative;
- Part or parcel of a building renovation program or tenant improvement/finishes;
- Enhancements to reposition the asset in the marketplace;
- For warranty transfer purposes;
- Routine or normal preventative maintenance;

- Less than the capital threshold for this report; and
- Are expected to occur beyond the time frame of this report

Cost Inflation Rate

We have presented the costs in current year (2022) values. We have used 3% in the capital reserve table attached. Further sensitivity analysis using other inflation assumptions should be tested when projecting future cash-flows.

Life Expectancies

Our estimates of the life expectancy of common element components, systems and sub-systems are based on our opinion of the observed condition during our Site visit, experience with similar material at other buildings, published industry standards, articles and recommendations made by material suppliers and manufacturers. For some materials or systems, the history of use is not sufficient to predict life expectancy accurately. Monitoring and adjustments to the assumptions are required.

The year in which the capital work is required is estimated on the basis of the current observed conditions, or the construction methods and materials used. This may be shorter or longer than the remaining time in the standard estimated life cycle based on the current age of the item. Our estimates of life cycles reflect our understanding of the standards that the prudent long-term owners would maintain. Deferring and phasing of work is often possible keeping in mind that doing so could reduce building standards, increase disruption to residents, increase costs and risks.

APPENDIX B

Limitations and Use of the Report

LIMITATIONS

This report is intended to provide an assessment of the property conditions at the subject property, at the time of the site visit. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. Should additional parties require reliance on this report, Stephenson Engineering may be contacted to extend reliance to such parties. Stephenson Engineering disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs, which result from reporting the factual information contained herein.

The conclusions as presented represent the judgement of Stephenson Engineering based on the visual observations of the accessible, exposed building elements, supplemented by information and data obtained by Stephenson Engineering and discussions with the Site Representative and other representatives of the owner identified. Except as otherwise may be requested, Stephenson Engineering disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Stephenson Engineering after the time during which Stephenson Engineering conducted the FCA. No physical testing or intrusive investigations were conducted, and no samples of building materials were collected to substantiate the observations made.

In evaluating the Site, Stephenson Engineering has relied in good faith on information provided by other individuals noted in this report. Stephenson Engineering in certain instances has been required to assume that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the Site Representative or operations staff in addition to our on-site visual observations and assessment. Stephenson Engineering accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Actual costs may vary from the opinions of probable cost outlined by Stephenson Engineering. Factors affecting actual cost may include, but are not limited to, type and design of suggested remedy, quality of materials and installation, manufacturer and type of equipment or system selected, field conditions, whether a physical deficiency is repaired or replaced in whole, phasing of the work (if applicable), quality of contractor, quality of project management exercised, market conditions, and whether competitive pricing is solicited, etc.

Stephenson Engineering makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time, thus any parties making use of this report should review these issues with appropriate legal counsel.

Should additional information become available with respect to the building elements or systems, Stephenson Engineering requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

APPENDIX C
Capital Reserve Table

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Summerland Arena & Curling Club Complex

8820 Jubilee Road East,
Summerland BC

Appendix C - Capital Reserve Table

Project Information

Total Gross Floor Area (m²)	5,300	Year Built	1976	Reserve Term (years)	25
Number of Buildings	1	Age	46	Assumed Inflation	5%

Identified Costs

Report Section	Building Component	Expected Useful Life	Observed Age	Remaining Useful Life	Unit Rate	Quantity	Code Rating	Category	Recommended Action	Immediate	Short Term					Mid Term					Long Term													Total
										2022	Year 1 2023	Year 2 2024	Year 3 2025	Year 4 2026	Year 5 2027	Year 6 2028	Year 7 2029	Year 8 2030	Year 9 2031	Year 10 2032	Year 11 2033	Year 12 2034	Year 13 2035	Year 14 2036	Year 15 2037	Year 16 2038	Year 17 2039	Year 18 2040	Year 19 2041	Year 20 2042	Year 21 2043	Year 22 2044	Year 23 2045	Year 24 2046	Year 25 2047	
4	**ARCHITECTURAL**																																	
A01	**Site**																																	
A01.2	Parking Lot, Asphalt Paving	25	46	0	$22 /m²	6,650 m²	3	C	Replace		$146,300																							$146,300
A01.3	Parking Lot, Pavement Markings	25	3	22	$18 /m	922 m	3	C	Repaint		$3,000																							$3,000
RAL.1 / A01.7	Site Drainage Study				Allowance		3	C	Study / Repair		$10,000	$10,000																						$20,000
A01.13	Exterior Stairs	50	46	4	$1,054 /riser	84 riser	3	C	Replace					$88,500																				$88,500
A02	**Exterior Walls**																																	
A02.2	Metal Cladding	40	46	2	$103 /m²	940 m²	3	C	Replace			$96,800																						$96,800
A02.3	Vinyl Siding	30	25	5	$116 /m²	260 m²	3	C	Replace						$30,200													$3,200						$33,400
A02.4	Exterior Paint - CMU walls	15	9	6	$12 /m²	1,500 m²	3	C	Repaint							$18,000														$18,000				$36,000
A02.5	Joint Sealers	20	22	1	$50 /m	300 m	2	C	Replace		$15,000																							$15,000
A03	**Exterior Windows**																																	
A03.1	Exterior Windows, Aluminum	40	24	16	$1,500 each	32 units	4	C	Replace																	$48,000								$48,000
A04	**Exterior Doors**																																	
A04.1	Main Entrance Door	30	10	20	$3,000 each	3 units	4	C	Replace																					$9,000				$9,000
A04.2	Exterior Secondary Doors	40	46	5	$3,000 each	1 unit	4	C	Replace						$3,000																			$3,000
A04.3	Exterior Utility Doors	40	35	5	$1,605 each	3 units	4	C	Replace						$4,800																			$4,800
A04.4	Overhead Doors	25	25	5	$10,179 each	2 units	4	C	Replace						$20,400																			$20,400
A05	**Fascia and Soffits**																																	
A05.1	Fascia	25	25	2	$161 /m²	150 m²	3	C	Replace			$24,200																						$24,200
A05.2	Exterior Soffits - Wood	40	46	2	$140 /m²	80 m²	3	C	Replace			$11,200																						$11,200
A06	**Interior Walls and Partitions**																																	
A06.2	Spectator Protection Boards	30	22	8	$734 /m²	290 m²	3	C	Replace									$212,900																$212,900
A06.3	Interior Paint	15	12	3	$18 /m² GFA	5,300 m² GFA	4	C	Repaint				$95,400															$95,400						$190,800
A06.4	Wall Finishes, Tile	40	25	15	$123 /m²	140 m²	3	C	Replace																$17,200									$17,200
A07	**Interior Doors and Windows**																																	
A07.1	Interior Doors - Pair - Steel	30	9	21	$1,072 each	10 units	3	C	Replace																						$57,900			$57,900
A07.2	Interior Fire Doors	30	9	21	$1,260 each	24 units	3	C	Replace																						$91,980			$91,980
A07.3	Interior Windows	40	46	3	$1,000 each	16 units	3	C	Replace				$16,000																					$16,000
A07.4	Overhead Doors	25	22	3	$10,179 each	1 unit	4	C	Replace				$10,200																					$10,200
A07.5	Overhead Counter Doors - Concession area & Curling lobby	25	10	15	$4,000 each	5 units	3	C	Replace																$20,000									$20,000
A07.6	Sliding Barn doors	25	46	3	$1,800 each	2 units	3	C	Replace				$3,600																					$3,600
A08	**Ceilings**																																	
A08.2	Suspended Ceiling Tiles	25	25	5	$77 /m²	940 m²	3	C	Replace						$72,400																			$72,400
A08.3	Wood Panels	25	46	5	$40 /m²	500 m²	4	C	Replace						$20,000																			$20,000
A08.4	FRP Ceiling Panels	25	12	13	$65 m²	100 m²	4	C	Replace														$6,500											$6,500
A08.5	Ceiling Finishes, Paint	15	13	2	$18 /m² GFA	1,200 m² GFA	4	C	Refinish			$21,600															$21,600							$43,200
A08.6	Reflective Insulation		0		Allowance		2	C	Replace					$25,000															$15,000				$40,000
A08.7	Vinyl faced insulation blankets	25	12	13	$9 /m²	1,100 m²	4	C	Replace														$9,900											$9,900
Imm.1	Exposed Structure - Fire Rating Code Study & Installation				Allowance		1	A	Code	$5,000	$50,000																							$50,000
A09	**Flooring**																																	
A09.1	Resilient Flooring tiles	20	25	2	$94 /m²	110 m²	3	C	Replace			$10,300																						$10,300
A09.2	Rubber Flooring	20	12	8	$214 /m²	680 m²	4	C	Replace									$145,500																$145,500
A09.3	Floor paint	15	12	3	$18 /m² GFA	1,000 m² GFA	4	C	Replace				$18,000															$18,000						$36,000
A09.4	Wooden Panels				Allowance		4	C	Repair / Replace						$8,000					$8,000					$8,000				$8,000				$40,000
A09.5	Ceramic Tiles	40	25	15	$169 /m²	240 m²	4	C	Replace																$40,600									$40,600
A09.6	Laminate Flooring	20	12	8	$107 /m²	90 m²	4	C	Replace									$9,600																$9,600
A09.7	Hardwood Decking Boards	30	46	5	$100 /m²	80 m²	4	C	Replace						$8,000																			$8,000
A09.8	Carpet	15	12	3	$53 /m² GFA	120 m² GFA	4	C	Replace				$6,400																					$6,400
A10	**Fixtures**																																	
A10.1	Fixed Casework	35	25	10	$740 /m	40 m	4	C	Replace											$29,600														$29,600
A10.2	Fixed Benches				Allowance		4	C	Repair / Replace						$15,000																			$15,000
A10.3	Railings - Metal	25	46	5	$140 /m	130 m	2	C	Replace						$20,000																			$20,000
A10.3	Railings - glass railings	25	12	13	$200 /m	24 m	4	C	Repair / Replace		$3,000												$4,800											$7,800
A10.4	Locker - Chain link	40	46	5	$123 /m	80 m	4	C	Replace						$9,800																			$9,800
A10.4	Locker - Wood athletic	35	12	23	$740 each	24 units	4	C	Replace																							$17,760		$17,760
A10.4	Locker - Metal	30	12	18	$436 each	43 units	4	C	Replace																			$18,700						$18,700
A10.5	Washrooms Accessories	15	10	5	Allowance		4	C	Replace						$10,000													$10,000						$20,000
A10.6	Toilet Partitions	20	46	5	$850 each	12 units	4	C	Replace						$10,200																			$10,200
A10.7	Appliances - Residential	20	12	8	$1,200 each	4 units	4	C	Replace									$4,800																$4,800
A10.9	Scoreboards	20	12	8	$32,000 each	1 unit	4	C	Replace									$32,000																$32,000
A10.11	Window coverings	30	28	2	Allowance		4	C	Replace			$5,000																						$5,000
A11	**Barrier Free**																																	
RAI.2	Barrier Free Study		-	-	Allowance		3	D	Code	$20,000																								
A11.3	Barrier Free - Interior Circulation		-	-	Allowance		2	D	Code	$80,000																								
A11.4	Barrier Free - Washroom		-	-	Allowance		2	D	Code	$200,000																								
R01	**Roofing**																																	
R01.1	Metal Roof System (1976)	40	46	1	$105 /m²	3,200 m²	2	C	Replace		$336,000																							$336,000
R01.1	Metal Roof System (1985)	40	37	3	$105 /m²	86 m²	2	C	Replace				$9,000																					$9,000
R01.2	SBS Roof	25	20	5	$111 /m²	710 m²	4	C	Replace						$78,800																			$78,800
R01.3	Asphalt shingles	25	37	5	$61 /m²	52 m²	4	C	Replace						$3,200																			$3,200
RAI.3	Water test				Allowance		2	C	Study		$5,000																							$5,000
R01.4	Roof gutters and downspouts	25	37	2	$180 /m²	60 m²	2	C	Repair / Replace			$10,800																						$10,800
R01.5	Cap Flashing	25	20	5	$161 /m²	180 m²	4	C	Replace						$29,000																			$29,000
A99	**Other**																																	
A99.1	Elevator - Replace cab & control renovation	25	46	2	Allowance		3	D	Replace			$100,000																						$100,000
5	**STRUCTURAL**																																	
S01	**Foundations**																																	
	No Capital Items Identified																																	
S02	**Floors on Grade**																																	
S02.1	Slab on Grade - Hockey rink with new hot deck				Allowance		4	C	Repair / Replace											$850,000													$850,000
S02.1	Slab on Grade - Curling rink with new hot deck				Allowance		4	C	Repair / Replace											$480,000													$480,000
S03	**Suspended Floors and Stairs**																																	

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Summerland Arena & Curling Club Complex

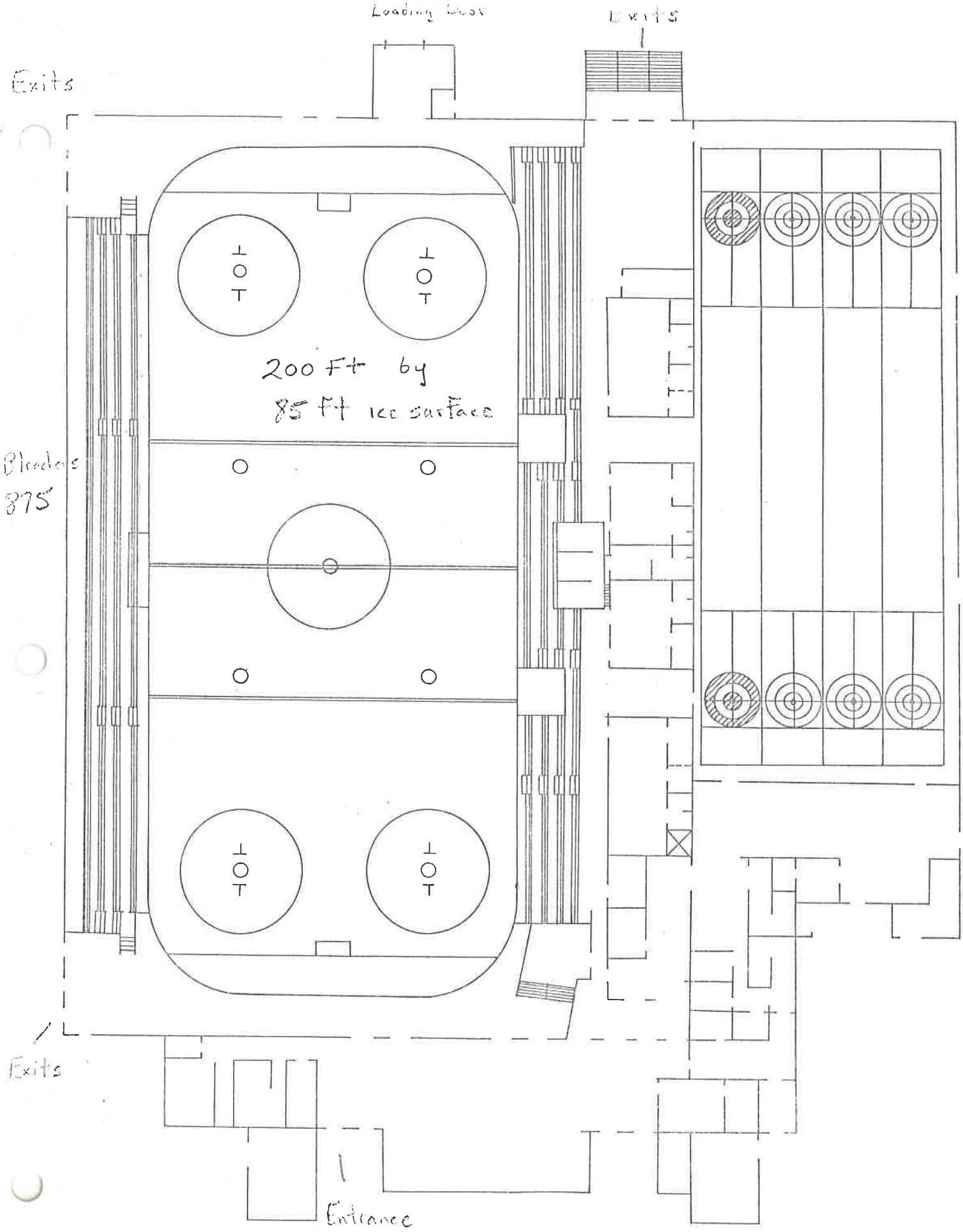
Summerland BC

Report Section	Building Component	Expected Useful Life	Observed Age	Remaining Useful Life	Unit Rate	Quantity	Code Rating	Category	Recommended Action	Immediate 2022	Short Term Year 1 2023	Year 2 2024	Year 3 2025	Year 4 2026	Year 5 2027	Mid Term Year 6 2028	Year 7 2029	Year 8 2030	Year 9 2031	Year 10 2032	Long Term Year 11 2033	Year 12 2034	Year 13 2035	Year 14 2036	Year 15 2037	Year 16 2038	Year 17 2039	Year 18 2040	Year 19 2041	Year 20 2042	Year 21 2043	Year 22 2044	Year 23 2045	Year 24 2046	Year 25 2047	Total
	No Capital Items Identified																																		
S04	**Roof Structures**																																		
	No Capital Items Identified																																		
S05	**Interior Walls and Columns**																																		
S05.1	Interior wall repair				Allowance		4	C	Repair			$15,000																							$15,000
S06	**Exterior Walls and Columns**																																		
S06.1	CMU Walls				Allowance		4	C	Repair			$6,000																							$6,000
S99	**Other**																																		
	No Capital Items Identified																																		
6	**MECHANICAL**																																		
M01	**Site Services**																																		
	No Capital Items Identified																																		
M02	**Plumbing**																																		
M02.3; .4	Domestic Water Heaters	20	17	3	$3,540 each	2 units	4	C	Replace				$7,100																						$7,100
M02.5	Tankless Domestic Water Heaters	15	14	1	$3,350 each	2 units	4	C	Replace		$6,700																								$6,700
M02.7; .8; .9	Domestic Hot Water Storage Tanks	20	17	3	$3,700 each	3 units	4	C	Replace				$11,100																						$11,100
M03	**Heating**																																		
M03.2	Unit Heaters, Gas-fired, Radiant	20	25	0	$5,000 each	4 units	3	C	Replace		$20,000																								$20,000
M03.3	Unit Heaters, Gas-fired, Forced flow	20	25	0	$2,200 each	1 unit	4	C	Replace		$2,200																								$2,200
M03.4	Hydronic Fan Coil Unit Heater	20	11	9	$1,700 each	5 units	4	C	Replace										$8,500																$8,500
M03.5	Hydronic Fan Coil Unit Heater	20	11	9	$4,000 each	2 units	4	C	Replace										$8,000																$8,000
M03.6	Backup Hydronic Inline Electric Heater	20	11	9	$2,800 each	1 unit	4	C	Replace										$2,800																$2,800
M03.7	Electric Forced Flow Heaters	18	30	0	$1,500 each	14 units	4	C	Replace		$21,000																								$21,000
M03.8	Baseboard Heaters	25	17	8	$2,700 each	6 units	4	C	Replace									$16,200																	$16,200
M03.11	Air Handling Unit AHU-2	20	4	16	$16,000 each	1 unit	4		Replace																	$16,000									$16,000
M03.12	Air Handling Unit AHU-1	20	30	0	$16,000 each	1 unit	3	C	Replace		$16,000																								$16,000
M04	**Cooling**																																		
M04.1	Heat pump	20	20	0	$3,800 each	1 unit	4	C	Replace		$3,800																								$3,800
M04.2	Condenser	20	16	4	$5,000 each	1 unit	4	C	Replace					$5,000																					$5,000
M04.3	Roof Top Unit	20	30	0	$12,000 each	1 unit	3	C	Replace		$12,000																								$12,000
M05	**Ventilations**																																		
RAI.4	Ventilation Assessment				Allowance				Study		$10,000																								$10,000
M05.2	Make-up air units for commercial kitchens				$6,400 each	2 units	3	A,C	Upgrade		$12,800																								$12,800
Imm.2	Exhaust fans for chemical storages				$2,800 each	2 units		A	Code / Safety	$5,600																								
M05.4; .6	Exhaust fans	20	25	0	$1,800 each	7 units	4	C	Replace		$12,600																								$12,600
M05.5	Exhaust fan	20	25	0	$6,000 each	1 unit	3	C	Replace		$6,000																								$6,000
M05.7	Exhaust Fans	20	25	0	$2,700 each	2 units	4	C	Replace		$5,400																								$5,400
M05.8	Exhaust Fan	20	17	3	$4,300 each	1	5		Replace				$4,300																						$4,300
M06	**Fire Protection**																																		
M06.1	Fire Extingusher, Cabinets and Accessories	15	7	8	$2 /m² GFA	5,300 m² GFA	5	C	Replace									$10,600																	$10,600
M06.2	Fire Protection, Sprinklers	40			$84 /m² GFA	5,300 m² GFA			Installation		$445,200																								$445,200
M06.3	Fire Extingusher System, Dry chemical	15	13	2	$15,500 each	2	4	C	Replace			$31,000																							$31,000
Imm.3	Fire protection Assesment								Code / Safety	$10,000																								
M07	**Controls**																																		
	No Capital Items Identified																																		
M99	**Other**																																		
M99.2	Dehumidifier	25	4	21	$64,000 each	1 unit	5	C	Replace					$68,000																					$68,000
M99.6	Ammonia compressors	20	30	0	$26,000 each	2 units	3	C	Replace		$52,000																								$52,000
M99.7; .8; .14; .17	Pumps	20	11	9	$3,800 each	6 units	4	C	Replace										$22,800																$22,800
M99.9	High Pressure Receiver	30	30	0	$6,500 each	1 unit	3	C	Replace		$6,500																								$6,500
M99.12	Evaporative Condenser	25	18	7	$40,000 each	1 unit	4	C	Replace								$40,000																		$40,000
M99.13	Thermal Equlizer	20	11	9	$5,000 each	1 unit	4		Replace										$5,000																$5,000
M99.15; .16	Heat Exchangers	20	11	9	$15,500 each	2 units	4	C	Replace										$31,000																$31,000
M99.18	Cold Brine Pumps	15	18	0	$18,000 each	2 units	4	C	Replace		$36,000																								$36,000
M99.19	Ammonia Chiller	20	18	2	$96,000 each	1 unit	4	C	Replace			$96,000																							$96,000
M99.19	Ammonia Chiller	20	18	2	$70,000 each	1 unit	4	C	Replace			$70,000																							$70,000
M99.20	Refrigeration piping & valves	30	30	0	$59,000 each	1 unit	4	C	Replace		$59,000																								$59,000
7	**ELECTRICAL**																																		
E02	**Distribution Equipment**																																		
E02.1	Primary Distribution - Main disconnect	30	46	0	$36,500 each	1 unit	4	C	Replace		$36,500																								$36,500
RAI.5	Arc Flash Hazard Study				Allowance				Study		$7,000																								$7,000
E02.3	Electrical Subpanels	30	20	10	$4,000 each	8 units	4	C	Replace											$32,000															$32,000
E02.4	Emegency Generator	20	16	4	$180,000 each	1 unit	4	C	Replace					$180,000																					$180,000
E02.5	Electrical Transformer, Secondary	30	25	5	$30,000 each	2 units	4	C	Replace						$60,000																				$60,000
E02.5	Electrical Transformer, Secondary	30	25	5	$9,000 each	1 unit	4	C	Replace						$9,000																				$9,000
E02.6	Motor Starters and Accessories	25	10	15	$800 each	35 units	4	C	Repair / Replace																$28,000										$28,000
E02.7	Electrical Switchboards	25	15	10	$20,000 each	1 unit	4	C	Replace											$20,000															$20,000
E02.8	Ice Plant Control Panel	50	30	20	$15,000 each	1 unit	4	C	Replace																					$15,000					$15,000
E03	**Lighting**																																		
E03.1	Interior Lighting, Fluorescent	20	17	3	$85 /m² GFA	36 m² GFA	4	C	Replace				$3,100																						$3,100
Imm.4	Emergency Lighting, Battery Packs	20	30	0	$486 each	50 units	2	A	Code / Safety	$24,300																								
E03.4	Exit Signs	20	30	0	$500 each	30 units	4	C	Replace		$15,000																								$15,000
E03.5	Exterior Lighting	30	28	2	$300 each	40 units	3	C	Repair / Replace			$12,000																							$12,000
E04	**Grounding**																																		
	No Capital Items Identified																																		
E05	**Fire Alarm**																																		
E05.1	Fire Alarm Panel	10	6	4	$18,000 each	1 units	4	C	Replace					$18,000																					$18,000
E05.4	Gas Monitoring System	15	12	3	Allowance		4	C	Replace				$8,000																						$8,000
E06	**Communications, Data & Security**																																		
E06.1	Public Address System	15	15	0	$18 /m²	2,790 m²	4	C	Replace		$50,200																								$50,200
E99	**Other**																																		
	No Capital Items Identified																																		

	Inflated	*Uninflated*		Immediate 2022	Year 1 2023	Year 2 2024	Year 3 2025	Year 4 2026	Year 5 2027	Year 6 2028	Year 7 2029	Year 8 2030	Year 9 2031	Year 10 2032	Year 11 2033	Year 12 2034	Year 13 2035	Year 14 2036	Year 15 2037	Year 16 2038	Year 17 2039	Year 18 2040	Year 19 2041	Year 20 2042	Year 21 2043	Year 22 2044	Year 23 2045	Year 24 2046	Year 25 2047	Total
Average Cost / Year	$316,166	$220,258	Totals *(Uninflated)*	$344,900	$1,404,200	$519,900	$192,200	$384,500	$411,800	$18,000	$40,000	$431,600	$78,100	$1,419,600	$0	$0	$21,200	$0	$113,800	$64,000	$21,600	$145,300	$0	$47,000	$167,880	$0	$17,760	$0	$8,000	**$5,506,440**
Average Cost / Year / Sq. M.	$59.65	$41.56	Totals *(Inflated)*	$344,900	$1,474,410	$573,190	$222,496	$467,362	$525,573	$24,122	$56,284	$637,670	$121,159	$2,312,379	$0	$0	$39,976	$0	$236,582	$139,704	$49,508	$349,682	$0	$124,705	$467,707	$0	$54,550	$0	$27,091	**$7,904,148**

Completed by: DK
Reviewed by: LPM

APPENDIX D
Floor Plan



SUMMERLAND RECREATION CENTRE - LOWER FLOOR

APPENDIX E
Ammonia Exposure Control Plan Review

District of Summerland– Anhydrous Ammonia
Exposure Control Plan

Prepared By:

District of Summerland
Summerland Arena
8820 Jubilee Rd. east
V0H1Z0

January 27th 2022

AME Group
consulting mechanical engineers
Reviewed
05/18/2022 10:46:06 AM

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APPENDIX

Definitions

Anhydrous Ammonia: ammonia gas that has been compressed into a pure liquefied form for use in refrigeration systems.

Cartridge: a filter used in conjunction with a respirator that can be used by workers involved in ammonia plant maintenance, or entry when ammonia concentration is greater than 25ppm and less than 300ppm.

Controlled leak: a release of gas which occurs while maintenance work is being done where the source of the release is immediately known and can be quickly remedied or corrected.

IDLH: immediately dangerous to life and health.

NH_3: the chemical formula for ammonia

ppm: parts per million.

PPE: Personal Protective Equipment (boots, gloves, respirator, glasses, etc.)

Qualified personnel: personnel knowledgeable of the work, the hazards involved and the means to control the hazards by reason of education, training, experience or a combination thereof. See page 5, Section 2.2 for criteria in determining whether a person is qualified.

Uncontrolled leak: a release of gas where the immediate cause of the leak is unknown, or when maintenance work is being done a release of gas occurs of a nature that cannot be quickly remedied, corrected, or controlled.

WHMIS: Workplace Hazardous Materials Information System.

Scope

This Ammonia program forms part of the District of Summerland's Health and Safety Program and complies with the requirements of *WorkSafeBC* and the *Occupational Health and Safety Regulations (OHSR)*. This program is specifically designed to be used at the **Summerland Arena Complex** which is the location of the district's curling and ice rinks:

The purpose of this Program is to satisfy the WCB regulation regarding toxic process gasses (Sections 6.116 – 6.121) and also satisfy the requirements of an exposure control plan detailed in section 5.54 of the WCB regulation. Compliance with these regulations will enable the District of Summerland to protect employees from the potential hazards of working with or around anhydrous ammonia.

Health and Safety Statement & Purpose

The District of Summerland is committed to providing a healthy and safe working environment for all of its employees. To achieve this goal, the district demonstrates a strong commitment to safety by making it a priority in all of the district's daily operations.

The success of the district's Health and Safety Program is based on the equal commitment of management and employees. This can be accomplished through awareness, leadership, cooperation and participation. To this end, the district strongly supports the Joint Health and Safety Committee and invites input from all employees regarding workplace safety.

Responsibilities

Employer will review this program on a regular basis and ensure it is implemented and remains compliant.

- Provide a safe workplace
- Ensure adequate training of workers.
- Keep written records of training: who, when, and what type.
- Initiate an immediate investigation into accidents.
- Provide adequate first aid facilities and services.
- Provide personal protective equipment where required.

Supervisors will ensure all workers are trained, have appropriate personal protective equipment (PPE) and comply with these procedures.

- Instruct new workers in safe work procedures.
- Train workers for all tasks assigned to them, and check progress.
- Ensure that only authorized, adequately trained workers operate tools, equipment, or use hazardous chemicals.
- Correct unsafe acts.

Workers are responsible to follow all procedures, maintain their PPE and wear it according to procedures.

- Know and follow safety and health regulations

- If you don`t know how to do something safely, ask for training before you begin work.
- Correct or immediately report any unsafe conditions to your supervisor.
- Report any injury immediately to a first aid attendant or supervisor.

Summerland Fire Dept. will participate in annual training and review pre fire plans.

1.0 Risk Identification & Assessment

The following job descriptions have been identified as having risk of exposure to ammonia;

- Arena Maintenance Supervisor
- Arena Maintenance Worker
- District Electrician
- District Plumber

Controls were administered to mitigate the risks and bring the hazard level down to a low and acceptable level. Hazard assessment for the job descriptions identified above. Controls used to mitigate the risks of exposure can be found throughout this document.

- Construction of ammonia plant and sealed shafts containing ammonia lines, B-52-13 6.3
- Alarm system that constantly monitors ammonia concentration that gets tested annually by a certified technician.
- Worker education & training with Summerland Fire Dept. and Contractor annually.
- Written safe work procedures for ammonia plant tasks, page 17
- Emergency facilities and first aid availability, 5.2 & 6.2,
- Use of personal protective equipment, 4.0
- Emergency response & evacuation procedures, 6.0 & 6.4
- Incident Investigation and Exposure Control Plan review, 7.0 and c
- Daily, Monthly, semi-annual checks. See appendix
- We have 800lbs of ammonia in a closed system.
- SDS sheets are in the office ice plant maintenance book, and emergency control guide.
- The ammonia is confined to an approved class T plant room and piped outside to a condenser. B-52-13
- The ammonia is safely stored in a receiver when not in operation. Shut down procedures, 8.6 & 8.7
- Conditions leading to an emergency may include issues when draining oil from the system or charging the system, servicing or maintenance by operators or contractors.
- Workers shall wear appropriate PPE for each task (see safe work procedures)
- Workers will follow leak response flow chart (appendix) and 6.4 in the control plan.
- Contractors will complete a tailgate meeting and sign forms prior to work commencing.
- The worst case emergency would be a broken liquid line in the room. See page 30, flow chart
- Most likely emergency scenarios would occur during service by a contractor, start-up and testing safeties. See page 30, leak flow chart
- An accidental release leading to worker exposure could only happen when a worker was in the plant room on route checks and something malfunctioned. Follow 6.4 and page 30

Ammonia should be pumped down and stored in the receiver, if the plant will not be operating for an extended period of time a refrigeration contractor should be engaged to pump down the system and close both the King and Queen (Receiver outlet and inlet service valves respectively) to store the refrigerant as a liquid in the vessel.

- There is only compressor oil stored in the plant room.
- There is a maximum of two, (four for ice in) workers at a time in our facility
- Adjacent facilities to the plant room include a RCMP building, daycare, and retirement complex. Procedures in the Summerland Fire Dept. pre fire plans address whether to shelter in place or evacuate these areas. See fire dept. pre fire plan attached
- Emergency washing facilities include an eye wash station in the pre-entry room, and showers in any of the dressing rooms within 10 seconds of the plant room. Page 13 6.2
- Workers have half-masks, full face masks and SCBA from SFD that they have been annually fit tested on, gloves, safety glasses, full shield face guard, and steel toe boots, page 11 4.0
- Mask cartridges are replaced annually and dated the year of replacement.
- Workers will be clean shaven when using respirator.
- Hand held ammonia monitor will be used for exposure controls.
- Relief stack monitor will be installed spring of 2018. Update report once confirmed installed
- Monthly bump testing for gas monitors will be on a monthly schedule.
- Bi-Annual brine testing results will be submitted to Technical Safety BC.

Recommend adding commentary that the Brine expansion tanks are never to be isolated from the system and service shutoff valves are locked in the open position. Operation of service valves is be trained contractors only.

Potential Exposure Risk:

- Conditions leading to an emergency may include issues when draining oil from the system or charging the system, servicing or maintenance by operators or contractors.
- The worst case emergency would be a broken liquid line in the room.
- Most likely emergency scenarios would occur during service by a contractor, start-up and testing safeties.
- An accidental release leading to worker exposure could only happen when a worker was in the plant room on route checks and something malfunctioned.
- Adjacent facilities to the plant room include a RCMP building, daycare, and retirement complex. Procedures in the Summerland Fire Dept. pre fire plans address whether to shelter in place or evacuate these areas.

I would also add failure of evaporator tube sheet resulting in a leak of ammonia into the brine secondary refrigerant system and subsequent leaking out through the secondary coolant expansion tank.

1.1 Ammonia Properties / Hazards

1.2 Ammonia – What is it?

Ammonia is a colorless gas made up of Hydrogen and Nitrogen ions (NH_3). It can easily be turned into a liquid through a cooling process or when placed under pressure.

Several characteristics of ammonia include:

- Extremely reactive with strong oxidizers such as chlorine, bromine, iodine, calcium, gold, mercury, silver and hypochlorite bleach. The mixture would be explosive in nature
- Very irritating to the eyes, nose and other parts of the respiratory tract which makes it easy to detect at low concentrations in the air
- Although ammonia itself has a low fire rating, the presence of oil or other combustibles increases its fire rating.
- Ammonia gas is lighter than air, so it tends to collect in higher areas like ceilings.
- Ammonia is corrosive and can cause chemical burns all over the body. It also corrodes most alloys, rubbers and plastics

For more information on the characteristics and chemical properties of anhydrous ammonia, refer to its *Safety Data Sheet (SDS)*

Initially this is the case, once anhydrous ammonia absorbs water/moisture from the room, the ammonia will settle at floor level as well.

1.3 Exposure Limits and Health Effects

Table 1 - Ammonia Exposure Limits

Exposure Limit (parts per million)	Description of Exposure Limit
25 ppm	Maximum allowable concentration averaged over an 8 hour period
35 ppm	Maximum allowable short-term (15 minutes) exposure limit
300 ppm or more	Immediately dangerous to life and health (IDLH) concentration. The concentration at which a person without appropriate respiratory protection could be fatally injured or could suffer irreversible or incapacitating health effects.

Table 2 – Toxic Effects of Ammonia

Ammonia Concentration (parts per million)	Effect
2 to 55 ppm	Range of odor threshold *
70 ppm	Stinging or burning of eyes, nose and throat; headache, watering eyes, sneezing, coughing
300 ppm	Severe irritation of eyes, nose and respiratory tract; difficulty breathing, possible burning in lungs (IDLH level)
2000 ppm or more	Can be fatal after a few breaths

*This does not apply to workers who routinely work with ammonia, as they are often desensitized to the smell of ammonia and are unable to detect it.

2.0 EDUCATION & TRAINING

2.1 Safety Data Sheets

A SDS program ensures that those who work near ammonia are trained in the general hazards of chemicals and know how to obtain the necessary information to safely manage chemicals that they may encounter in the workplace. A competency test on the topics covered in the SDS training is administered to all participants. Those staff who work directly with the ice refrigeration system are trained to the level of qualified person by completing the training listed below in section 2.2 Qualified Personnel Training.

2.2 Qualified Personnel Training

A reference to "qualified personnel" is made throughout this document with regards to District of Summerland staff that are permitted to enter the ammonia plant and perform routine maintenance on the ice refrigeration system. The following District Staff are considered to be qualified personnel, providing that they have completed the training in the table below:

- Arena Maintenance Supervisor (Class 5 Power Engineers)
- Arena Maintenance Worker (Ice Facility Operator Certificate or 5th Class Power Engineers)
- *Refrigeration Safety Awareness Certification* – Limited access and responsibility. Primary role is to initiate emergency response procedures if necessary during the period of time when no Class 5 Power Engineer is on site.

	Training Topic	**Course Length**	**Frequency**	**Course Facilitator**
1	Ammonia Safety & Handling	4 hours	Initial & every 3 years	Ammonia Supplier
2	Respiratory Protection & Fit Testing	1 hour	Annual	Coordinator, Safety & Training

Other training may include but is not limited to periodic sessions from equipment suppliers and courses administered by the District of Summerland. Please see the Appendix of this document for a copy of the Ammonia Plant Orientation checklist.

2.3 Resources

- Ammonia in Refrigeration Systems, WorkSafeBC, 2006 edition
- Anhydrous Ammonia SDS, Praxair, 10/13/16
- Occupational Health and Safety Regulations
- Supplier Manual (Brenntag Canada, Inc.)
- Gas Detection Controller Operation Manual, Critical Environmental Technologies
- Worksafe BC, Employer Information for ice rinks and recreational facilities.
- Technical Safety BC, B-52 codes and maintenance requirements

3.0 ICE REFRIGERATION SYSTEM/AMMONIA PLANT

3.1 Ammonia Storage

Eight hundred pounds of liquefied ammonia is stored inside the plant in sealed storage tanks. The refrigeration system is a closed system that continuously uses and reuses the ammonia inside the tanks. Staff are not required to add or remove ammonia at any time. Any correction to ammonia levels is not routine and will be performed by Complete Climate Control personnel. Key points regarding ammonia storage include:

- Never apply heat to ammonia storage tanks or valves as rupture could occur
- The temperature of storage containers must never reach 50 degrees Celsius.
- Do not store bleach anywhere inside the ammonia plant
- Do not block access to emergency equipment and doors in the storage area

For more information regarding the storage of ammonia, refer to Ammonia in Refrigeration Systems, WorkSafeBC, 2006 edition.

3.2 Ammonia Alarms

The following are characteristics of the ammonia alarms located at the Summerland Arena Complex:

- A **digitally displayed** alarm, and exhaust fan turns on when the ammonia concentration in the ammonia room **reaches 25 ppm (low alarm).**
- An **audible, visible**, **and digitally displayed** alarm activates when the ammonia concentration in the ammonia plant room **reaches 100 ppm (medium alarm).** Audible alarms can be heard inside and outside of the ammonia plant, while the display located immediately outside of the ammonia plant visually flashes and the strobe lights are activated.
- In addition to these on site indicators of an alarm, **the building fire alarm is activated at 200ppm (high alarm), and Summerland Fire is notified of the ammonia alarm**.
- The alarm systems is calibrated annually (minimum), by Complete Climate Control, who is certified in calibration by Critical Environment Technologies.

3.3 Alarm Response

Only Qualified Personnel are to respond to ammonia alarms. If a possible ammonia leak is indicated on the ammonia gauge (concentration higher than 1ppm) and the indicated level is below 300 ppm, qualified personnel are to follow the detailed leak control procedure (Alarm / Leak Response & Investigation) in Section 8.3 of this document (a copy is also placed near the ammonia plant entry door). If the ammonia concentration on the alarm monitor is above 300 ppm, commence Evacuation Procedures which can be found in the Ammonia Leak Response flow chart in the Appendix of this document, as well as section

6.4(a copy will also be kept beside the ammonia concentration gauge). **If a high alarm or a system shutdown is required, all qualified and affected personnel must be notified.**

3.4 Working Alone

There must be a check in system to ensure the continued well-being of workers who are working alone or isolated. Entry of the ammonia room during an alarm state (concentration is between 25ppm –299ppm), or entry to drain the ammonia oil pots is only permitted with a minimum of 2 staff members involved, with one person being a stand-by to call for assistance if necessary. Entry to the ammonia room in a non-alarm state (less than 25ppm) and not for the purpose of draining the oil pots or investigating a leak requires the entrant to inform a co-worker of the estimated duration of the entry and subsequent contact with that co-worker upon exit.

In the event that the co-worker is not contacted within the given time frame, the co-worker will investigate and contact the appropriate emergency response agencies if necessary.

In situations where a co-worker is not available, workers must follow the procedures outlined in the District of Summerland Working Alone Program.

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 Respirator

A full face dual canister air purifying respirator is required when ammonia concentrations are between 25ppm – 299ppm. The full face respirator must be equipped with gas cartridges that protect the worker against ammonia exposure. The worker must be clean shaven while wearing a respirator and been fit tested within the last year. Workers shall follow the procedures that they have been trained on regarding respirator use and care.

If the concentration is above 0 ppm, workers must wear a respirator at all times. If the concentration is above 300ppm, workers are **Not** to enter the plant.

4.2 Hand / Foot / Body Protection

Due to the corrosive effects of ammonia it is necessary during some tasks to cover up skin that may be exposed. This may include boots, gloves and coveralls. The individual Safe Work Procedures (Section 8) will outline the protection required for each task. It is important to note, that clothes must not be contaminated with grease, lubricants or cleaners as they can react violently with ammonia gas causing severe burns.

4.3 Eye Protection

When eye protection is required for certain tasks (see Section 8), it will be achieved with the use of the full face respirator. It is very important that contact lenses are **not** worn whenever entering or working in the ammonia plant.

5.0 FIRST AID & HEALTH MONITORING

Artificial Respiration and CPR are only to be administered by trained personnel.

5.1 Inhalation Treatment

Ensure that the concentration in the ammonia room is below 300ppm and you are wearing your full face respirator. Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give CPR if there is no breathing and no pulse. Oxygen to be administered by trained personnel. Obtain medical attention **immediately.**

5.2 Eye Contact Treatment

If liquid or gaseous ammonia contacts the eyes, the employee needs to be removed from the contaminated area and continuously flush eyes with tempered water for 20 minutes. The eye wash station is located directly outside of the ammonia room in the pre-entry room. Ensure that the eyes are held open and there is direct contact between the water and eyes.

5.3 Skin Contact Treatment

Liquid ammonia causes the moisture in the skin to freeze (almost instantly with higher concentrations). Skin should be continually flushed with tempered water. If a large area has been exposed, do not remove clothing until you have thoroughly rinsed in the emergency shower. After rinsing, remove any contaminated clothing and obtain medical attention.

5.4 Health Monitoring

The WCB and OSHA currently have no requirements for medical surveillance of ammonia exposure. Medical surveillance is intended to protect workers from developing occupational disease by detecting early biological indicators or adverse health effects at an early stage.

The effects of ammonia on humans are largely acute and victims of ammonia exposure in excess of exposure limits will often feel the effects immediately. Workers who may be exposed to levels of ammonia in excess of exposure limits are trained to seek medical aid following exposures, regardless of route of entry.

6.0 EMERGENCY RESPONSE

6.1 Emergency Contact List

A list of emergency contact numbers for qualified ammonia plant entrants, managers and other key personnel will be kept current. The list will be provided to District of Summerland arena staff and the Health & Safety Advisor. It will be posted in prominent locations as a resource for staff on site.

In an emergency event, the following people must be called immediately:

- **Summerland Fire Department; 911**
- **Arena Maintenance Supervisor; 250-490-7987, or 250-494-0243**
- **Recreation Manager; 250-460-1480 or 250-404-0494**
- **Technical Safety B.C. 1-866-566-7233 option 1**
- **WorksafeBC;1-888-621-7233**
- **Ministry of Environment; 1-800-663-3456**
- **Complete Climate Control 1-866-766-0186**

6.2 Emergency Equipment and First Aid Kits

The Summerland Arena Complex has an emergency shower in #4,#3,&#5 dressing rooms and eye wash station inside the pre-entry room. The shower/eyewash has been plumbed with tempered water to avoid the increased severity of exposures that cold water can cause.

First aid kits are available in the office.

6.3 Ammonia Leak Emergency

or there is a visible fog in the machine room.

An ammonia leak is considered an emergency when the concentration in the ammonia plant reaches 300ppm. **As previously stated, the audible alarm will engage when the ammonia concentration reaches 200ppm**. Qualified personnel are to be contacted immediately to address the situation.

6.4 Evacuation Procedure

Evacuation of the facility will commence when qualified personnel have deemed it necessary and or if the fire alarm is triggered. The building will be evacuated by following the Evacuation Procedures for the Summerland Arena Complex. The following is a summary of the key evacuation steps.

Important Notes:

- ***DO NOT attempt rescue of any employees / members of the public that are unconscious in ammonia contaminated area. The Summerland Fire Department (SFD) will handle this.***

Emergency shutdown button should be pressed in the machine room vestibule when leak detector has alarmed. See procedure 8.4 in this manual.

Key evacuation steps:

1. Call 911, advise that there is an ammonia leak at the facility, provide the address and ask for Summerland Fire Department (SFD) to respond.
2. **(OMIT if outside business hours)** Contact the recreation office and let them know of the emergency and that an has been done evacuation
3. Call the Recreation Manager and provide information on the emergency and the names of the other staff members called.
4. The staff on site will facilitate the building evacuation ensuring that the following tasks are accomplished:
    - Clear all ice surfaces, change rooms, Banquet room, and Curling club directing public to safe exits.
    - Address all public entrances of facility to ensure that patrons do not try and re-enter the building
    - Prevent patrons who have been exposed to high levels of ammonia from leaving without being medically assessed first.
5. During non-business hours, whomever discovers the leak must ensure that any other workers leave the building immediately
6. Determine the direction of the wind ASAP, wind sock on the north roof of the arena, and on the B.C. Tree Fruits building. If the muster/marshalling station is downwind of the ammonia room, then a new location upwind of the ammonia room for mustering must be chosen. Portable detector should be used.
7. Await arrival of SFD and District management representatives. Any information about the leak and the site should be passed along to the SFD.
8. The SFD will determine when it is safe to allow re-entry into the building.

If outside concentration levels will be detectable by smell, leak detector outdoors will not operate correctly due to wind. If ammonia can be detected by smell move the muster point further away from the building and or change location.

6.5 Evacuation Roles & Responsibilities

Arena Maintenance Supervisor / Arena Maintenance Worker

These are workers who have received formal ammonia training and are primarily responsible for responding to alarms. At least two qualified and properly trained workers must respond to alarms and perform these roles during an **EMERGENCY**:

- Respond to alarm and follow procedures for leak investigation.
- **When ammonia concentration exceeds 200 ppm, Summerland Fire Department (SFD), will be dispatched from the alarm company automatically.**
- The Arena Maintenance Worker or Arena Maintenance Supervisor will proceed in ordering an evacuation in the building for the general public.

- Determine direction of wind and whether or not mustering station needs to be moved (It must be upwind of the ammonia storage room) Use portable detector.
- Liaise with SFD and city management reps as they arrive and debrief on situation**.** If possible, provide a floor plan of the facility
- Perform any roles that the SFD asks of you and await the decision on re-entry or facility closure.

Facilities Supervisor

The Arena Supervisor that will be called upon to help coordinate a full or partial building evacuation.

Duties include:

- Assignment of building areas to staff for sweeping and evacuation.
- Recording of any injured, disabled persons located in stairwells or areas of refuge.
- Ensuring consistent messaging to public both indoors and at the muster station.
- Report any missing, or injured/disabled persons to the Summerland Fire Department (SFD)

Recreation Manager / Employer

The Recreation Manager will be notified of any facility evacuation and will arrive on site to perform the following roles:

- Ensure that the facility is secure and not permit workers or members of the public to re-enter the facility unless it is deemed safe to do so by the SFD

- Supervise the clean-up efforts by assisting agencies.
- Arrange assistance and first aid for workers if required.
- Ensure that the incident is reported immediately to the Occupational Health & Safety Advisor and Senior Management.
- Conduct an incident investigation and report findings
- Respond to any media requests

Summerland Fire Department (SFD) Role

During the incident, SFD will:

- Respond and upon arrival, the SFD with arena supervisor, will be unified command of the scene and all staff members and managers. Everyone will report to and follow the directions of the SFD.

- SFD will leave the scene with a responsible person, will not participate in clean-up of the incident and will not participate in cleanup of hazardous materials in particular. If

required, hazardous waste clean-up contractor should be contacted by the Recreation Manager.

7.0 RECORD KEEPING & INVESTIGATION

7.1 Record Keeping

Proper activity logbooks will be maintained regarding any ammonia issues. Detailed information will be entered into the logbook for any release large enough to set off the low ammonia alarm (greater than 25 ppm). Investigations are conducted for any release large enough to set off the high ammonia alarm (greater than 300ppm) and or if an evacuation is performed. See Section 7.2 for information on ammonia release reporting requirements. Any outstanding maintenance or supplier issues must be noted in the log book and receive follow up promptly.

7.2 Investigation & Reporting

An 'incident' is an accident or other occurrence which resulted in or had the potential for causing an injury or occupational disease. If enough ammonia is released to set off the high alarm, the District of Summerland must conduct an investigation to discover the cause(s) of the incident. The investigation must also examine measures that will prevent similar incidents in the future. The District of Summerland must forward copies of the investigation report to the Health and Safety Committee.

Note: The District of Summerland must immediately notify WorkSafeBC and Technical Safety B.C. of any major release of a toxic substance. A major release of ammonia includes:

1. A leak or spill resulting in at least one person receiving professional medical attention; or
2. A leak or spill resulting in at least three people receiving first aid.

8.0 WRITTEN WORK PROCEDURES

High hazard job tasks require detailed safe work procedures to be developed and made available for staff performing these tasks. The following tasks have safe work procedures and are found on the following pages:

- 8.1 Ammonia Plant Entry
- 8.2 Draining Ammonia Plant Oil Pots
- 8.3 Alarm / Leak Response & Investigation
- 8.4 Emergency Plant Shut down
- 8.5 Safe Work Procedure- Critical Emergency Components of Plant
- 8.6 Arena Seasonal Shut Down
- 8.7 Curling Seasonal Shut Down
- 8.8 Resetting Ice Plant after Power Outage
- 8.9 Safe Work Procedure - CONTRACTOR Plant Entry

8.1 Safe Work Procedure - **Ammonia Plant Entry**

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for entering the Ammonia Plant which is also compliant with all applicable regulations and standards. Health & Safety of Ammonia Plant entrants is of the utmost importance and is the basis for the following procedure.

This procedure is consistent with the training that is supplied to all entrants of the Ammonia Plant. Failure to follow these procedures is subject to discipline.

SCOPE

These procedures are applicable to all Ammonia Plant Entrants and are enforceable when the ammonia plant is in operation. This group includes, but is not limited to the following occupations:

Arena Maintenance Workers	Electricians	Arena Maintenance Supervisor
Plumber	Contractors / Inspectors	Health & Safety Coordinator
Summerland Fire Department		

Entry Requirements: Entrants **must** possess a Refrigeration Operator Certificate, Ice Facility Operator, or a Refrigeration Safety Awareness Officer certificate. Anyone without this certification must be accompanied by someone with this classification at all times.

Recommend staff turn on the exhaust fan purge mode (switch/button) in vestibule before commencing this work.

PROCEDURE

1. Ensure that you satisfy the above entry requirements and are **not** wearing contact lenses.
2. Let your Supervisor, or Co-worker know that you are entering the Ammonia Plant.
3. View the ammonia concentration gauge located to the left of the door in the pre-entry room and ensure that its reading is less than 300ppm. **NO ENTRY WHEN LEVELS ARE ABOVE 300ppm.**
4. Obtain your personal full face respirator. You must have been fit tested within the last year and have no facial hair where the respirator seals against the skin of your face. **Escape respirators may also be used.**
5. Full face Respirators are to be put on when:
    - Concentration are greater than 25ppm and less than 300ppm
    - An audible / visual alarm is observed while in the Ammonia Plant (after respirator is donned, immediately evacuate the ammonia plant)
    - The task of draining the Oil Pots is undertaken (see Draining Oil Pots SWP for complete details and additional PPE requirements)
    - Minor fluctuations in ammonia concentration are being investigated
    - The strong smell of ammonia is encountered
6. Complete your work / plant logs, then inform your Supervisor or co-worker upon plant exit.

*****NOTE- If the audible alarms engage at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 200 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

Applicable Regulations:	**OHS Regulation: 5.48, 6.119, 5.54, 8.5**
	Safety Standards Act M62
	B52-99 Mechanical Refrigeration Code

8.2 Safe Work Procedure- **Draining Ammonia Plant Oil Pots**

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for draining the ammonia room oil pots. When draining the oil pots workers are exposed to levels of ammonia which may exceed 35ppm. This procedure needs to be followed to ensure that workers are protected from these elevated concentrations of ammonia.

This procedure is consistent with the training that is provided for all entrants to the ammonia plant. Failure to follow these procedures is subject to discipline.

SCOPE

These procedures are applicat[illegible] Ice Facility Operators (when supervised).

Recommend staff turn on the exhaust fan purge mode (switch/button) in vestibule before commencing this work.

PROCEDURES

1. This task requires an additional person to accompany you into the ammonia plant. This person may place themselves anywhere between you and the exit door but must remain within sight and at a distance where conversation can take place.
2. Ensure that you meet the requirements for entry into the Ammonia Plant before entering.
3. Obtain an oil pot draining bucket with 4 liters of water in it.
4. View the ammonia concentration gauge located to the left of the door in the pre-entry room and ensure that its reading is less than 300ppm. **NO ENTRY WHEN LEVELS ARE ABOVE 300ppm.**
5. Put on your butyl gloves and Full Face respirator. Perform a positive and negative pressure check to ensure the respirator has made a good seal with your face. Use the portable ammonia detector.
6. Once in the ammonia room, let your partner know where you would like him to be.
7. Turn off the associated brine pump and compressor.
8. Remove the Blue Cap to gain access to the release valve on the oil pot. Use a 5/16" refrigeration wrench to loosen the valve. Place the draining bucket beneath the valve.
9. Use the dead man's switch / valve on the oil pot to begin releasing the mixture into the bucket.
10. Drain the mixture slowly until spitting occurs (this signals that draining is complete) and then release the dead man switch. This may have to be repeated. Do not leave Dead man switch unattended.
11. Tighten up the release valve on the oil pot, being careful not to spill any of the mixture.
12. Pour mixture into barrel, accessible from the outside on the North side of the building

13. You may remove Personal Protective Equipment once bucket is replaced under dead man switches and levels are safe.*****NOTE- If the audible alarm engages at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 200 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

Applicable Regulations:	**Safety Standards Act M62**
	B52-99 Mechanical Refrigeration Code
	OHS Regulation 8.2-8.10, 8.14-8.18, 8.32-8.44

8.3 Safe Work Procedure- **Alarm / Leak Response & Investigation**

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for investigating leaks in the Ammonia Plant. The ammonia plant is only to be entered when the levels inside are under 200 ppm.

This procedure is consistent with the training that is provided for Arena Maintenance staff. Failure to follow these procedures is subject to discipline.

SCOPE

These procedures are applicable to all Arena Maintenance Workers / Supervisors

PROCEDURE

Recommend staff turn on the exhaust fan purge mode (switch/button) in vestibule before commencing this work.

1. This task requires an additional person to accompany you into the ammonia plant. This person must have their full face respirator on for the duration of this task and position themselves near the entrance to the ammonia plant with the door open. This person must maintain visual contact throughout leak investigation and be able to monitor the ammonia concentration gauge.
2. Ensure that you and your stand by person meet the requirements for entry into the Ammonia Plant before entering.
3. View the ammonia concentration gauge located to the left of the door in the pre-entry room and make sure concentration is below 200ppm. You must don your **full face** respirator and enter the ammonia room with the intent of locating the leak.
4. Enter the ammonia room and ensure that your partner remains near the open door.
5. Begin the investigation by slowly walking around the Ammonia room with moistened litmus paper (do not moisten with your lips), then held at different locations to better pinpoint the location of the leak.
6. If the Litmus Paper turns pink, this indicates the presence of Ammonia. If the leak is found it should be isolated and stopped if possible by shutting valves on either side of the leak and turning the compressors off at the electrical panel. Contact Complete Climate Control perform the repairs or if the source of the leak can't be determined. If the leak causes the concentration in the ammonia room to reach 300ppm at any time, evacuation procedures must be implemented.

Applicable Regulations:	**OHS Regulation: 5.48, 5.53, 8.5,**
	Safety Standards Act M62
	B52-99 Mechanical Refrigeration Code

8.4 Safe Work Procedure- **Emergency Plant Shutdown**

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for shutting down the ammonia plant in the event of an emergency. If the concentration is below 300ppm, you may enter the ammonia plant room and physically close the King valve which stops the flow of ammonia through the system. If the concentration is above 300ppm, then shut down must be performed from the pre-entry room directly outside of the ammonia plant room.

This procedure is consistent with the training that is provided for Arena Maintenance staff. Failure to follow these procedures is subject to discipline.

Only one worker shall enter

PROCEDURES

Uncontrollable leak under 300ppm	Uncontrollable leak over 300ppm
• Ensure that exhaust fan is on high setting	• Close all doors leading to the ammonia plant
• Entrant & stand by person must be wearing full face respirator	• Depress Emergency stop button in pre-entry room and push fan start button
• Enter ammonia plant and close the King Valve	• Commence evacuation procedures
• Immediately exit plant closing door behind you	• Call emergency contacts
• Monitor Plant on DDC terminal in pre-entry room as it will take time for all ammonia to return to the receiver	
• If at any point the concentration reaches 200ppm, commence evacuation procedures	
• Call Complete Climate Control to respond and repair cause of leak	

Refrigeration contractor. Recommend keeping contractor names from this type of documentation to prevent confusion, and if contractor changes the document does not need to be updated.

Applicable Regulations:	**OHS Regulation: 5.48, 5.53, 8.5,**
	Safety Standards Act M62
	B52-99 Mechanical Refrigeration Code

8.5 Safe Work Procedure- **Critical Emergency Components of Plant**

PURPOSE

To identify and explain the functions of two plant components that can be used in an emergency to mitigate risk and assist in controlling the hazards associated with a serious ammonia leak (concentration greater than 300ppm) or fire.

Recommend turning on the exhaust fan purge mode (switch/button) in vestibule.

Critical Component #1 – Emergency Remote Shut Off

Location: Inside the ammonia pre-entry room, to the left of the door leading to the plant at shoulder height. Also on the north exterior wall to the right of the exit door.

Description: 2" red, round emergency stop button clearly identified by label

Functions: When this button is depressed it stops any machinery which is controlled by electrical power. This will cause the compressors, and brine pump to stop (which stops the flow of ammonia through the system) and solenoids will close causing the bulk of the ammonia to remain inside the chillers.

When to be used: When the concentration in the ammonia room exceeds 300 ppm. This shut off is used in conjunction with emergency evacuation procedures and the assistance of emergency response teams. **If possible Chiller solenoid switches can be shut off to pump out chillers prior to shutting down system.**

Critical Component #2 – Exterior Plant shut off button

Location: Accessible via extension ladder from the north end of the building. The button is 10-12 ft. on the exterior wall.

Description: Contained in a red recessed box with a breakable glass front

Functions: When this button is depressed it stops any machinery which is controlled by electrical power. This will cause the compressors, and brine pump to stop (which stops the flow of ammonia through the system) and solenoids will close causing the bulk of the ammonia to remain inside the chillers.

When to be used: When the concentration in the ammonia room exceeds 300 ppm. This shut off is used in conjunction with emergency evacuation procedures and the assistance of emergency response teams.

8.6 Safe Work Procedure- *SEASONAL ICE PLANT SHUT DOWN*
ARENA REFRIGERATION SHUT DOWN PROCEDURE

MYCOM 6B COMPRESSOR 100HP MOTOR

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for shutting down DRAINING THE CHILLER AND ISOLATING ammonia plant for the season and annual service. Two qualified staff must be on hand.
This procedure is consistent with the training that is provided for Arena Maintenance staff. Failure to follow these procedures is subject to discipline.

PROCEDURES

DESCRIPTION	KEY TERM
• ***Entrant & stand by person must be wearing full face respirator***	IN PRE ENTRY ROOM
• CARRY PORTABLE GAS DETECTOR	LOCATED IN THE OFFICE
• TURN 6B COMPRESSOR TO HAND	ON MAIN CONTROL PANEL
• TURN ARENA SOLENOID SWITCH TO OFF POSTION	ON MAIN CONTROL PANEL
• ALLOW COMPRESSOR TO RUN UNTIL IT SHUTS OFF FROM LOW SUCTION PRESURE	MONITOR SUCTION GAUGE
• CLOSE VALVE #31 TO DRAIN CHILLER	UNDER CHILLER
• CLOSE VALVE #39	TOP OF CHILLER
• SHUT OFF N6B, COOLING PUMP	ON MAIN CONTROL PANEL
• THROW ARENA COMPRESSOR MOTOR REMOTE DISCONNECT	ON EAST WALL
• PUT HOCKEY SYSTEM OFF LINE	ON COMPUTER PROGRAM SYSTEM

* USE FLOURESCENT FLAGGING TAPE TO MARK EACH CLOSED VALVE.

Is this available stored in vestibule?

Recommend including a piping schematic with the valves identified and photos of location of valves in room.

8.7 Safe Work Procedure- *SEASONAL ICE PLANT SHUT DOWN*

CURLING CLUB REFRIGERATION SHUT DOWN PROCEDURE

MYCOM 4A COMPRESSOR 30HP MOTOR

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for shutting down DRAINING THE CHILLER AND ISOLATING ammonia plant for the season and annual service. Two qualified staff must be on hand.
This procedure is consistent with the training that is provided for Arena Maintenance staff. Failure to follow these procedures is subject to discipline.

PROCEDURES

DESCRIPTION	KEY TERM
• ***Entrant & stand by person must be wearing full face respirator***	• IN PRE ENTRY ROOM
• CARRY PORTABLE GAS DETECTOR	• LOCATED IN THE OFFICE
• TURN 4A COMPRESSOR TO HAND	• ON MAIN CONTROL PANEL
• TURN CURLING SOLENOID SWITCH TO OFF POSTION	• ON MAIN CONTROL PANEL
• ALLOW COMPRESSOR TO RUN UNTIL IT SHUTS OFF FROM LOW SUCTION PRESURE	MONITOR SUCTION GAUGE
• CLOSE VALVE #14	UNDER CHILLER
• CLOSE VALVE #27	TOP OF CHILLER
• SHUT OFF CURLING BRINE PUMP	ON MAIN CONTROL PANEL
• THROW ARENA COMPRESSOR MOTOR REMOTE DISCONNECT	ON EAST WALL
• PUT CURLING SYSTEM OFF LINE	ON COMPUTER PROGRAM SYSTEM

* USE FLOURESCENT FLAGGING TAPE TO MARK EACH CLOSED VALVE.

Is this available stored in vestibule?

Recommend including a piping schematic with the valves identified and photos of location of valves in room.

8.8 Safe Work Procedure – RESETTING ICE PLANT AFTER POWER LOSS.

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for entering the Ammonia Plant and resetting after power loss which is also compliant with all applicable regulations and standards. Health & Safety of Ammonia Plant entrants is of the utmost importance and is the basis for the following procedure.

This procedure is consistent with the training that is supplied to all entrants of the Ammonia Plant. Failure to follow these procedures is subject to discipline.

SCOPE

These procedures are applicable to the emp ıe ammonia plant is in operation. This group includes, b

Arena Maintenance Workers E ıce Supervisor

Contractors

Ensure the leak detector is powered and has had time to detect the room air space. Do not rush into the room until the detector has had time to restart and provide stable measurements to operations staff.

PROCEDURES

1. Let your Supervisor or Co-worker know that you are entering the Ammonia Plant.
2. View the ammonia concentration gauge located to the left of the door in the pre-entry room and ensure that its reading is less than 200ppm. **NO ENTRY WHEN LEVELS ARE ABOVE 200ppm.**
3. Obtain your personal full face respirator. You must have been fit tested within the last year and have no facial hair where the respirator seals against the skin of your face. **Escape respirators may also be used.**
4. Press the reset button on the lower right side the Main Control Panel.
5. Monitor all equipment for proper start up and operation as per set points
6. Complete your work / plant logs, upon plant exit.

*****NOTE- If the audible alarms engage at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 200 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

8.9 Safe Work Procedure - CONTRACTOR Plant Entry

PURPOSE

The purpose of this Safe Work Procedure is to establish a consistent method for entering the Ammonia Plant which is also compliant with all applicable regulations and standards. Health & Safety of Ammonia Plant entrants is of the utmost importance and is the basis for the following procedure.

This procedure is consistent with the training that is supplied to all entrants of the Ammonia Plant.

SCOPE

These procedures are applicable to Refrigeration Contractors and are enforceable when the ammonia plant is in operation or idle.

PROCEDURES

1. Contractor must notify staff when they arrive on site.
2. A face to face meeting with either the chief engineer or shift operator.
3. Contractor must confirm what work is being performed and have appropriate PPE.
4. Staff will confirm contact numbers with the contractor, task timelines, and notify any other staff of the work being performed.
5. The Contractor must notify staff when work is completed and upon plant exit.
6. Staff must fill out work completed / plant logs.

*****NOTE- If the audible alarms engage at any point while in the ammonia room, this signifies that the concentration level has reached or surpassed 200 ppm and the plant needs to be evacuated. Once you have evacuated to the pre-entry room, review the ammonia concentration gauge and perform the required action(s) for the displayed concentration.***

Risk Assessment and Emergency Response			
Ammonia Plant Entry	Entry Requirements: - Entrants must possess a minimum Refrigeration Operator, Ice Facility Operator or Refrigeration Safety Awareness certificate. - Anyone without this certification must be accompanied by a certified person at all times. - PPE must be carried by each person entering the ammonia plant and must be worn if ammonia levels are between 25 and 300 ppm - The ammonia plant room must be evacuated if levels reach or exceed 200 ppm - Re-entry is only allowed if ammonia levels are below 300 ppm, two or more qualified and trained individuals are available to enter the room and full face PPE is worn **** FOLLOW 8.1 Work Safe Procedure – Ammonia Plant Entry**		
Plant is off on a Safety	- Power failure - High pressure switch - Low Suction switch - Low oil pressure switch - Cooling water high temperature - High liquid level cut out		
Ammonia Leak	- Gas leak could occur at pipe joint or valve - Gas could escape during the draining of oil from the chiller - Relief valve failure - Rupture in piping due to deterioration - Gas leak from valve packing gland - Component failure - Operator error with over-loosening the packing nuts - Fracture or rupture in the chiller - Piping issues in the condensing tower - Valve breaks - Weld does not hold or pin hole develops - Pipe breaks - Contractor error	Follow Safe Work Procedures: 8.1 – Ammonia Plant Entry 8.3 – Alarm/Leak Response and Investigation 8.4 – Emergency Plant Shut Down	
High Pressure	- Condenser failure could cause high pressure cut out - Condenser water failure and/or fan failure - Non-condensable gasses causing a blockage in flow - Condenser off - Tripped DDC panel - Closed Discharge valve or valve adjusted the wrong way	Check condenser fan operation Check vfd operation Check water pump operation Reset pressure switch after fixing issue.	Call refrigeration contractor if needed
Low Pressure	- Low refrigerant could cause low pressure failure - Closed Suction Valve or valve adjusted wrong way - Major ammonia leak	Check liquid levels Check suction line valves	Call refrigeration contractor if needed

Risk Assessment and Emergency Response (page 2)					
	Start Up	Contractors perform start up although suction valves need monitoring every couple hours. - We have in our contract that Complete Climate Control is responsible for the operation with our staff.	Proper procedures need to be followed to ensure the steps taken on start-up are followed to monitor the safety and operations of the plant. - Possible leaks could be in packing valves or in compressor parts not put on correctly.	- Gas leak from valve packing gland - Over loosening packing valve nut - High pressure cut out from high temperatures - Low refrigerant – critically charged - Component failure - Incorrectly installed or repaired compressor parts - Valve could be turned the wrong way causing the system to trip the high limit cut-off.	Follow flow chart and safe work procedures.
	Seasonal Shut Down	Arena – Follow Safe Work Procedure 8.6 Curling – Follow Safe Work Procedure 8.7	Proper procedures need to be followed to ensure the steps taken on shut down are followed to monitor the safety and operations of the plant.	- Valve does not hold - High pressure cut out fails - Operator error with over-loosening the packing nuts on the suction and/or discharge valve would result in the release of ammonia. - Fracture in the chiller - Piping issues in the condensing tower	Follow flow chart and safe work procedures.
	Repair Activities	Repairs are done by Contractors – Follow Safe Work Procedure 8.9	Proper procedures and PPE must be used to ensure the safety of operators and contractors during routine maintenance and while doing repairs.	- Valve breaks or does not hold - Weld does not hold or pin hole develops - Pipe breaks - Contractor error - Faulty part or part installed incorrectly	Follow flow chart and safe work procedures.
	Maintenance Activities	Maintenance activities have procedures to follow	Proper procedures and PPE must be used to ensure the safety of operators and contractors during routine maintenance and while doing repairs.	8.1 – Ammonia Plant Entry 8.2 – Draining Ammonia Plant Oil Pots 8.3 – Alarm/Leak Response and Investigation 8.4 – Emergency Plant Shutdown 8.5 – Critical Emergency Components of Plant 8.6 – Arena Seasonal Shutdown 8.7 – Curling Seasonal Shutdown 8.8 – Resetting Ice Plant after Power Outage 8.9 – Contractor Plant Entry	

Risk Assessment and Emergency Response (page 3)					
	When the system is idled	System is drained. Ammonia is stored in the receiver. Valves closed.		- Gas leaks past a valve charging the system - Gas leak from valve packing gland - detector or monitor system failure - Rupture of chiller - Shaft seal on compressor could dry out and possibly leak	Follow flow chart and safe work procedures.
	Other Scenarios	Chiller Failure	If there was a crack or break inside the vessel, high pressure liquid ammonia could be forced in to the low pressure brine system resulting in an increased volume of liquid being forced out through the brine expansion tank. Contaminated brine would release ammonia out through the tank overflow and into an uncontrolled area. This would put people at risk of being exposed to ammonia.		Do not isolate brine system. Call contractor, and Emergency services. Evacuate areas according to wind sock. With Back-up, if possible shut solenoid switch off and the let the system shut down on low suction.

AMMONIA PLANT ORIENTATION CHECKLIST FOR QUALIFIED PERSONNEL

SECTION A: EMPLOYEE INFORMATION

Job Title:				
Employee Name: (Print Clearly)				
Certification	❑ Refrigeration Safety Awareness Officer	❑ Class 4/5 Power Engineer	❑ Ice Facility Operator	
Supervisor Name: (Print Clearly)				

SECTION B: MAJOR COMPONENTS – Identify location and explain function in system

Evaporator (Chiller)	**Receiver**	**Exhaust fan operation**	
Compressor(s)	**Expansion Valve**	**DDC operation**	
Condenser	**King Valve**	**Brine expansion tanks**	
Fire Box	**Shut down buttons**	**Brine Pumps**	**Fire Box**

SECTION C: PROCEDURES – The following procedures must be communicated to all entrants

Ammonia Plant Entry	**Shut Down**	**Emergency Shut Down**
Building Evacuation	**Logbook Use**	**Alarm System Use**

The following procedures must be communicated to Arena Maintenance Workers

Draining Ammonia Plant Oil Pots	**Alarm / Leak Response & Investigation**
Working Alone	**Read the Exposure Control Plan**
Re-Starting plant after a power bump or outage	

SECTION D: WORKER & SUPERVISOR ACKNOWLEDGEMENT

	Ammonia Plant Entrant Signature	**Date**
I understand and feel comfortable with the material presented to me during this Orientation.		___ / ___ / ___
	Ammonia Plant Supervisor Signature	**Date**

I have provided the above Orientation and feel comfortable with this worker entering the ammonia plant.		**___ / ___ / ___**

APPENDIX

(from ice plant maintenance book)

- LEVEL A - Arena Maintenance Worker
- LEVEL B - Arena Maintenance Supervisor
- LEVEL C – Refrigeration Contractor

AMMONIA LEAK RESPONSE FLOW CHART

DAILY

Level A Maintenance	Level B Maintenance	Level C Maintenance
1. Complete log checks every two hours or a minimum of twice per day: -brine temperature -discharge pressure -suction pressure -oil level and pressure -refrigerant level -brine level -condenser water level 2. Check for refrigerant leaks. 3. Turn oil filter "T" handle/s on compressors. 4. Keep plant room clean and tidy. 5. Check belt tensions and couplers. 6. (Visual and audible checks only.) 7. Check condenser pump operation. 8. Check brine pump operation.		

AMMONIA LEAK RESPONSE FLOW CHART

MONTHLY

Level A Maintenance	Level B Maintenance	Level C Maintenance
1. Check – Brine PH (7.5 - 8.2) except when organic inhibitors are in use (8.5 – 9.5). Specific Gravity (1.20-1.23).	1. Review Operating log and assess efficiency. 2. Bump test ammonia detector 3. Check condenser belts. 4. Check condenser air passages. 5. Check condenser for leaks. 6. Check condenser spray nozzles. 7. Check Exhaust Fan operation. 8. Check compressor oil supply/quantity of reserve. 9. Check all motors. (Visual and audible) 10. Check compressor oil for discoloration and contamination. 11. Check compressor drives. 12. Change filter on HX water system, and check static pressure (20psi)	

AMMONIA LEAK RESPONSE FLOW CHART

AS REQUIRED

Level A Maintenance	Level B Maintenance	Level C Maintenance
1. Add oil to compressor. Record amount added. Ensure oil supply is adequate and not contaminated.	1. Purge oil from chiller. 2. Adjust belts and lubricate drives to compressors. Ensure equipment is locked out. 3. Locate refrigerant leaks. 4. Add and test brine. 5. Check condenser nozzle operation.	1. Add refrigerant to chiller. 2. repair refrigerant leaks 3. Test/change safeties. 4. Annual maintenance

PRE-START UP AND START UP

Level A Maintenance	Level B Maintenance	Level C Maintenance
	Brine System • Check seals on brine pump • Check coupling alignment between brine pump and motor • Grease brine pump motor • Check brine pH and specific gravity • Check floor piping for leaks (start pumping) • Check headers and mains for leaks/rust • Check sub-floor heating system; brine level, pump operation, condition of tank and piping, gauges, thermostat, thermometers. • Grease exposed valve stems	Brine System Take brine samples for testing Monitors Calibrate all monitors General 1. Check accuracy of controls, gauges and thermometers.

AMMONIA LEAK RESPONSE FLOW CHART

	Condenser Clean/replace spray nozzles Descale if necessary Clean system Repair leaks, seal seams Clean tank inside and outside, paint Clean fins Check/replace fan belts and fan bearings Check float valve operation Check seals on pump Check motors and grease open bearings Chiller • Purge oil • Check refrigerant level	Condenser • Purge non-condensable gases • Check tub bundle for scaling • Calibrate sensors • Check accuracy of operating controls and safety cut-outs • Ensure all valves are in proper operating positions • Check/clean oil return float valve

SHUT DOWN

Level A Maintenance	Level B Maintenance	Level C Maintenance
	1. Check logged hours on compressor for overhaul schedule. 2. Periodically turn on brine pump to maintain seal in good condition, if packed seal type. Pump down refrigerant and purge compressor. 3. Drain water from compressor and condenser system. 4. Check brine. 5. Assess general operation and recommend off-season maintenance. 6. During shut down period, occasionally monitor compressor pressure, purge if necessary, and tighten valves.	2. Check accuracy of controls, gauges and thermometers.

ARENA CONDENSER
SEMI-ANNUAL MAINTENANCE

YEAR: _____. INSPECTED BY:_____

SCHEDULE: THE END OF JUNE AND OCTOBER.

MAINTENANCE:

- INSPECT CONDENSER FAN ASSEMBLIES FOR STRUCTURAL DAMAGE.
- INSPECT AND REPORT ANY WATER LEAKS.
- ANNUALLY FLUSH OUT WATER TANK AND CHECK BUNDLES FOR SCALE.
- CLEAN OR REPLACE SPRAY NOZZLES AS NECESSARY.
- CHECK BELTS AND GREASE BEARINGS.
- RECORD DISCHARGE PRESURES;
- WATER PUMP ON: _____ OFF:_____.
- FAN MOTOR: _____ OFF: _____.

AMMONIA LEAK RESPONSE FLOW CHART

Possible ammonia leak is detected

***Is the concentration on the ammonia gauge below* 300 ppm?**

NO

Press the emergency stop button in the pre-entry room and commence Evacuation Procedures
-See Below-

EVACUATION PROCEDURES

Contact Arena Maintenance Supervisor, then Summerland Fire Department (SFD) (911), to let them know that you have an ammonia leak and give facility address. If you have not already, call Complete Climate Control 1-866-766-0186

Commence evacuation of the building. Inform them if the wind direction has affected the location of the muster station.

- Begin sweeping and evacuating public areas
- Ensure that patrons do not try and re-enter the building
- Identify areas containing injured/disabled people and communicate to SFD upon arrival

Also contact, Recreation Director and H&S Advisor to inform of the situation.

Await arrival of SFD and City Management reps, then provide any requested information.

IMPORTANT NOTES:

- ☐ DO NOT leave any ammonia plant doors open, or any doors near the ammonia room that lead to public areas
- ☐ DO NOT attempt rescue of any employees /guests that are unconscious in a contaminated area

The SFD is responsible for these tasks and to make the decision to dump the contents of the ammonia plant (emergency valve)

YES

Safe work procedure for upset conditions based on risk assessment. – staff have been directed in the event of an ammonia leak above 35ppm, from the safety of the vestibule they call the contractor to assist and monitor for possible evacuation of the facility. No attempts to circumvent the leak to save the ice sheets are to be done, the safety of staff and patrons is the mandate for all operators.

Should be located at the exit and not beside the person executing the tasks

taff with respirator training, an nd a stand by person may enter the **Both staff must be wearing their full face respirators with appropriate gas cartridges, and handheld detector** throughout this procedure.

Stand-by should watch the entrant and monitor the ammonia gauge ensuring that if it reaches 35ppm, leave plant room.

Obtain a moistened piece of litmus paper. Don your full face respirator, carry hand held detector, and place the litmus paper at various points in the general area of the leak (the litmus will turn pink when in contact with ammonia gas)

-Do not operate equipment that is suspected to be failed/leaking.
-Do not isolate liquid refrigerant within suspected failed/leaking equipment.
-Do not isolate secondary coolant systems.

Has the leak been controlled and the ammonia concentration stopped increasing?

NO

You may continue to look for the leak, using the litmus paper, or you may choose to perform shutdown of the ammonia plant. If at any point the concentration reaches above 35ppm leave room and wait for Complete Climate Control to make repairs.

Refrigeration Contractor

YES

Monitor concentration to ensure it doesn't reach 35ppm

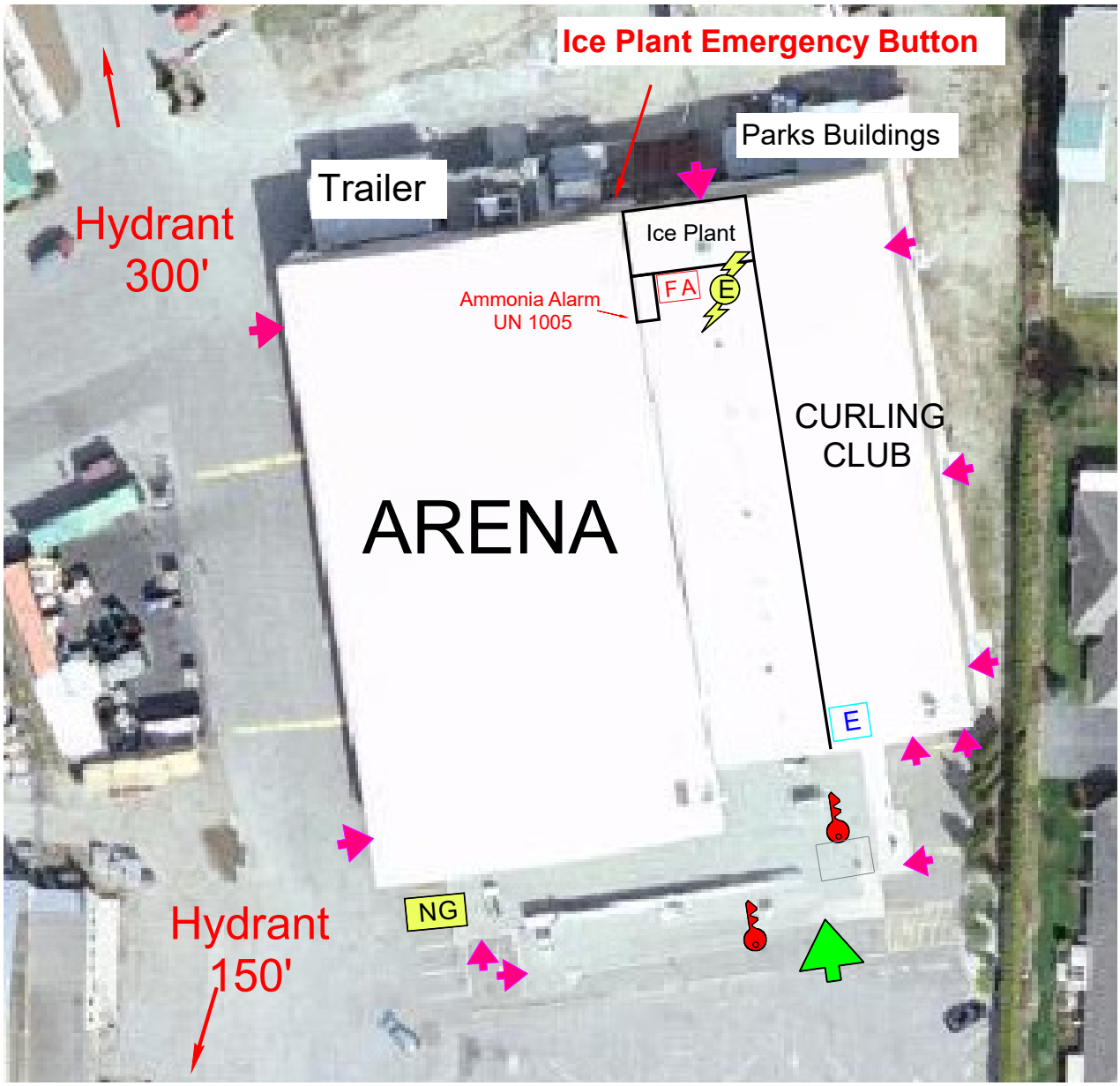
Summerland Fire Department Pre-Plan

N

1 / 3 / 0	Property: **Summerland Recreation Centre**	Plate #: **178**	25%	4580
			50%	9161
	Address: **8820 Jubilee Rd E**	PRE-PLAN **103**	75%	13740
			100%	18323

Hydrant	Lock Box	FD Connection	Main Entrance	Access Point	Sprinkler Shut Off	Gas Shut Off	Main Electrical Shut-Off	Stand Pipe	Fire Alarm
						NG	E	SP	F A

FIRE ALARM: Yes SPRINKLERS: No MONITORED: Yes



Special Circumstances: Zone 2 - Ammonia Alarm

Drawing Saved As:	Date:	Drawn By:
103 - Summerland Recreation Centre	Jan 27, 2022	G. Pugh

SFD Pre-Fire Plan # 103

Building Name:	**Summerland Recreation Centre**
Address:	**8820 Jubilee Rd. East**
Plate:	**178**
Property Contact # 3:	**After Hours Emergency - Cell 809-9460**
Lockbox Location:	**Main Arena entrance**
Electrical Panel Location:	**Main electrical room, North end of dressing room hallway**
Gas Meter Location	**South West corner of ice arena**

Fire Protection Devices

Annunciator Panel:	**Main arena entrance on right**
Emergency Generator:	**North end of ice arena**
FD Sprinkler Connection:	**None**
Fire Alarm Main Panel:	**Main electrical room, North end of dressing room hallway**
Sprinkler System (Shut Offs):	**None**
Standpipes:	**None**
Wet Pipe System:	**Arena Concession & Banquet Room 2nd floor**

Hydrants

1. **South West corner of parking lot.**
2. **South side of Jubilee Rd. East of Packing House**
3. **Pineo Crt. – North of complex in front of RCMP detachment**
4. **Corner of Rose Ave. and Peach Orchard Rd.**

Building Construction and Interior Access Locations

Construction Type:	**Type II - Cement block and metal siding**
Roof Construction:	**Metal truss, metal cladding. Some asphalt torch down (Banquet Room)**
Number of Floors:	**2 Floors**
Attic Access Locations:	**Curling Club Lounge**
Roof Access:	**FD ladder – South West stairwell**
Levels Below Grade:	**0**

Operating Guideline

Response Zone 1
1st Alarm – E231, L231 2nd Alarm – E232, R231

OIC & E231 go directly to the front door and gain access to read the alarm panel. L231 will stage at the hydrant at the South West corner of the Arena parking lot.

If the alarm is "Zone 2" High Ammonia Alarm, Duty Officer will proceed to the Ammonia Alarm and read the PPM on the display. Maintenance person must be contacted immediately for Ammonia Alarm.
L231 & R231 will proceed to the rear of building if the alarm is in fact Ammonia and wait further instructions.
L231 will then stage at the hydrant on Peach Orchard Rd. and Rose Ave. Awaiting further instructions.

For small ammonia spills or leaks: Utilize "Shelter in Place" procedures for personnel, general public & neighbouring properties, until a compete size-up has been completed.

For large ammonia spills or leaks: Area wide evacuations may be required. Refer to the "Dangerous Goods Response Guide" for isolation distances.

Utilization of the "Unified Command" system with facility staff is required for any ammonia related incident.

Summerland Fire Department Pre-Plan

N

1 / 3 / 0

Property:
Summerland Recreation Centre

Address: **8820 Jubilee Rd E**

Text

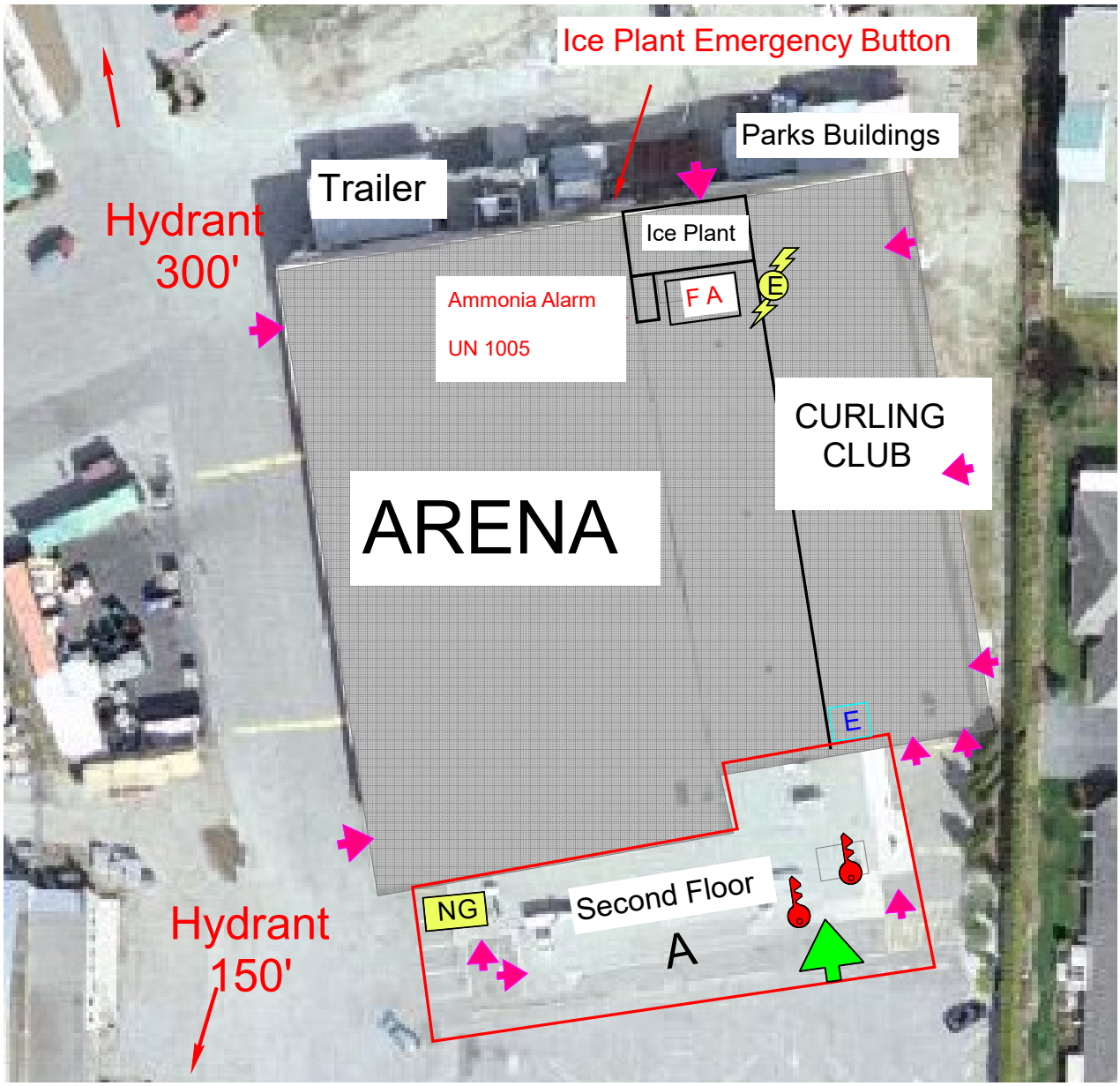
Plate #:
178

PRE-PLAN
103A

25%	312
50%	625
75%	937
100%	1250

Hydrant	Lock Box	FD Connection	Main Entrance	Access Point	Sprinkler Shut Off	Gas Shut Off	Main Electrical Shut-Off	Stand Pipe	Fire Alarm
						NG	E	SP	F A

FIRE ALARM: Yes SPRINKLERS: No MONITORED: Yes

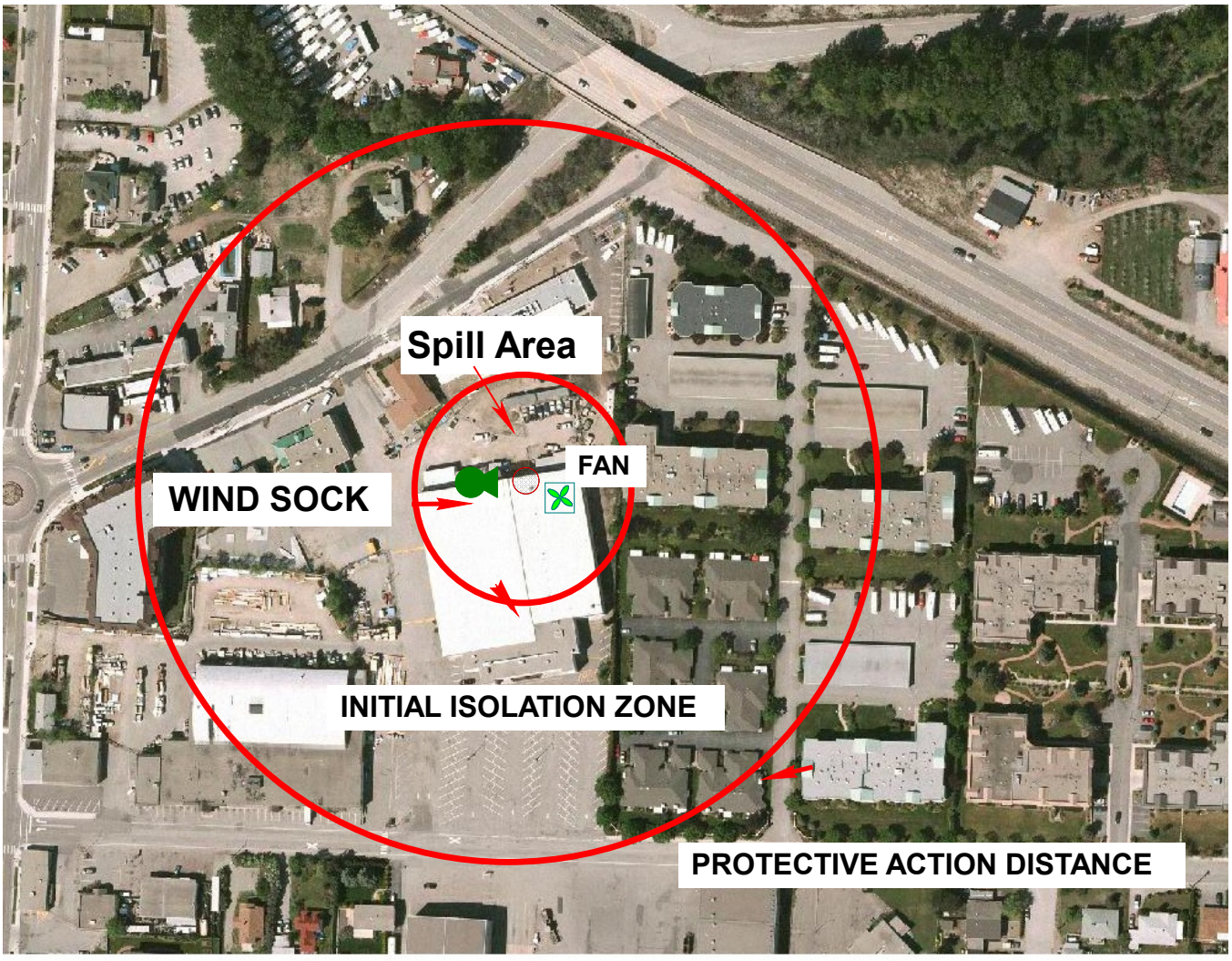


Special Circumstances: Zone 2 - Ammonia Alarm

Drawing Saved As:	Date:	Drawn By:
103A - Smld. Recreation Centre	Jan 27, 2022	G. Pugh

Summerland Fire Department Pre-Plan

1 / 3 / 0	Property: **Summerland Recreation Centre** Address: **8820 Jubilee Rd East**	Plate #: **178**	PRE-PLAN **103B**



** Note **
- 800lb Amonia capacity on site located at the North end of building in mechanical room.
- Monitor wind direction for Command as well as evacuation routes.

Special Circumstances: Reference emergency control guide

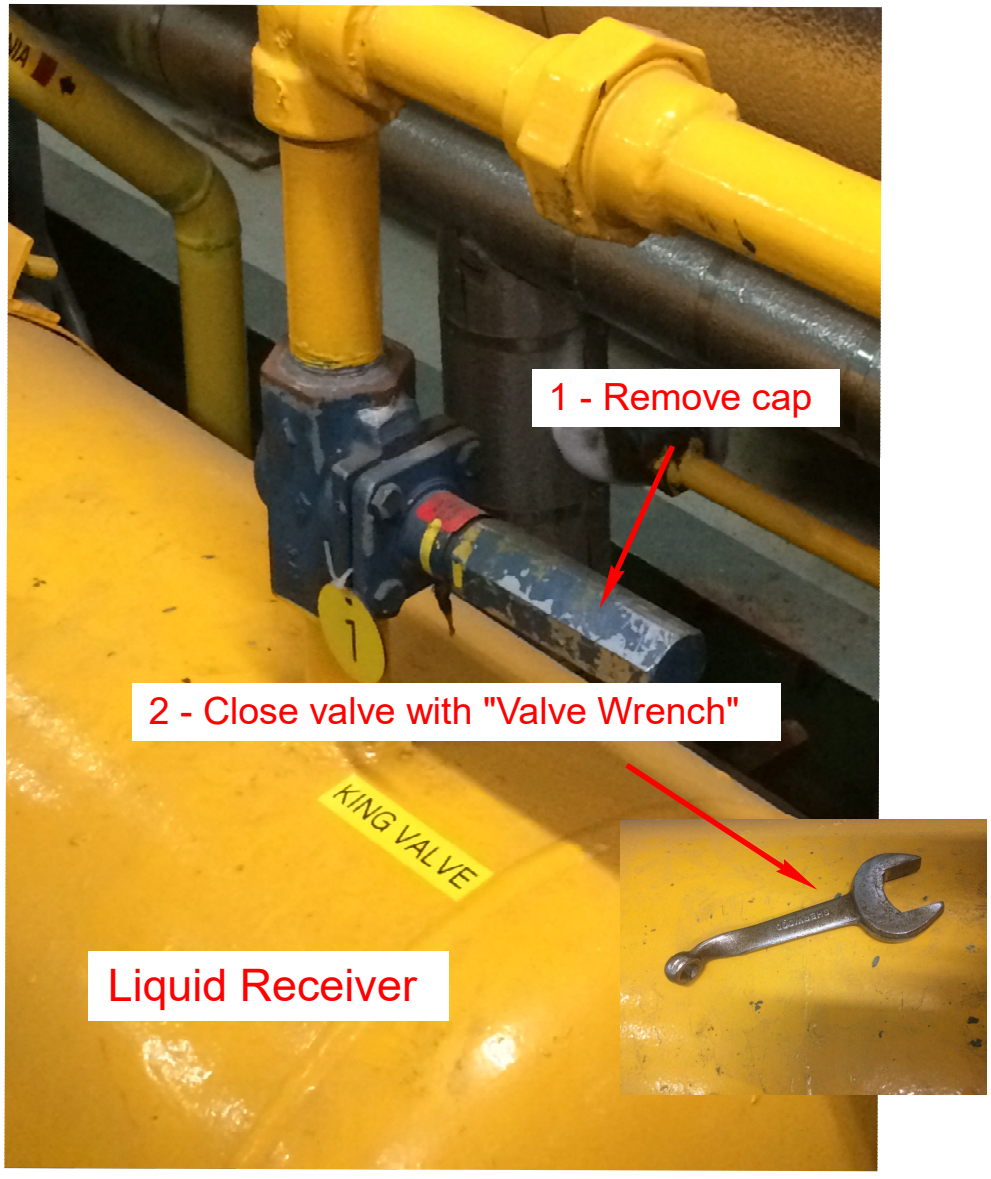
Drawing Saved As: 103B - Summerland Recreation Centre	**Date: Jan 27, 2022**	Drawn By: G. Pugh

Summerland Fire Department Pre-Plan

Property: **Summerland Recreation Centre**

PFP#103C

Address: **8820 Jubilee Rd East**



Summerland Fire Department Pre-Plan

Property:

Summerland Recreation Centre

PFP#103D

Address:

8820 Jubilee Rd East

Turn yellow labeled switches to the off position

Recommend including a floor plan showing mechanical equipment in the mechanical room and identify the location of the King valve, control panel and exterior FDB locations.

Summerland Fire Department Pre-Plan

Property: **Summerland Recreation Centre**

PFP# 103E

Address: **8820 Jubilee Rd East**

SUMMERLAND FIRE DEPARTMENT

HAZ-MAT Response Sheet

Facility: **Summerland Recreation Centre – PFP # 103**

Address: **8820 Jubilee Rd. East**

Chemical Name: **Ammonia**

UN / NA : 1005 **CAS:** 7664-41-7 **STCC:** 4920359 **ERG #** 125

NFPA 704: **Blue 3, Red 1, Yellow 0, White 0**

Reactivity Alert :

- Soluble in water with evolution of heat. The amount of heat generated may be large.
- Mixing of ammonia with several chemicals can cause severe fire hazards and/or explosions. Ammonia in container may explode in heat of fire. Incompatible with many materials including silver and gold salts, halogens, alkali metals, nitrogen trichloride, potassium chlorate, chromyl chloride, oxygen halides, acid vapors, azides, ethylene oxide, picric acid and many other chemicals.

Isolation Distances:

- Isolate spill or leak area in all directions for at least 100 metres (330 ft) in all directions.
- Gasses are heavier than air and will spread along the ground and collect in low areas.
- If tank truck is involved in a fire, isolate for 1600 metres (1 mile) in all directions, also consider initial evacuation for 1600 metres (1 mile) in all directions.

Health Hazard:

- Vapors cause irritation of eyes and respiratory tract. Liquid will burn skin and eyes. Poisonous; may be fatal if inhaled. Contact may cause burns to skin and eyes. Contact with liquid may cause frostbite.

Fire Fighting:

- Wear positive pressure breathing apparatus and full protective clothing. Small fires: dry chemical or carbon dioxide.
- Small fires: dry chemical or carbon dioxide. Large fires: water spray, fog or foam. Apply water gently to the surface. Do not get water inside container. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Isolate area until gas has dispersed.

Non-Fire Response:

- Keep material out of water sources and sewers. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Neutralize with vinegar or other dilute acid. Water spill: Neutralize with dilute acid. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates.

First Aid:

- Ammonia is extremely corrosive to the skin, eyes, and mucous membranes. Contact with the liquefied gas may cause frostbite.
- Transport to a health care facility.

Deactivating / Neutralizing Agents:

- Neutralize with dilute acid.

Supplier Name:

Brenntag

24 hour emergency contact – 1-604-685-5036

Emergency Contacts:

Ministry of Environment – Call PEP in Victoria, PEP will contact M.O.E.

1- 800-663-3456

Canutec –

1-613-996-6666

Cell - *666

Dale MacDonald, Recreation Director –

250-404-4091 bus

250-494-5015 res

250-490-6385 cell

Brenda Ingram, Deputy Recreation Director –

250-404-4084 bus

250-494-0608 res

Mike Fetterer, Arena Manager –

250-494-0400 bus

250-494-0243 res

250-809-9460 cell

Recreation Department –

250-494-0447 office

250-490-7966 spare cell

Hazco Environmental Services –

250-762-5380 bus

30-MINUTE PLAN EMERGENCY CONTROL GUIDE

PHASE 1 DISCOVERY - LANCE

Life Safety: Clear the Isolation Zone (NH3 = 100 ft. to 1,000 ft.)

- ☐ Clear the Isolation Zone and escape laterally and upwind or SIP
- ☐ Set up for rapid entry rescue, decontamination, and medical care

Alert: Record Size-Up on Alert Form

- ☐ Who? (your name)
- ☐ What? (casualties, rescue, medical, fire, or chemical release)
- ☐ Where? (specific location)

Notification: Coordinate Checklist Notifications with IC

- ☐ 9-1-1; give response route and on-site meeting location
- ☐ LEPC: (___)_____ SERC: (___)_____
- ☐ NRC: (800) 424-8802 OSHA: (___)_____
- ☐ Contractor: (___)_____ CORP: (___)_____

Command and Control

Action: Identify Hazard Zone, Level of Concern, size of Isolation Zone, and location of the Incident Command Post (ICP)

Plan: Engage the Command Team; set the Life Safety Objective

Hazards (chemical/physical), **Risks** (life and environmental), **Threats** (fire, pressure, reactivity, slip/fall, structural integrity)

Level of Concern: 1-Controlled and contained
2-Controlled or contained
3-Uncontrolled and uncontained

Isolation and Protective Action Distance (PAD) for ammonia:

Small 100 ft.	PAD: 550 ft. (day and night)
Large 500 ft.	PAD: Day = .5 miles; Night = 1.3 miles
Catastrophic 1,000 ft.	PAD: Track plume beyond 1.3 miles

Acute Exposure Guideline Levels (AEGL):

10 Minutes: AEGL 2 = 220 PPM	AEGL 3 = 2,700 PPM
30 Minutes: AEGL 2 = 220 PPM	AEGL 3 = 1,600 PPM

Flammability of confined NH_3 vapor with a 1,204°F ignition source: Caution at 15,000 and high risk at 40,000 PPM

Evacuation to Safe Refuge or SIP

- ☐ Movement Plan–move laterally and upwind to safe refuge
- ☐ Secure the safe refuge locations
- ☐ Setup Access Controls to and from the Plant
- ☐ Personnel accountability–check in/check out

PHASE 2 INITIAL RESPONSE - SIMPLE

Size-up: CAN report Conditions-Actions-Needs

Conditions: Hazard Zone Location? Status of emergency; Level 1, 2, or 3? Life Safety status? Controlled? Not Controlled? Contained?

Actions: Incident Commander and Command Post location? Evacuation status and rescue in progress? Size of Isolation Zone? Status of emergency Shut-down?

Needs: Rescue? Medical? Decon? Shut-down? Ventilation support? Downwind/downstream receptor management?

Sources of ignition and fire suppression controls

- ☐ Control utilities, ventilation, and sources of ignition
- ☐ Access to hydrants and FDCs for fire sprinkler system
- ☐ Firewall integrity, containment of fire, exposure protection

Isolate the source of the leak and pump down the liquid

- ☐ Identify upstream and downstream control points
- ☐ Avoid hydraulic shock caused by slamming a valve
- ☐ Avoid trapping liquid between valves with no relief valve
- ☐ Isolate the liquid flow to the leak site, and control defrost cycle
- ☐ Containment: tarp, and/or close doors
- ☐ Move liquid to safe location upstream or downstream of leak

Manage energy flow to the high and low sides

- ☐ Release: High or low side? Status of emergency relief system?
- ☐ Manage liquid flow and system pressure
- ☐ Reduce incoming heat–disable evaporators and defrost
- ☐ Use diffuser and/or pressure equalizer

Pressurized ventilation using system or portable fans

- ☐ Plan air flow–entry (upwind) and exhaust (downwind)
- ☐ Use fan to dilute or redirect vapor
- ☐ Engage portable fan to support rescue

Life Safety and Engage Incident Action Plan

- ☐ Set up Control Zone Layout (see diagram below)
- ☐ Public Safety coordination of downwind receptors in the Protective Action Area
- ☐ Eye-level wind movement: CAUTION for wind changes, eddies, backflow, and turbulence
- ☐ Consider site access control and air monitoring
- ☐ Assure containment of downstream environmental threat

PHASE 3 SUSTAINED RESPONSE

Sustained Response: Integrate and/or Unify Command

Actions: Assure personnel accountability and conduct a pre-entry site evaluation.

Plan: Write an IAP and Safety Plan (see back of 30-Minute Plan)

Hazmat Tech Team Engagement

- ☐ IC to review a Situation Status Report
- ☐ IC to integrate Command with Plant Liaison
- ☐ Safety Officer to update Site Safety and Control Plan (ICS 208)
- ☐ Conduct and IAP Command Team briefing
- ☐ Plans Section Chief updates situation status and proposes future IAP objectives
- ☐ Hazard assessment updates at least every 30 minutes and prior to engaging the next IAP
- ☐ Consider opening a Joint Information Center
- ☐ Consider opening an Emergency Command Center and assign a Public Information Officer and Plans Section Chief

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www.ToucanEd.com

Safety Plan: Pre-entry to Hot Zone

- ☐ Review the IAP objective(s) and task assignments
- ☐ Assure safety, rehab, decon, and medical evaluation
- ☐ Position hose line, ventilation and back-up team
- ☐ NO entry into IDLH without IC approval and a back-up
- ☐ Do a pre-entry review: use back-ups, proper PPE, entry/exit times, communications, and emergency alert signals
- ☐ Respirator < IDLH (300 PPM) and SCBA > IDLH (300 PPM)
- ☐ Vapor protection: Level B < 5,000 PPM to 10,000 PPM and Level A > 10,000 PPM
- ☐ Flammability = No entry > 15,000 PPM without mitigations (for sources of ignition) and flash protection
- ☐ Aerosol Stream/Dense Gas: Level A with flashfire and cold temperature protection (avoid using water to absorb liquid or aerosol)
- ☐ Chemical monitoring (fixed and/or handheld) for monitoring control zones and for entry team

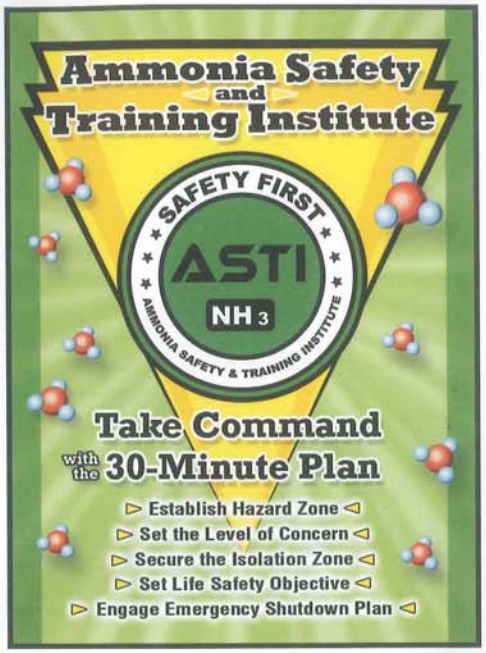
PHASE 4 TERMINATION

Termination of the Emergency

Actions: Hazard/threat mitigations completed and IC sign-off of Termination Proclamation

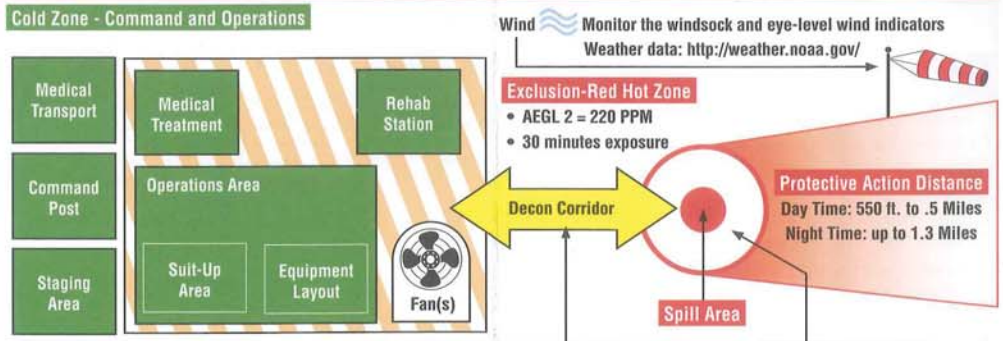
Plan: Communicate termination order to Command Team, shelter locations, regulators, and media

- ☐ Plant IC engages Recovery, Restart, and Business Continuation IAP; maintain pre-emergency status (PPE and Command Team)
- ☐ Debrief and identify prevention and mitigation and preparedness improvements



Save yourself, engage the team, and help others.
Act decisively to stop problems when they are small.

CONTROL ZONE LAYOUT—AMMONIA RELEASE



Command Team

- Establish personnel accountability
- Secure a site safety and control plan (ICS 208)
- Situation status and pre-entry hazard analysis
- Written Incident Action Plan

Contamination Reduction - Yellow Zone

- Minimum of 100 ft. to 150 ft. between Red and Green Zones
- Drop equipment at the entry
- Decon with water for gross contamination (liquid)
- Decon with a fan for vapor exposure

Initial Isolation Zone

- 100' small leak < 100#s
- 500' large leak (aerosol cloud)
- Use buddy system
- Support with a fan and hose line

CORP. OF THE DISTRICT OF SUMMERLAND FIRE DEPARTMENT
OPERATIONAL GUIDELINES

TITLE	NO.
DANGEROUS GOODS RESPONSE	**2.23.01**

PURPOSE:

Response to a dangerous goods incident presents greater unseen dangers than the normal emergency response of the Fire Department, because of the hazards or potential hazards of the dangerous goods themselves. For this reason, the decisions must be more carefully considered and more deliberate than the routine.

SCOPE:

This Operational Guideline applies to all Fire Department personnel.

POLICY:

The Fire Department response to dangerous goods incidents must concentrate on life safety, both of firefighters and the public. The second priority must be containment and stabilization of the incident and hazards. Wherever possible, clean up and resolution of dangerous goods incidents must remain with companies and agencies trained in the appropriate procedures, with the Department providing assistance as necessary.

PROCEDURE:

1. If there is any initial indication that an incident involves dangerous goods, **the first responding units must consciously avoid committing themselves to a dangerous situation**. A dangerous goods incident requires a more cautious and deliberate size-up than other emergency situations. The Incident Commander may initiate immediate action to make a rescue or evacuate an area, but this must be done with an awareness of the risk to Department personnel and must take advantage of all available protective clothing.

2. Members in charge of the Decontamination Unit and members donning encapsulated suits **must** be trained in accordance with NFPA 472 - Operations Level.

3. Initial operations at a dangerous goods incident should include:

    a) Establishing an operational perimeter.
    b) Initiating material identification.
    c) Obtaining technical information related to the dangerous goods.
    d) Identifying the strategic priorities of the incident, based on:
        1) the type and magnitude of life hazard involved.
        2) the type and quantity of dangerous goods involved.
        3) the current and projected situations.
    e) Identifying the tactical objectives of the incident.
    f) Initiating an action plan based on:
        1) protection of life.
        2) confinement and/or containment of the materials and its by-products.

3) control of the material and its effects on humans, animals, property and the environment.

4. The Incident Commander must clearly communicate his priorities, objectives and action plan to Division Supervisors and Group Leaders.

5. The Incident Commander must monitor progress of the action plan to insure that objectives are either accomplished or that the plan is modified according to the demands of the changing situation.

CLEANUP AND DISPOSAL

6. The Fire Department's responsibility, beyond that of preserving life and property, is only to identify and, if possible, to contain the spilled material. No attempt should be made to decontaminate an area or remove a spill unless directed and supervised by responsible personnel from the industry. Wherever possible, clean up and resolution of a dangerous goods incident must remain with companies and agencies trained in the appropriate procedures, with the Department providing assistance as necessary. Professional disposal companies may be used, if available.

SAFETY

7. All operations, including rescue and evacuation, must be accomplished with overall safety as the key component. Department members must wear appropriate protective equipment.

8. All personnel must remain alert for the symptoms of chemical poisoning and reactions that could threaten the health of firefighters and other involved personnel. Members who have been exposed to dangerous goods must receive immediate medical attention once decontaminated.

9. If injuries occur on scene, the Incident Commander must advise the Industrial Hygiene Department of the Workers Compensation Board

10. If the incident involves a fire in any of the following materials, the Incident Commander should signal a non-attack posture and immediate evacuation of the surrounding area:
    a) explosives. b) oxidizers. c) organic peroxides.
    d) unstable or highly reactive substances. e) poisons.
    f) potential BLEVEs with inadequate water supplies.

ATTACHMENTS

11. Included as part of this OG is:
    a) Dangerous Goods Response Checklist.

Dangerous Goods Response Checklist.

	Completed	Required
INITIAL RESPONSE:		
1. Consciously avoid committing personnel and equipment to a dangerous situation.		
UPON ARRIVAL		
2. Establish command.		
3. Size up the situation and make a status report.		
INITIAL OPERATIONS		
4. Establish a hot zone and operational perimeter.		
5. Initiate material identification.		
6. Obtain technical information related to the dangerous goods.		
7. Identify the strategic priorities.		
8. Identify the tactical objectives.		
9. Initiate an action plan.		
CONTINUING OPERATIONS		
10. Monitor progress of action plan. Modify the plan, if necessary.		
CLEANUP AND DISPOSAL		
11. Contain the spilled material.		
12. Leave cleanup and resolution for companies and agencies trained in the appropriate procedures.		
SAFETY		
13. Appoint Safety Officer. Maintain safety as a key component of all operations.		
14. Remain alert for symptoms of chemical reactions. Members exposed to dangerous goods must receive immediate medical attention after decontamination.		

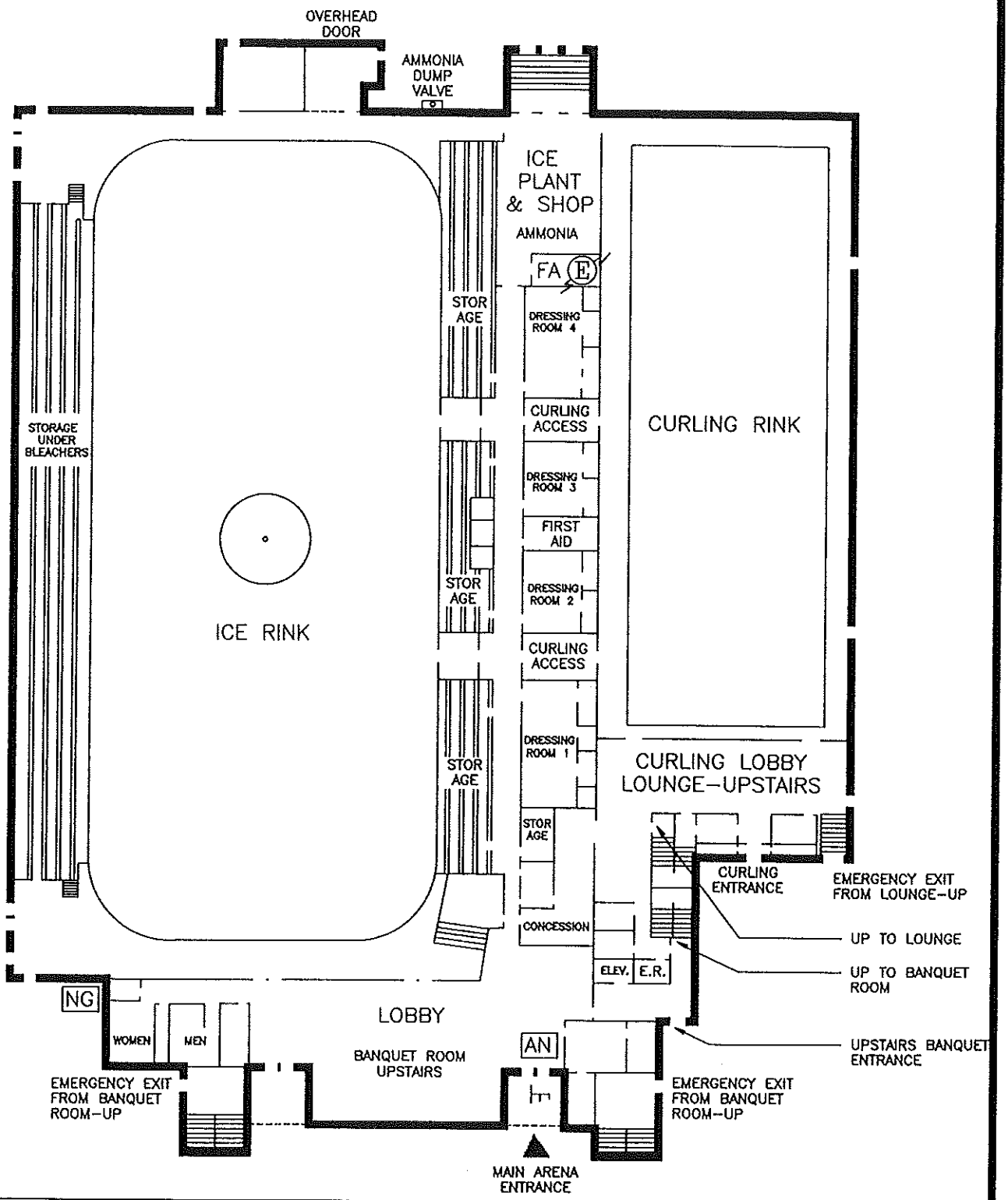
103

ICE ARENA & CURLING CLUB

SUMMERLAND RECREATION CENTRE–LOWER FLOOR

8820 JUBILEE AVENUE

N



E MAIN ELECTRICAL SWITCH

NG NATURAL GAS SHUT OFF

MAIN BUILDING ENTRANCE

FA S FIRE ALARM SUPERVISED

AN ANNUNCIATOR

LOCK BOX

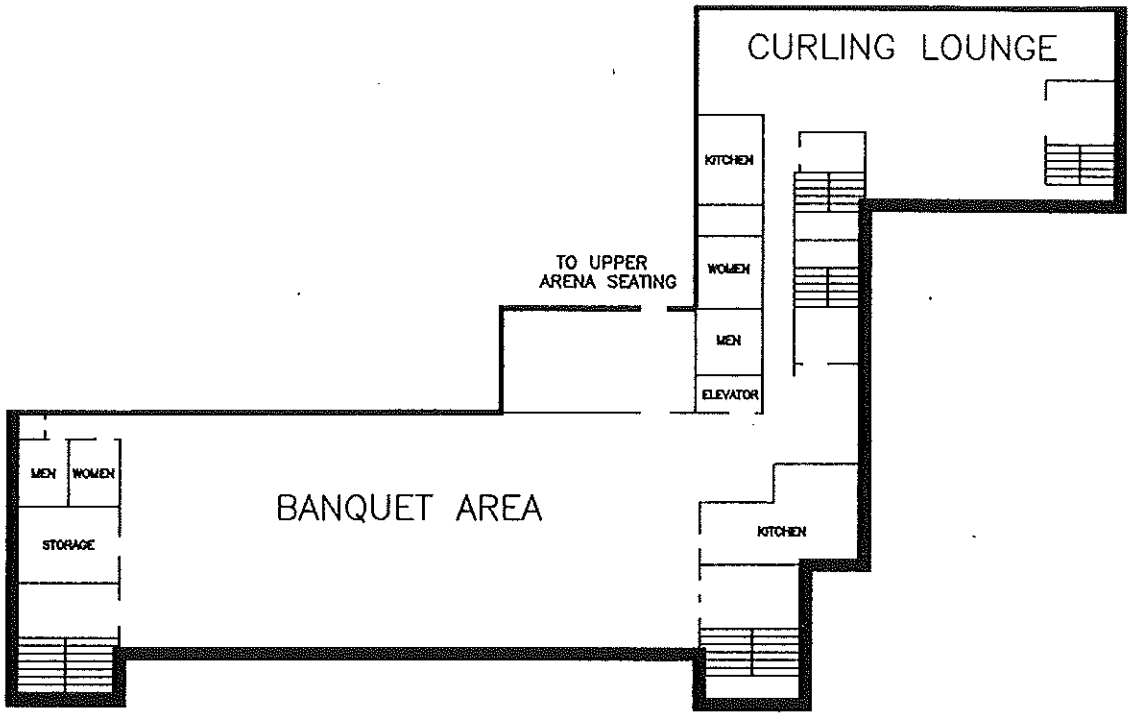
103

ICE ARENA & CURLING CLUB

8820 JUBILEE AVENUE

N

SECOND FLOOR BANQUET AREA



ICS ORGANIZATIONAL CHART

Plant Response Team

- Plant IC
- Lead Responder
- Notification Unit Leader
- Evacuation Group Supervisor
- Safety Officer
- Plans Section Chief
- Documentation (Scribe)
- Production Control Specialist
- Access Control Officer
- Air Monitoring Team Leader
- Media Representative
- Logistics Officer

Assignments:

Command

Assignments:
Incident Commander:
Unified Command Team:
Plant Liaison:

COMMAND STAFF

- ☐ Incident Safety Officer
- ☐ Liaison Officer/Agency Rep.
- ☐ Public Information Officer
- ☐ Legal Officer

Incident Assignments:

Operations Section Chief

Assignment:

- **Branch Director** Title: — Assignment:
  - Hazmat Division and/or Group Supervisor
- **Branch Director** Title: — Assignment:
  - Division/Group Supervisor — Assignments:
- **Branch Director** Title: — Assignment:
  - Division/Group Supervisor — Assignments:
- **Branch Director** Title: — Assignment:
  - Division/Group Supervisor — Assignments:

INITIAL RESPONSE ASSIGNMENT OPTIONS

Hazmat Group Supervisor:

- ☐ Assistant Safety Officer
- ☐ Entry Team Leader
- ☐ Decon Officer
- ☐ Rehab Officer

Optional Positions:

- ☐ Site Access and Control Officer
- ☐ Safe Refuge Officer
- ☐ Staging Officer
- ☐ Rescue Team Leader
- ☐ Ventilation Group Supervisor
- ☐ Air Monitoring Group Supervisor

ACTUAL ASSIGNMENTS:

Plans Section Chief

Assignment:

- ☐ Notification Unit Leader
- ☐ Documentation Unit Leader
- ☐ Situation Unit Leader
- ☐ Environmental Unit Leader
- ☐ Sampling and Monitoring Coordinator
- ☐ Modeling Analysis Coordinator
- ☐ Science Officer/Technical Specialist

Assignments:

Logistics Section Chief

Assignment:

- ☐ Medical Unit Leader
- ☐ Supply Unit Leader
- ☐ Communications Unit Leader
- ☐ Food and Facilities Unit Leaders
- ☐ Breathing Air Support
- ☐ Logistics Set-up

Assignments:

Finance Section Chief

Assignment:

- ☐ Procurement Unit Leader
- ☐ Cost Unit Leader
- ☐ Time Unit Leader
- ☐ Contractor Compliance Unit Leader

Assignments:

Status Reports

- ☐ ICS 215A and/or ICS 208
- ☐ Situation Status Report
- ☐ Detailed hazard analysis
- ☐ Personnel Accountability Report
- ☐ Status of Emergency Shut-Down
- ☐ Downwind receptor status within the Protective Action Zone
- ☐ Downstream – contain contaminated run-off
- ☐ Other:

ICS 201 FORM Incident Action Plan (IAP)

INCIDENT BRIEFING	1. Incident Name:	2. Date Prepared:	3. Time Prepared:

4. Map Sketch: See site maps in the Plant Emergency Response Plan.

*Also, use satellite photos and building floor plans provided by the Company Liaison.

5. Overall Objective(s): Check the appropriate box(s); recommend no more than two objectives per 30-minute planning period.

- ☐ Rapid Entry Rescue
- ☐ Emergency Medical Support
- ☐ Downwind Receptor Management
- ☐ Life Safety in Isolation Zone
- ☐ Emergency Shut-down
- ☐ Fire Control
- ☐ Contain and Control
- ☐ Reconnaissance
- ☐ Utility Control
- ☐ Ventilation
- ☐ Search and Rescue
- ☐ Other:

Selected Objective: _____

Tasks:

Selected Objective: _____

Tasks:

6. Weather Forecast: Go to www.noaa.gov, enter city/state in search box, enter the zip code at the top of the page, select "go."

7. Safety Message: See front of 30-Minute Plan with emphasis on the Safety Plan and Hazard Assessment (green boxes on front).

- ☐ Personal Protective Equipment
- ☐ Air Monitoring Hazard Concentration
- ☐ Emergency Evacuation/Hand Signal Alert
- ☐ Set-up of Decon, Rehab, and Medical
- ☐ Entry Team On-air Monitoring
- ☐ Safety Officer/Assistant Safety Officer
- ☐ Eye-level and roof wind indicators
- ☐ Review the movement through the decon corridor
- ☐ Position hose lines and ventilation fans
- ☐ Back-up/Rapid-Entry Rescue

Hand Signals:

Hands gripping throat: Out of air/Breathing difficulty
Grip partner's wrist: Leave area immediately
Hands on waist: Leave area immediately
Hands on top of head: Need assistance
Thumbs up: I'm OK/I understand
Thumbs down: I'm not OK

Tag Line Rope Signals:

O – Okay: One tug—entrant is okay
A – Advance: Two tugs—need rope
T – Take up slack: Three tugs—entrant is retreating, take up slack
H – Help: Four tugs—entrant needs help

Emergency Escape Signal:

A repeated triple horn blast (10 second blasts)

8. Attachments:

- ☐ Organizational List - ICS 203
- ☐ Div. Assignment List - ICS 204
- ☐ Communications Plan - ICS 205
- ☐ Medical Plan - ICS 206
- ☐ Site Safety and Control Plan - ICS 208
- ☐ Unit Log - ICS 214
- ☐ Safety and Risk Analysis - ICS 215A
- ☐ Radio Requirement Worksheet ICS - 216
- ☐ Support Vehicle List - ICS 218
- ☐ Other:

9. Prepared by (name and position):

SAFETY DATA SHEET

Ammonia

Section 1. Identification

GHS product identifier : Ammonia

Chemical name : ammonia

Other means of identification : ammonia; anhydrous ammonia

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : ammonia; anhydrous ammonia

SDS # : 001003

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 2
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
SKIN CORROSION - Category 1
SERIOUS EYE DAMAGE - Category 1
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
Harmful if inhaled.
Causes severe skin burns and eye damage.
Very toxic to aquatic life.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Store locked up. Protect from sunlight. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : ammonia

Other means of identification : ammonia; anhydrous ammonia

Product code : 001003

CAS number/other identifiers

CAS number : 7664-41-7

Ingredient name	%	CAS number
ammonia	100	7664-41-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately.Chemical burns must be treated promptly by a physician.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately. Call medical doctor or poison control center immediately. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 4. First aid measures

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled.

Skin contact : Causes severe burns.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
Refer to ANSI/CGA G-2.1, Section 5.13 for electrical classification of anhydrous ammonia storage and handling areas. Where anhydrous ammonia is stored indoors, use electrical (ventilating, lighting and material handling) equipment with the appropriate electrical classification rating and use only non-sparking tools.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ammonia	**California PEL for Chemical Contaminants (*Table AC-1*) (United States).** PEL: 25 ppm 8 hours. STEL: 35 ppm 15 minutes. **ACGIH TLV (United States, 3/2017).** TWA: 25 ppm 8 hours. TWA: 17 mg/m³ 8 hours. STEL: 35 ppm 15 minutes. STEL: 24 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 18 mg/m³ 10 hours. STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Section 8. Exposure controls/personal protection

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Pungent.

Odor threshold : Not available.

pH : Approx. 11.6

Melting point : -77.7°C (-107.9°F)

Boiling point : -33°C (-27.4°F)

Critical temperature : 132.85°C (271.1°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 16%
Upper: 25%

Vapor pressure : 114.1 (psig)

Vapor density : 0.59 (Air = 1)

Specific Volume (ft^3/lb) : 20.79

Gas Density (lb/ft^3) : 0.0481 (32°C / 89.6 to °F)

Relative density : SPECIFIC GRAVITY (AIR=1): @ 70°F (21.1°C) = 0.59

Solubility : Soluble in water. Soluble in alcohol and ether.

Solubility in water : 540 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 651°C (1203.8°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 17.03 g/mole

Aerosol product

Heat of combustion : -18589392 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Section 10. Stability and reactivity

Incompatible materials : Oxidizers and Yellow Metals (brass & copper)

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ammonia	LC50 Inhalation Gas.	Rat	7338 ppm	1 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled.

Skin contact : Causes severe burns.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Section 11. Toxicological information

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Other information : IDLH : 300 ppm

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
ammonia	Acute EC50 29.2 mg/l Marine water Acute LC50 2080 µg/l Fresh water Acute LC50 0.53 ppm Fresh water Acute LC50 300 µg/l Fresh water Chronic NOEC 0.204 mg/l Marine water	Algae - Ulva fasciata - Zoea Crustaceans - Gammarus pulex Daphnia - Daphnia magna Fish - Hypophthalmichthys nobilis Fish - Dicentrarchus labrax	96 hours 48 hours 48 hours 96 hours 62 days

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

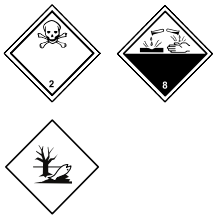
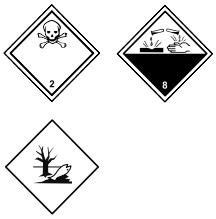
Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1005	UN1005	UN1005	UN1005	UN1005
UN proper shipping name	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS; OR ANHYDROUS AMMONIA	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS
Transport hazard class(es)	2.2 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environmental hazards	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : Inhalation hazard
This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a.
Reportable quantity 100 lbs / 45.4 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: Forbidden.
Special provisions 13,T50

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark).
The marine pollutant mark is not required when transported by road or rail.
Explosive Limit and Limited Quantity Index 0
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden

Section 14. Transport information

Special provisions

Mexico Classification : Toxic Inhalation Hazard Zone D

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.
Quantity limitation Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: Forbidden. Limited Quantities - Passenger Aircraft: Forbidden.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Water Act (CWA) 311: ammonia

Clean Air Act (CAA) 112 regulated toxic substances: ammonia

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ (lbs)	SARA 302 TPQ (gallons)	SARA 304 RQ (lbs)	SARA 304 RQ (gallons)
ammonia	100	Yes.	500	-	100	-

SARA 304 RQ : 100 lbs / 45.4 kg

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonia	7664-41-7	100
Supplier notification	ammonia	7664-41-7	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

Section 15. Regulatory information

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

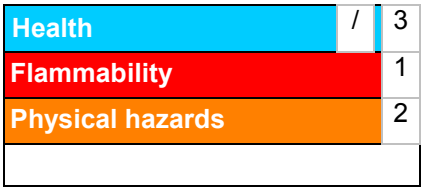
Turkey : This material is listed or exempted.

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 2	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
ACUTE TOXICITY (inhalation) - Category 4	Expert judgment
SKIN CORROSION - Category 1	Expert judgment
SERIOUS EYE DAMAGE - Category 1	Expert judgment
AQUATIC HAZARD (ACUTE) - Category 1	Expert judgment

History

Date of printing : 1/10/2019

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Date of previous issue : 10/9/2018

Version : 1.09

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.