The Workers Compensation Act requires that the employer must post a copy of this report in a conspicuous place at or near the workplace inspected for at least seven days, or until compliance has been achieved, whichever is the longer period. A copy of this report must also be given to the joint committee or worker health and safety representative, as applicable.

<table>
<thead>
<tr>
<th>Employer Name</th>
<th>Jobsite Inspected</th>
<th>Scope of Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>THE UNIVERSITY OF BRITISH COLUMBIA</td>
<td>THUNDERBIRD WINTER SPORTS 6066 THUNDERBIRD BLVD Vancouver BC V6T 2E5</td>
<td>Ammonia Inspection Initiative</td>
</tr>
</tbody>
</table>

The there are five (5) orders or other items outstanding

**ACTION REQUIRED**

### Summary of Orders or other Items

See “Orders/Items – Full Details” section of this Inspection Report for orders/items cited

<table>
<thead>
<tr>
<th>Order/Item No.</th>
<th>Status</th>
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<tbody>
<tr>
<td>1</td>
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<td>OHS6.127(2)</td>
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<td>Outstanding</td>
<td>OHS5.97(1)</td>
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</table>

Notice of Compliance Required.
<table>
<thead>
<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>Outstanding</td>
<td>Order Outstanding - Action Required to Achieve Compliance</td>
</tr>
<tr>
<td>Complied</td>
<td>Compliance Achieved - No Further Action Required</td>
</tr>
<tr>
<td>Closed</td>
<td>Order is Closed</td>
</tr>
<tr>
<td>Rescinded</td>
<td>Order has been cancelled – No Further Action Required</td>
</tr>
</tbody>
</table>
INSPECTION NOTES

This inspection was conducted as per the 2017 WorkSafeBC Ammonia Inspection Initiative focusing on anhydrous ammonia used as a refrigerant in ice and curling rinks and arenas.

Purpose of Initiative

The purpose of this initiative is to ensure that ice arenas and ice rink facilities using anhydrous ammonia refrigeration systems throughout British Columbia have implemented appropriate controls, measures, plans, and procedures to protect workers and minimize the risk of an adverse exposure to anhydrous ammonia.

Focus of Inspection Initiative

The primary focus of the inspection initiative is to ensure that employers are compliant with the requirements of the Occupational Health and Safety Regulation pertaining to the storage and use of anhydrous ammonia in refrigeration systems and will include a review the following:

* Development and implementation of the ammonia exposure control plan.
* A review of ammonia refrigeration system safety systems, including ventilation systems, ammonia monitoring and alarm systems.
* A review of the servicing and maintenance frequency for the ammonia system including associated instructions and procedures.
* A review of the ammonia room including critical components of equipment and machinery used for handling ammonia.
* A review of ammonia respiratory protection and other associated personal protective equipment used in the ammonia room.
* A review of the ammonia exposure emergency washing systems and decontamination procedures.
* Development and implementation of the emergency plan, as it relates to an ammonia release.

About Anhydrous Ammonia

Anhydrous ammonia is a corrosive gas which, when used as a refrigerant, is considered a “toxic process gas.” At low concentrations, ammonia can be irritating to the eyes, skin, and lungs, and can cause headaches, loss of the sense of smell, nausea, and vomiting. Very high concentrations of ammonia can be immediately fatal, and can also be explosive. Chemical type burns from anhydrous ammonia can cause severe injury including blindness.

Closed-loop ammonia refrigeration systems normally maintain their quantities of ammonia, but these systems have a potential to lose small quantities of ammonia gradually over extended periods of time. Workers are most at risk of exposure to ammonia in the event of a leak, and during some servicing and maintenance tasks.

Ammonia can easily be smelled in air as it has a low odour threshold (2-55 ppm). Workers that have been repeatedly exposed over time to low levels of ammonia may have a reduced ability to smell ammonia at these lower concentrations.

Anhydrous ammonia is lighter than air and will rise; however, in the presence of moisture it will form ammonia vapours that are heavier than air and will fall. Depending on the terrain, weather, and nature of release, ammonia can present a risk to people a considerable distance away from a facility where a leak has occurred.

Stop Work / Stop Use

During this inspection the employer was advised that they would be required to stop work or stop use if unsafe conditions were present relating to (at least):

* Unsafe work practices involving ammonia servicing or maintenance operations. Such practices could include ammonia maintenance operations where appropriate personal protective equipment is not being used.
* The isolation systems for the ammonia room have been compromised such as enclosure doors propped open or removed
* Working on ammonia systems where lockout and / or isolation of the system is required but not implemented
* An ammonia system that has not been regularly inspected by authorities having jurisdiction, and shows clear signs of gross disrepair or significant non-functional safety systems.
Jurisdictional Requirements for Ammonia refrigeration systems

Ammonia refrigeration systems are subject to the requirements of the BC Occupational Health and Safety Regulation and the requirements of Technical Safety British Columbia ("TSBC", formerly known as British Columbia Safety Authority). If there are compliance issues determined during this inspection that relate to violations of the requirements of TSBC then a referral to that organization may be made. The employer will be advised that a referral to TSBC has been made as the following statement will appear in this inspection report:
“Based on the observation of one or more issues that appear to be non-compliant with Technical Safety British Columbia’s requirements, a referral has been made to that agency.”

Background

This facility has 3 sheets of ice with 2160 pounds of ammonia. The Thunderbird Arena operates from September to June and the Protrans and Bauer rinks operates year round. The system is serviced regularly by an external contractor. General maintenance activities are conducted on site by qualified on-site workers. The employer has 5 Fifth and 1 Fourth Class Power Engineers, and 2 trainees on staff.

The following documents relating to the ammonia system were reviewed.

1. Risk Assessment and Exposure Control Plan (ECP)

The employer has conducted a risk assessment and provided an Exposure Control Plan for review. The employer advised that the ECP was being updated. Refer to order #3 for details.

2. Emergency Procedures

The employer provided documents titled “Safe Work Procedure - Ammonia Response" and "Emergency Response Plan". The employer advised that they were currently updating their emergency procedures for an unintended ammonia release and have consulted an external safety consultant. Refer to order #5 for details.

Observations from this Inspection

- The ammonia monitor was located in the vestibule and has 2 set points (25 ppm and 175 ppm). The monitors are calibrated annually by an external contractor but the sensors were not bump tested monthly by workers. As such, order #2 is written. The ammonia sensors are alarmed with visual and audible alarms.

- The ammonia room ventilation system is in constant operation to ensure a negative pressure atmosphere in the room exists. Emergency ventilation ("high" flow rate) is activated by an operator in the vestibule or automatically when the upper alarm is set.

- The ammonia room has adequate signage prior to entry. The process piping systems in the ammonia room are clearly marked and identifiable and work procedures for each component are posted.

- The emergency ventilation exhaust stack was observed to be greater than 3 metres above the roof line.

- The ammonia room was tidy and clear of obstructions for access and egress.

- The respiratory protection systems (1/2 mask and full-face respirators with ammonia cartridges) were in place, fit-tested annually (as applicable), sanitary and ready for use.

- A tempered water emergency eyewash and shower station is tested monthly and located immediately outside the ammonia room.
Next Steps

The employer is required to submit a Notice of Compliance and supporting documents to WorkSafeBC, describing the steps taken or planned to comply with orders 1-5 by January 12, 2018. Correspondence may be emailed, faxed or mailed to this officer (contact information below).

If any person at this workplace has any questions or requires further information regarding this inspection report, please contact:

Yat Chow
Occupational Hygiene Officer
Email: yat.chow@worksafebc.com
Fax: 604-231-8662
Phone: 604-276-3100 Ext. 6407
Address: PO Box 5350 Stn. Terminal, Vancouver, BC, V6B 5L5
ORDERS/ITEMS

An employer who fails to comply with Part 3 of the *Workers Compensation Act*, the Occupational Health & Safety Regulation, or WorkSafeBC orders may be subject to monetary or other sanctions as prescribed by the *Workers Compensation Act*.

### Orders/Items - Full Details

<table>
<thead>
<tr>
<th>Order/Item No.1</th>
<th>Status: Outstanding</th>
<th>Cited: OHS6.127(2)</th>
</tr>
</thead>
</table>
| The employer and worker representatives stated that currently workers performing a hazardous work procedures on machinery such as draining the oil from the chiller where there is a risk of ammonia gas being released directly into the breathing zone of the worker are not wearing full facepiece respirator fitted with ammonia cartridges. The representatives stated that workers are using half-mask respirators for such a task. Without adequate respiratory protection, eye and face protection while carrying out this job tasks put the worker at serious risk of exposure to ammonia. 
This is in contravention of Occupational Health and Safety Regulation Section 6.127(2). 

A worker performing a hazardous work procedure on equipment or machinery where there is the risk of toxic process gas being released directly into the breathing zone, such as cylinder changing, system or line purging or draining, and leak detection and repair, must wear an appropriate respirator. 

**Measures to Ensure Compliance:**
Without undue delay, the employer must ensure workers are wearing at least a fit tested full facepiece respirator equipped with ammonia cartridges when workers are assigned to perform a hazardous work procedure on machinery such as draining oil from the chiller.

Pursuant to section 194 (1) of the Workers Compensation Act, the employer must prepare a Notice of Compliance report. In accordance with section 194 (2), this report must detail what has been done to comply with the order, and where compliance has not been achieved by the time the report has been submitted, include a plan of what will be done to comply and when compliance will be achieved. Please submit the report no later than January 12, 2018. |

<table>
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</tr>
</thead>
</table>
| The ammonia room ammonia sensor and alarm systems is currently not tested at least monthly for proper operation by authorized personnel. 
This is in contravention of the Occupational Health and Safety Regulation Section 6.128(3)(a). 

Monitoring and alarm systems must be 
(a) tested at least monthly for proper operation by authorized personnel using procedures set out in section 4.3 (2) or other procedures acceptable to the Board. 

**Measures to Ensure Compliance:**
Pursuant to section 194 (1) of the Workers Compensation Act, the employer must prepare a Notice of Compliance report. In accordance with section 194 (2), this report must detail what has been done to comply with the order, and where compliance has not been achieved by the time the report has been submitted, include a plan of what will be done to comply and when compliance will be achieved. Please submit the report no later than January 12, 2018. |
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<td>Outstanding</td>
<td>OHS6.119</td>
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</table>

The employer has developed and implemented an Ammonia exposure control plan (ECP). The employer representatives reported that that the ECP was not fully compliant and was in the process of reviewing it. Several deficiencies were noted including, but not limited to:
- The ECP did not identify how much ammonia was present and where it was located;
- The ECP did not have sections on responsibility of the employer (e.g. ensure that the ECP is developed and maintained and the joint health and safety committee or worker representative;
- The responsibility of a worker did not include the use person protective equipment and the reporting of unsafe conditions to the supervisor or employer;
- The risk assessment required did not include the circumstances, events, failures or errors that could cause conditions leading to an emergency;
- The risk assessment in the ECP identifies Low, Moderate and High risk activities, but there is no indication as to the frequency and duration of these tasks;
- The ECP identified an exposure limit of 50 ppm (ceiling) in which this value is not identified in the WorkSafeBC's Table of Exposure Limits;
- The procedure to use exterior doors to help ventilate the ammonia plant room circumvents OHS Regulation 6.122(a);
- Information on controls, such as PPE, does not reflect the hazard and level of PPE required (e.g. the use of a half-mask respirator while draining the chiller);
- Requirements for workplace inspections for the system is not identified;
- Record keeping is not identified as a requirement in the documents;
- The representatives were not aware when the ECP was last reviewed in consultation with the joint committee.

The employer has failed to develop an exposure control plan meeting the requirements of section 5.54, and the risk assessment indicates a risk of adverse health effect to workers from exposure to a toxic process gas.

This is in contravention of the Occupational Health and Safety Regulation Section 6.119.

If there is a risk of adverse health effect to workers from exposure to a toxic process gas, based on the risk assessment, the employer must develop and implement an exposure control plan meeting the requirements of section 5.54.

**Measures to Ensure Compliance:**

Pursuant to section 194 (1) of the Workers Compensation Act, the employer must prepare a Notice of Compliance report. In accordance with section 194 (2), this report must detail what has been done to comply with the order, and where compliance has not been achieved by the time the report has been submitted, include a plan of what will be done to comply and when compliance will be achieved. Please submit the report no later than January 12, 2018.
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<tr>
<td>5</td>
<td>Outstanding</td>
<td>OHS5.97(1)</td>
</tr>
</tbody>
</table>

### Order/Item No. 4

**Status:** Outstanding  
**Cited:** OHS5.102(b)

The employer has failed to conduct drills to test the adequacy of procedures and to ensure that workers and supervisors are familiar with their roles and responsibilities. The representatives reported that an emergency drill was last held a couple of years ago.

This is in contravention of the Occupational Health and Safety Regulation Section 5.102(b).

The employer must conduct drills to test the adequacy of procedures and to ensure that workers and supervisors are familiar with their roles and responsibilities.

**Measures to Ensure Compliance:**

Pursuant to section 194 (1) of the Workers Compensation Act, the employer must prepare a Notice of Compliance report. In accordance with section 194 (2), this report must detail what has been done to comply with the order, and where compliance has not been achieved by the time the report has been submitted, include a plan of what will be done to comply and when compliance will be achieved. Please submit the report no later than January 12, 2018.

### Order/Item No. 5

**Status:** Outstanding  
**Cited:** OHS5.97(1)

The employer has developed and implemented Emergency Response Procedures (ERP) for a hazardous materials response. During the review of the procedures, several deficiencies were noted including, but not limited to:

- The ERP did not specifically address an unintended ammonia release;
- The representatives reported that there are 2 muster stations but did not have a procedure to determine the appropriate muster station depending on wind direction (e.g. no wind sock);
- Did not have procedures to check and confirm the safe evacuation of all workers;
- Did not have procedures for spill cleanup, testing and re-entry;
- The emergency plan has not been reviewed annually in consultation with the joint committee.

This is in contravention of the Occupational Health and Safety Regulation Section 5.97(1).

A workplace must have a written emergency plan, appropriate to the hazards of the workplace, that addresses the requirements of sections 5.98 to 5.102.

**Measures to Ensure Compliance:**

Pursuant to section 194 (1) of the Workers Compensation Act, the employer must prepare a Notice of Compliance report. In accordance with section 194 (2), this report must detail what has been done to comply with the order, and where compliance has not been achieved by the time the report has been submitted, include a plan of what will be done to comply and when compliance will be achieved. Please submit the report no later than January 12, 2018.
REFERENCES

In addition to any orders, or other items, and the information provided in the Inspection Notes section in this Inspection Report, the officer may discuss other health and safety issues with the employer arising out of the inspection. The information below sets out the health and safety requirements discussed with the employer, and unless otherwise noted, violations of these requirements were not observed.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Details Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCA194(1)</td>
<td>Notice of Compliance</td>
</tr>
<tr>
<td></td>
<td>This Inspection Report contains one or more orders requiring you to submit a Notice of Compliance report. This report must be prepared in accordance with section 194(2) of the Workers Compensation Act.</td>
</tr>
<tr>
<td>WCA194(2)</td>
<td>Notice of Compliance</td>
</tr>
<tr>
<td></td>
<td>The employer or other person directed by an order under subsection (1) must prepare a compliance report that specifies: (a) what has been done to comply with the order, and (b) if compliance has not been achieved at the time of the report, a plan of what will be done to comply and when compliance will be achieved.</td>
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### Lab Samples Taken

<table>
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<th>Workers onsite during Inspection</th>
<th>Notice of Project Number</th>
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<tbody>
<tr>
<td>N</td>
<td>17</td>
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### Inspection Report Delivered To

<table>
<thead>
<tr>
<th>Employer Representative Present During Inspection</th>
<th>Worker Representative Present During Inspection</th>
<th>Labour Organizations &amp; Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan Cooper</td>
<td>Jeff Harley</td>
<td>CUPE 116</td>
</tr>
<tr>
<td></td>
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<td>CUPE 2950</td>
</tr>
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### WorkSafeBC Officer Conducting Inspection

<table>
<thead>
<tr>
<th>Yat Chow</th>
</tr>
</thead>
</table>

### *Inspection Time and Travel Time*

<table>
<thead>
<tr>
<th>*Inspection Time</th>
<th>*Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.75 hrs</td>
<td>1.25 hrs</td>
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</tbody>
</table>

*The time recorded above reflects the inspection time and travel time associated with this inspection report and includes time spent on pre and post-inspection activities. Additional time may be added for subsequent activity.*

### Right to Review

Any employer, worker, owner, supplier, union, or a member of a deceased worker's family directly affected may, within 45 calendar days of the delivery date of this report, in writing, request the Review Division of WorkSafeBC to conduct a review of an order, or the non-issuance of an order, by contacting the Review Division. Employers requiring assistance may contact the Employers' Advisers at 1-800-925-2233.

WorkSafeBC values your feedback. To obtain that feedback, an external market research provider may be contacting you to complete a survey.
December 14, 2017

THE UNIVERSITY OF BRITISH COLUMBIA
C/O WCB CLAIMS ADMINISTRATOR
HUMAN RESOURCES
6TH FLOOR 6190 AGRONOMY RD
VANCOUVER BC V6T 1Z3

Reference: Inspection Report #201717538077A

Dear Dan Cooper,

One or more orders cited in the above referenced Inspection Report includes a requirement for you to provide a Notice of Compliance Report (NOC) to WorkSafeBC, explaining the actions you have either taken, or plan to take to comply with the order(s).

Please note that a copy of this NOC has also been provided to your head office, along with a copy of the related Inspection Report. Coordinate completion and submission of this NOC with your head office.

Instructions

1. Complete in full the attached Notice of Compliance Report. If you prefer to submit documents in addition to or in place of this NOC, note the associated Inspection Report number on those documents.

2. Submit by email, fax, or mail one copy of the NOC and any other related documents to the prevention officer identified below by the due date specified on the Notice of Compliance Report or as otherwise specified in the Inspection Report. Failure to prepare and submit a NOC Report by the date specified may result in enforcement action.

3. If compliance has not been achieved by the due date of the NOC, the employer or other person must also prepare a follow-up compliance report when compliance is achieved, and submit the report to WorkSafeBC.

4. A copy of all completed NOC reports must be posted in a conspicuous place at or near the workplace where the inspection was conducted for at least seven days, or until compliance has been achieved, whichever is the longer period.

5. Provide a copy of all completed NOC reports to the joint committee or worker health and safety representative, as applicable. If the report relates to a workplace where workers of the employer are represented by a union, send a copy of the report to the union.

Submit NOC to:
Attention: Yat Chow (Occup Hygiene Officer)
Phone: (604) 244-6407
Fax: (604) 231-8662
Email: Yat.Chow@worksafebc.com
Mailing Address: Worker and Employer Services Division
WorkSafeBC
Field Svcs - Van/Rich/Delta
6951 Westminster Hwy
Richmond BC V7C 1C6

Should you have any questions, please contact the officer identified above.
The *Workers Compensation Act* requires that the employer must post a copy of this report in a conspicuous place at or near the workplace inspected for at least seven days, or until compliance has been achieved, whichever is the longer period. A copy of this report must also be given to the joint committee or worker health and safety representative, as applicable. If the report relates to a workplace where workers of the employer are represented by a union, send a copy to the union.

THE UNIVERSITY OF BRITISH COLUMBIA
C/O WCB CLAIMS ADMINISTRATOR
HUMAN RESOURCES
6TH FLOOR 6190 AGRONOMY RD
VANCOUVER BC  V6T 1Z3

Reference: Inspection Report #201717538077A

Refer to the ‘Orders - Full Details’ section of the Inspection Report when completing this form.

<table>
<thead>
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<td></td>
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Please submit the completed NOC report along with any supporting documentation, or in turn the documents that replace it no later than Saturday, January 13, 2018 or as otherwise specified in the Inspection Report.

Submit NOC to:
Attention: Yat Chow (Occup Hygiene Officer)
Phone: (604) 244-6407
Fax: (604) 231-8662
Email: Yat.Chow@worksafebc.com
Mailing Address: Worker and Employer Services Division
WorkSafeBC
Field Svcs - Van/Rich/Delta
6951 Westminster Hwy
Richmond BC
V7C 1C6

For Employer Use Only
Person Submitting this Report (Please Print)          Date Submitted

Phone:                      Email:
Month:    Day:    Year:

For WorkSafeBC Use Only
Person Receiving this Report (Please Print)          Date Received

Phone:                      Email:
Month:    Day:    Year: