

**Notable Event Report**

Title of Event			
<b>Event Title:</b>	Refrigerant Detections System Disabled Following Discovery of a small leak- Interim Mitigations were Less than adequate (LTA)		
<b>Date and Time of Occurrence:</b>	11/29/2016	<b>Notable Event Number:</b>	FML-16-1130
<b>Event Location:</b>	Building 60 –CUP	<b>Date Notable Event Report is Due*:</b>	12/30/2016

\*The Notable Event Report is due to the ESH&Q Reporting Officer with 30 days of the Initial Fact Finding Meeting unless an extension is requested.

**Summary of Event and / or Injuries, including Initial Fact Finding Meeting information: determine the chain of events and timeline. Use attachment as necessary.**

On November 29, 2016 an IH employee and Safety employee were in the CUP building (Building 60) to inspect the eye wash station. While walking through the building they noticed that the refrigerant alarm was not on. The IH employee emailed the FM Mechanical Manager and asked when the system would be returned to service. The FM Mechanical Manager replied that the monitoring system was off due to a slow refrigerant leak however the building refrigerant exhaust ventilation was manually activated and rollup doors partially open. The IH employee then replied to the FM Mechanical Manager and cc'd ESH Department line management stating that other means of hazard control needed to be in place (e.g. signs, PPE). Line management informed their supervisor and the Reporting Officer. The Reporting Officer conducted a fact finding meeting to determine if this event met Notable Event criteria.

Timeline provided by FM&L and includes additional notes from initial timeline created during Fact Finding.

1. 8/8/16 Monitor alarms and is cleared multiple times – entry to building after hand held leak detector indicates no refrigerant present. Monitor alarms several times overnight and is reset. Roll-up doors are opened to mitigate possible “real” leaks. Notified all workers in area of monitor issues and NOT to enter building if doors are down. Discussed with C. Jones and R. Mattox of JLab, Kenny with Kirby, Carr Electric and JCI controls techs. Monitor remains ON. See WO# 56784-2 for cautions, mitigation procedures and instructions. FM&L responded to the alarm, but were unable to find the leak location
2. 8/9/16 JCI issued service call to find leak – no leaks found on either chiller. Monitor continues to intermittently alarm overnight. See WO# 56784-1
3. 8/10/16 MRI issued call to re-check for leaks as well as FMO-M checking for leaks – none found (minor /normal loss at 60-CH-1 seal which is NOT repeatable). WO# 56784-2
4. 8/10/16 ~ mid-day alarms stop. Monitor remains ON.
5. Unable to troubleshoot further as chillers are operating and cannot be turned off as the TL system is inoperable due to construction activities (UIM). Monitor remains ON, roll-up doors remain open.
  - The roll up doors were fully open until ~11/14/2016 when they were brought down to approximately 4” from the finished floor. This was done to protect the area as temperatures were reaching the freezing mark.
6. 8/25/16 JCI performs scheduled quarterly inspection – machine operating normally with no loss of capacity noted (which would be an indicator of refrigerant loss). Variable orifice actuator is found inoperable and repair is quoted.
7. 9/7/16 JCI replaces VO actuator and performs operational check – machine operating normally. See WO# 57051-1.
8. 10/31/2016 CUP building was released to JLab
  - The test lab work was complete the first week of November therefore providing the ability for FM&L to scheduled

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permanent repair. FM&L began to switch attention back to the CUP building.

9. 11/14/16 Monitor begins alarming repeatedly - late in day
10. 11/15/16 MRI tasked to find refrigerant leak (again) – leak is found at VO actuator valve, manual valve and gaskets. Packing is tightened to control loss – this action is very successful and renders the leaks undetectable with hand held detectors (multiple detectors tried). Monitor continues to alarm with no detectable refrigerant present – monitor is disabled at this time. Roll-up doors remain locked open to mitigate the potential refrigerant hazards until repairs to chiller are able to be implemented (chiller has to be off ~ 1 week). See WO# 58306-1
11. Award of repair delayed due to contract negotiations and funding deficiencies with JCI and MRI. Procurement has requested more information before they would officially award this repair contract.
12. 11/21/16 Fire Protection is wary of potential freeze with open doors - Roll-up doors closed to approximately 6" open. Mike S. on vacation at this time, however this topic was discussed with R. Myles the previous week with a warning NOT to close the doors and discussed reasons (no refrigerant monitor). Exhaust fan activated and fresh air make-up louver / damper overridden open (by C. Jones).
13. 11/29/16 IH notices monitor is OFF while evaluating eye wash concern. Roll-up doors re-opened, area marked DO NOT ENTER. Monitor activation attempted – full alarm with no detectable refrigerant present. Monitor remains OFF.
14. 11/30/2016 IH posted doors warning of leak and monitoring system disabled, hand-held monitor or SCBA required for entry.
15. 11/30/16 Repair awarded to MRI – awaiting repair parts.
16. 12/2/16 Sentec technical support contacted – after exhaustive testing, the monitor will be shipped back to Sentec for evaluation / repair as it is believed (proven) unreliable.
17. 12/6 unit received at Factory for repairs
18. 12/8 Estimate to repair monitor was received
19. FM Mechanical Staff closed doors at the CUP Building due to weather freezing pipes / damage – email notification to Mike Sprouse, Todd Meier, Carrol Jones and copied Jennifer (this was discussed with IH prior to closing doors)
20. 12/9 Monitor was repaired
21. 12/12 refrigerant monitor repaired and re-installed; IH removes initial postings from door.
22. 12/13 IH installed hazard communication signs on CUP Bldg doors
23. 12/27/2016 Full repair was complete without incident

#### NOTES:

FM&L would check the CUP building approximately once a week with a handheld refrigerant gas detector, and they reported no instances where these checks found elevated refrigerant gas concentrations/alarm conditions with the interim ventilation controls in place.

Per the SOTR, subcontractors and FM&L staff that entered that building were informally briefed on the potential hazards associated with entry into this area.

Through the security shift turn-over logs, security guards were tracking the CUP building status that the door were to remain open, ever since the refrigerant leak was first identified.

Below is the entry pertaining to this event which was entered on the Daily Instructions for the Guards. Per the Guards SOTR, this notice remains on the log until the repair is made. Email from FM&L Mechanical Engineer to guards was sent on August 22, 2016.

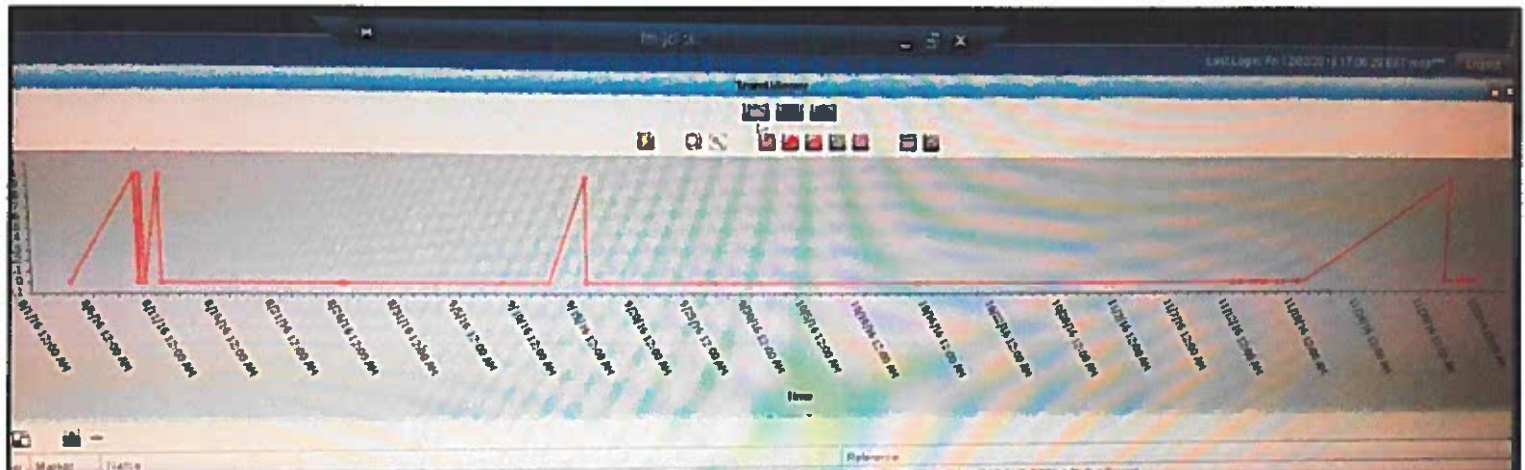
**Summary of Event and / or Injuries, including Initial Fact Finding Meeting information:** determine the chain of events and timeline. Use attachment as necessary.

*Daily Instructions For Guards - Check Your Posts*

Subject Post Action

Adjacent to Building 60 All The two roll-up doors adjacent to Building 60 are to remain open until a repair to the chiller is completed in mid September. POCs are Mike Sprouse, 757-846-1707 or Carroll Jones, 757-876-1778.

The monitor has been switched on/off on multiple occasions (with undetermined duration) during this specific time frame, trend data supports the recollection of the events - see below. The monitor was OFF for electrical outages, control modifications, construction activities such as pipe painting, cleaning and some chiller evaluation work, but the monitor was ON / active to alarm on 11/14/16. This would suggest our length of potential exposure is less than originally determined.



Issue appears there were 2 separate failures leading to complex evaluation and solution(s) development. There was a leak, and the monitor was determined to be unreliable. Both repairs have active solutions in-motion and will be vigorously executed.

**Causal Analysis: (Use attachment as necessary)**

<b>Root Cause:</b>	<p>Work Organization and Planning was LTA- When the conditions of the building changed (fixed monitoring system continued to alarm following several failed attempts to find a leak using a hand-held device), they failed to recognize and properly mitigate the hazards associated with this building as a result of the refrigerant leak to include a potential catastrophic event. Initial mitigations were rationalized for a small refrigerant leak only: roll-up doors were locked open, exhaust fan and air intake fans were turned on; and did not account for the potential catastrophic failure that may have occurred.</p> <p>Employees did not contact all invested parties when the change occurred. Employees were not aware that they should communicate changes with Industrial Hygiene, per the draft OSP. could have given guidance as to how to properly proceed with mitigating all potential hazards until the system could have been restored.</p> <p>As a result, entrants were able to access the building with no visual clues, there were no personnel door locks, or hazard communication signage stating that the alarm had been turned off and who to contact if entry into this building was needed. Briefing to potential building entrants were informal at best and did not account for "others" that may have needed access to this building for a variety of reasons.</p>
<b>Contributing Causes:</b> (List as many as apply.)	<p>Verbal Communication LTA among work groups. The change in conditions was not effectively communicated to all invested parties. Management was unaware that the refrigerant system alarms was no longer on, that the refrigerant leak detection system was offline, and that the employees believed that they system may be defective in nature.</p> <p>Written Communication not used- There is no approved procedure (OSP) for handling refrigerant leaks. Employees were working from an old DRAFT version of an OSP. The OSP approval process will give SME's the opportunity to review and provide valuable input for employees. This had not occurred when this event occurred.</p> <p>Written Communication content LTA- Draft procedure (OSP) did not cover all scenarios that may occur in the event of a leak. Employee did not have a procedure on how to handle communication if/when a fixed alarm system must be turned off for any reason. Also, the draft procedure did not cover appropriate mitigation efforts in the event of a leak, which would include the use of hand held meters, and PPE as needed.</p> <p>Supervisory Methods LTA- Emphasis on schedule and job shuffling. Employees were faced with mixed priorities as they were trying to balance the Test Lab basement work and the CUP building work during the same time. Both systems must remain on for commissioning activities.</p>

Extent of Condition Check		JLab CATS Number	Target Date	Action Owner
N/A				
Does this event involve failed equipment?	Y N	Is there similar equipment in other areas?	Y N	** If yes, assign extent of condition check to the appropriate DSO(s).

Corrective Action(s)	JLab CATS Number	Target Date	Action Owner

Corrective Action(s)	<u>JLab CATS Number</u>	Target Date	Action Owner
Put up signs on the building to ensure entry is made with hand-held refrigerant monitor or SCBA until leak is repaired and monitoring system returned to operation.  Evidence of completion: Pictures	NE-2016-20-01-01	11/30/2016 complete	Jennifer Williams
Install locks to the personnel doors to ensure only authorized personnel are able to enter the building.  Evidence of completion: Picture of the doors with keyed locks	NE-2016-20-01-02	03/31/2017	Todd Meier
Send the fixed alarm off-site for evaluation.  Evidence of completion: Estimate from contractor	NE-2016-20-01-03	02/28/2017	Mike Sprouse
Update and finalize the OSP for entries into these specific areas. Be sure to include lesson learned from previous incidents. The OSP should also include communication procedures in the event of a leak and the need to turn off any early detection system and cover the use of a hand held meter.  Evidence of completion: Link to approved OSP	NE-2016-20-01-04	01/31/2017	Carroll Jones
Install hazard communication signs on CUP entry doors to inform entrants of the presence of refrigeration machinery/Freon and response required in case of an alarm.  Evidence of Completion: Picture of signage	NE-2016-20-01-05	12/13/2016 complete	Jennifer Williams
Once the OSP is updated with the new steps to cover lessons learned and additional steps, review with FM&L staff that will be required to work in building with refrigerant systems.  Evidence of completion: Copy of material used for briefing and sign-in sheet.	NE-2016-20-01-06	03/31/2017	B. Sperlazza
Ensure all parties responsible for entering these areas have the appropriate SCBA training.  Evidence of completion: Snapshots of training records	NE-2016-20-01-07	04/30/2017	B. Sperlazza
Applicable Lessons Learned from recent Notable Events will be shared to supervisors during supervisor training.  Evidence of completion: Training Materials and sign in sheets	NE-2016-20-01-08	9/30/2017	Bob May

Lessons Learned (Confer with Lessons Learned Coordinator) (Use attachment as necessary)	<u>Lessons Learned Number</u>
When planning our work, we should always prepare and mitigate for the worst case scenario. This will ensure that we have all the proper mitigations in place before we proceed.	988
Communication is the key. When a change in conditions occur, consult with all invested parties. This will ensure that all potential scenarios are covered and that invested parties are notified of the change in conditions. Consider a checklist when applicable or if notifications involve multiple groups.	988

**Witness Accounts:** (Use attachments as necessary. Box will expand as necessary)

JW:  
 I accompanied Tina Menefee to the CUP building Tuesday, November 29th, to check the location of the eyewash in the building after a question was raised to her by the Safety Warden during a recent safety walk-through. She texted the Safety Warden to inform him that we would be entering the building. Two doors were unlocked so we entered the building and looked at the eyewash and chemical location.

Before we exited the building I told Tina that I wanted to look at the refrigeration monitoring system since I had reviewed the OSP for the area and I wanted to verify the monitoring system manufacturer and model.

Once I located the panel I noticed that the display was black and did not indicate concentration of refrigerants. I took a picture of the display and emailed Carroll Jones notifying him that the monitoring system was turned off and asked when it would be back online.

Carroll responded via email stating:  
*"The refrigerant monitor is offline due to a slow refrigerant leak on Chiller 60-CH-1. Roll-up doors are partially open and the refrigerant exhaust system has been manually activated until the repair is completed. If the refrigerant monitoring system were online at this time there would be intermittent alarms."*

On November 30th I responded to Carroll's email and copied by Manager (Bill Rainey) to notify him of the event. Email to Carroll (with Bill cc'd below):  
*"I understand that the alarms would be a nuisance since you are already aware there is a leak, but staff can still enter the building without knowing that they could be in a harmful environment.*

*If the alarm is being activated, then the exhaust and open doors are not effectively making the area safe for entry.*

*Could the monitoring system be returned to operation, or lock the building and post a sign to eliminate entry? Entry should only be made if we can monitor or use PPE (e.g. SCBA if we can not verify air quality)."*

Bill Rainey contacted me stating that he would notify Mary Logue and Tina Johnson of the event. I then went to the CUP building to post signs that the monitoring system was off and entry required additional monitoring equipment or PPE (i.e. SCBA).

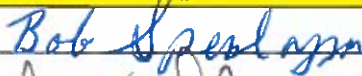


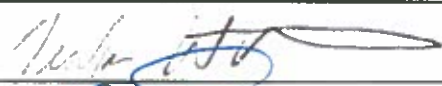

**Records, Documents, Pictures, and Other References:** (Copy and paste, use attachments or document links as necessary)

Emergency Notifications Made (Subsequent to the Event):	Date	Time
Fire, Rescue & Emergency Medical: (9-911)		
Guard Post: x5822; 269-5822		
Occupational Medicine 269-7539		
ESH&Q Reporting Officer: 876-1750	11/30/2016	11:00
Crew Chief 630-7050		
Industrial Hygiene: 269-7863:		
Other:	11/30/2016	12:00


<b>Confirmation Review Distribution:</b> Investigation Team Members Affected Division Managers ESH&Q Reporting Officer	It is asked that you review and provide comments to this document to the Lead Investigator (denoted on Page 1) within <u>30</u> days. Your comments will be reviewed and incorporated as appropriate. Thank you for your consideration in this matter.
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### Investigation Team Confirmation:

The below signees, confirm to the best of their knowledge, that the information presented in this document is accurate and complete.

Role	Print	Signature	Date
Lead Investigator	Bob Sperlazza		1/19/17
Co-Lead/ Reporting Officer	Tina Johnson		1/19/17
SME- Mechanical Engineer	Todd Meier		1/19/17
SME- Industrial Hygiene	Jennifer Williams		1-19-17
FM&L	Ed Douberly		1-19-17

### Acceptance/Acknowledgement of Facts

	Print	Signature	Date:
Associate Director/ Department Manger	Rusty Sprouse		20 Jan 17

Upon confirmation submit document to the ES&H Reporting Officer for completion and distribution.

<b>Documentation of Findings: (To be Completed by ESH&amp;Q Reporting Officer)</b>	
<u>Notable Event Number:</u>	FML-16-1130
<u>CATS Number:</u>	NE-2016-20-01
<u>Lessons Learned</u>	988

<b>Number:</b>	
<b>ORPS Number:</b>	SC--TJSO-JSA-TJNAF-2016-0007
<b>NTS Number:</b>	N/A
<b>CAIRS Entry:</b>	N/A
<b>DOE Cause Code:</b>	A4B3C08 ; A5B3C01, A5B4C01, A5B4C06.
<b>ISM Code:</b>	Develop and Implement hazard controls, Analyze the hazards



Unless otherwise specified the following is to be completed by the Lead Investigator.

Step 1 Initial Fact-Finding Meeting (To be held as soon as reasonably possible following event (within 24 hours))			
<b>Date:</b>	11/30/2016	<b>Time:</b>	1600
<b>Location:</b>	SSC -53		
Required Attendees: (Print Name)		Optional Attendees: (Print Name) Present	
<b>Lead Investigator:</b>	Bob Sperlazza	<b>Associate Director:</b>	Rusty Sprouse Present
<b>ESH&amp;Q Representative:</b>	Tina Johnson	<b>TJSO Observer:</b>	Steve Neilson Present
<b>Supervisor of involved persons(s):</b>	Rusty Sprouse	<b>Subject Matter Expert(s), Facility/Equipment Owner as applicable:</b>	
<b>Involved or impacted person(s):</b>		Jennifer Williams	
	Carroll Jones, Mike Sprouse	Ed Douberly	
<b>Witness(es):</b>			

Agenda (Ensure the pace of the meeting allows time for accurate note taking.)	√ if Complete
1. Introduction – Provide Event Title, Date and Time of Occurrence, and Location:	√
2. Attendance - Are Required Attendees present.	√
3. Purpose of Initial Fact-Finding meeting.	√
4. Event Reconstruction – Use information to complete Section 3. <u>Summary of Event and/or Injuries</u> below.	√
a. Personnel and organizations involved in the event.	√
b. Conditions and actions preceding the event.	√
c. Chronology (timeline) of the event; and	√
d. Immediate actions taken in response to the event.	√
5. Clarify information – <u>Subject-Matter Expert</u> (SME) confirms work conditions.	√
6. <u>Stop Work</u> or the <u>Tag Out</u> Required? If “Yes” – establish the restart criteria and inform the affected Management chain.	N/A
7. Compensatory Actions Required? If “Yes” determine responsibility and include confirmation documentation.	N/A
8. Records or documentation required to confirm, clarify, or complete information (i.e., work plans, work control documents, photos, etc).	√
9. Other Questions or Concerns: Ask attendees if there are any other questions, concerns, or information that they wish to provide.	√
10. Obtain TJSO Observer feedback on conduct of fact finding meeting and potential improvements.	√

<b>Step 2 Investigation Team:</b>		<b>Date Convened:</b> (Within 24 hours of Fact Finding Meeting.)	12/01/2016
Role	Name	Department/Group	Phone
Lead Investigator/DSO	Bob Sperlazza	FM&L	6241
Co-Lead	Tina Johnson	ESH&Q	7611
FM&L Mechanical Engineer	Todd Meier	FM&L	5596
SME- IH	Jennifer Williams	ESH&Q	7882
FM&L Fire Engineer	Ed Douberly	FM&L	6638
<u>TJSO Observer</u>	Steve Neilson	TJSO	7215

Environmental Aspects			
<b>Type of Material Released:</b>		<b>Quantity:</b>	
Refrigerant R134a		Approximately 50 pounds of loss	
<b>Source:</b>		<b>Time Flow was Halted or Controlled:</b>	
CUP Building Chiller		12/27/2016 full repair was complete	
For Investigation Team (✓ All That Apply):			
<input type="checkbox"/> N/A	Reportable Quantity	<input type="checkbox"/> N/A	Impact Ground/Soil
<input type="checkbox"/> N/A		<input type="checkbox"/> N/A	Storm Water Channel/Drain
<input type="checkbox"/> N/A		<input type="checkbox"/> N/A	Sanitary Sewer

Categorization and Reporting			
(To be completed by ESH&Q Reporting Officer within two hours – unless essential information is still pending)			
<b>ORPS Determination:</b>	<b>Date:</b>	12/1/2016	<b>Time:</b> 1122
<p>** Email to Steve Neilson, TJSO on the above date and time: The following measures are now in place or underway to ensure the safety of those that may enter that building:</p> <ol style="list-style-type: none"> <li>1. Signs on doors which state the condition of the building (Do not enter, alarm systems not operational, and contact FM&amp;L before entry)</li> <li>2. The bay doors remain open and are locked to ensure they remain open- Guards are aware that they must remain open</li> <li>3. Local exhaust was placed at the leak</li> <li>4. Door locks are being installed</li> </ol> <p>The lab has determined that this is a notable event and that this event is also ORPS Reportable:</p> <p>Group 10 - Management Concerns and Issues SC 3- An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.</p> <p>The Lab will complete the ORPS notification and notable event report in the allotted time frame.</p> <p>-- Tina Johnson</p>			

**10 CFR 851 Screen:**

**Date:** 12/1/2016

**Time:** 1122

Negative: This event does not meet the voluntary criteria as a discreet programmatic weakness.

**Final Distribution:**

- [ES&H Reporting Officer](#) (Original)  
 Associate Director/Department Manager
- [Division Safety Officer](#)  
 Investigation Team Members
- [ESH&Q Liaisons](#)

**Form Revision Summary**

- Revision 1.6 – 02/22/16** – Updated form to reflect extent of condition ensuring it covers failed equipment per MOA
- Revision 1.5 – 10/04/13** – Changed COE to Lessons Learned; updated links.
- Revision 1.4 – 09/06/12** – Qualifying Periodic Review. Clarification of content only.
- Revision 1.3 – 01/31/12** – Updated ESH&Q Reporting Officer assignment from S.Smith to C.Johnson per M.Logue  
 Edited to clarify process steps.
- Revision 1.2 – 10/20/11** – Updated ESH&Q Reporting Officer assignment from J.Kelly to S.Smith per M.Logue.
- Revision 1.1 – 05/24/11** – Edited to clarify process steps.
- Revision 1.0 – 11/23/10** – Updated to reflect current laboratory operations.

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	<a href="#">Tina Johnson</a>	02/22/16	02/22/19	1.6

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