JSA
THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY
12000 Jefferson Avenue
Newport News, VA 23606
Phone: (757) 269-7100

Notable Event

Event Title: ACC-21-0809- Employee Received 120 Volt Shock While Unplugging Equipment-No Injuries

Date Submitted: 09/03/2021 10:15:05 AM **Response Owner:** Andrei Seryi (seryi)
Category: Personnel Safety **Date of Occurrence:** 08/09/2021 05:15 pm **Event Location:** 58_1
Date Notable Event Report is Due: 09/09/2021

Short Summary of Event and/or Injuries

On August 9, 2021 an SRF Operations worker received an electrical shock after unplugging an electrical cord in the Test Lab High Bay. Late in the shift he had experienced a GFCI trip and observed condensation from an LN2 piping and valve assembly dripping onto the outlet box. This prompted him to submit a priority 1 work order to FML, about 2 hours before end of shift. Prior to ending work at 1715, he decided to unplug all electrical cords from the outlet box. While unplugging the fourth and final cord, he experienced an electrical shock travel from his right hand, up his right arm, and terminate in his right pectoral muscle region. The worker noticed water on the prongs, took a picture, and then contacted his supervisor and Occupational Medicine, who directed him to Port Warwick ER. He was later discharged with no restrictions.

Details of the Event and/or Injuries

Conditions and actions preceding and leading up to the event.
* Indicates information disclosed through workers subsequent written statement, and Work Order submission.

o The involved worker started his day at 07:00. He was performing cryo-cycling of doglegs. A common procedure that he performs often. The operation normally runs unattended and only
requires occassional checks to ensure the program is running properly.

o About 14:45, the worker returned to the cryo-cycle equipment to discover that the electrical outlet's GFCI had tripped. Seeing no abnormal conditions, he resets the GFCI.*

o About 15:30, the worker began to shut down the equipment. He saw that water (condensation) was dripping down from the liquid nitrogen piping onto the electric receptacle.
Thinking this is why the GFCI had tripped earlier, he took pictures of the box and receptacle to record the conditions (these photos are attachments).* He contacted his supervisor and sent
FM&L a work request via the work request system. The involved worker put this in as a priority 1 work order.

o After about 1.5 hours (17:15), the worker concluded that FM&L might not respond until tomorrow. He no longer observed water on the receptacle, and not wanting to leave the cryo-
cycling equipment at risk of electrical damage, he began unplugging the cords from the receptacle. The worker commented that he put his left hand in his pocket as a safety
measure he learned in the Air Force and proceeded to unplug the cords. He pulled out three plugs successfully. When pulling out the fourth plug he felt a shock travel up his right arm and
shoulder to his pectoral muscle. The worker noticed there was water on the prongs of the plug, so he took a picture of the plug (this photo is an attachment). The worker stated that none of
the cords/plugs was observably wet when he made the decision to pull them out.

o ~17:17 the worker sent a text to his supervisor and called Occ Med, who referred him to Port Warwick ER for an EKG. The involved worker called FM&L and relayed what had occurred.

o ~17:25 personnel from FM&L arrived to the scene to lock out the breaker. They secured the scene and lent general assistance.

o ~18:10 the involved worker and his supervisor arrived at Sentara Port Warwick ER. The worker was triaged, given an EKG and blood test.

o ~21:40 the worker was discharged with instructions to have a follow-up visit if not symptom-free within a few days. His supervsor drove them back to the Test Lab parking lot where the
worker's car was parked. The worker drove off site.

Pertinent Conditions:
o The electrical receptacle was a GFCI. Although the GFCI had tripped earlier in the day, it did not trip when the employee received the shock.*
o The GFCI was tested and found to be functioning properly.

Causal Analysis

Judgement of Needs

Doe Cause Code: A1: Design / Engineering Problem, B5: Operability of Design / Environment LTA, C2: Physical environment LTA
Risk Code: 2

JON #1: Management needs to ensure that equipment and supporting infrastructure are suitable and "fit for use", and performs and operates as expected.

Conclusion:
The insulation installed on the LN2 piping was not effective as a control (barrier) against the formation of condensation. Either the process owner(s) or subcontractor chose insulation material inappropriate for the application, or installed the insulation poorly, leaving gaps where exposed, below dew point pipe surfaces could condense water from the ambient air of the Test Lab.

Corrective Action:

Action Owner(s): Larry King, Philip Denny **Due Date:** 12/31/2021

CA #1: Plan and implement the reinsulating of the LN2 piping associated with the cryo-cycling cabinet. Acceptable performance will protect against condensation and the resulting accumulation of water in the interior spaces of the Test Lab.

Corrective Action:

Action Owner(s): Tony Reilly, Philip Denny **Due Date:** 03/31/2022

CA #2: When executing projects (such as the relocation of equipment), management must ensure the work is supported by the preparation and use of acceptance criteria against which the project implementation can be measured and monitored. Develop and implement a User Acceptance Test (UAT) mechanism. This will create a "forcing function" to verify the work meets all installation and operational expectations.

Root Cause

LN2 piping insulation coverage insufficient to prevent the condensing of moisture from the atmosphere

Judgement of Needs

Doe Cause Code: A3: Human Performance LTA, B2: Rule Based Error, C2: Signs to stop were ignored and step performed incorrectly
Risk Code: 2

JON #2: Management needs to ensure that workers are adequately trained and have a knowledge of their work practices that allows performance in the "skill-based" mode (fluency). Management also needs to ensure that workers have a clear understanding of expectations regarding safety practices, hazard identification and mitigation controls.

Conclusion:
The involved worker proceeded with unplugging the electrical cords from the wall-mounted receptacle box, an action he should have recognized as high-risk given his earlier observation of condensation dripping onto the electrical outlet box and cords and an associated trip of the GFCI breaker. The fact that, after observing the aforementioned conditions and the GFCI trip, the involved worker submitted a priority 1 work order in the work request system substantiates the fact that the involved worker recognized the hazard. The involved worker later dismissed the hazard based solely on his observation that the condensation that had dripped down and accumulated on the electrical box was no longer visible, and that no additional GFCI trips had occurred.

HPI Error Precursor(s): HN#6 - Inaccurate Risk Perception, HN#4 - Complacency/Overconfidence

Corrective Action:

Action Owner(s): Larry King **Due Date:** 12/31/2021

CA #3: Provide appropriate training/retraining aimed at closing gaps in the worker's ability to perform in the "skill-based" mode.

Corrective Action:

Action Owner(s): Tim Fitzgerald **Due Date:** 03/31/2022

CA #4: Incorporate the operating experience from this event into pertinent electrical/LOTO training curriculum, possibly as a case study.

Corrective Action:

Action Owner(s): Larry King **Due Date:** 12/31/2021

CA #5: Provide greater levels of management oversight and behavior monitoring to verify that the worker is capable of working safely, and has the ability to make appropriate decisions when encountering the unexpected.

Root Cause

A3B2C02 - Human Performance / Rule Based Error / Signs to Stop were Ignored - Visual change in appearance of the electrical box and cords (no longer wet) led employee to believe there was no longer moisture on/in the receptacle, and to ignore earlier signs of hazardous conditions

Root Cause

A3B3C01 - Human Performance / Knowledge Based Error / Attention was Given to Wrong Issues - Involved worker became focused on ensuring the equipment was unplugged from an outlet which he recently observed to be wet. Prioritized equipment safety over his personal safety.

Root Cause

A3B3C03 - Human Performance / Knowledge Based Error / Individual Justified Action by Focusing on Biased Evidence - Involved worker assessed that it was safe to proceed based on his observation that there no longer was water on the exterior of the outlet box and cords.

Extent of Condition Check

Risk Code: 2

FM&L has conducted checks of outlets in the follwoing buildings: EEL, Test Lab, and TED.

Does this event involve failed equipment? NO

Is there similar equipment in other areas? YES

Records, Documents, Pictures, and Other References

Attached documents to this report are the following:
1) Fact-Finding Meeting minutes
2) Involved Worker Statement (2- original + supplemental)
3) Involved Worker's Supervisor Statement
4) FM&L Personnel Statement
5) Photo(s) taken by the involved worker of conditions exisitng prior to the shock event, and of the electrical cord/plug-end immediately following the shock event.
6) Communications materials prepared by the Lab's Electrical Safety Program Manager (PowerPoint)
7) Email of the Work Order submitted by the involved worker communicating the existence of conditions/hazards warranting priority attention.
8) Photo(s) of the immediate corrections (within 24 hrs) conducted by FM&L showing the upgrades (now IPX-rated) to the wall-mounted electrical box.
9) Causal Analysis - Ishikawa (Fishbone) diagram for the event.
10) Causal Analysis - 5-Why's diagram for the event.

Emergency Notifications Made (Subsequent to the Event)

Occupational Medicine (269-7539): 08/09/2021
Other (Supervisor): 08/09/2021

Documentation of Findings

Notable Event Number: 119576

CATS Number: NE-2021-05

Lessons Learned Number: [No Data]

ORPS Number: ORPS- SC--TJSO-JSA-TJNAF-2021-0003

NTS Number: [No Data]

CAIRS Entry: CAIRS- 21-0809

DOE Cause Code: [No Data]

ISM Code: [No Data]

Signatures

Investigation Team	Daniel Gautier (gautier)	09/03/2021 10:17:30 AM
Investigation Team	Tim Fitzgerald (tfitzger)	09/07/2021 07:20:55 AM
Investigation Team	Larry King (king)	09/07/2021 02:48:25 PM

Attachment: "ACC-21-0809- Employee Received 120 Volt Shock While Unplugging Equipment-No Injuries-Fact Finding Meeting Minutes rev2.docx" could not be added.

Attachment: "Joshua Oman Cryo Cabinet Shock Incident - Involved Individual Statement.docx" could not be added.

Attachment: "Joshua Oman Cryo Cabinet Shock Incident - Individual Involved Statement-Supplemental.docx" could not be added.

Attachment: "Narrative of events_LK.docx" could not be added.

Re: Minor Shock in Test Lab Hi-Bay

Steve Smith <sjsmith@jlab.org>

Tue 8/10/2021 8:39 AM

To: Steven Hoey <hoey@jlab.org>
Cc: Tim Fitzgerald <tfitzger@jlab.org>; Daniel Gautier <gautier@jlab.org>; Tina Johnson <cjohnson@jlab.org>

I got some more context on this from Tina, inserted below. Dan Gautier has the basic info and is ready. The ORPS order looks like this will be a "high"? We'll coordinate with Tina on next steps.

Fw: Re: Details? // Re: Accelerator Incident Notification

FYI

-------- Forwarded Message --------
Subject: Re: Details? // Re: Accelerator Incident Notification
Date: Mon, 9 Aug 2021 19:40:51 -0400
From: Larry King <king@jlab.org>
To: Andrei Seryi <seryi@jlab.org>
CC: Harry Fanning <fanning@jlab.org>, Tony Reilly <areilly@jlab.org>, Kirk Davis <kdavis@jlab.org>

Hi Andrei,
It was not a regular evolution. The worker saw that a quad GFCI receptacle, located below a cold N2 pipe, was in danger of getting wet with condensation. Seeing no moisture yet on the cord plug or GFCI receptacle, he was unplugging a rolling equipment rack, so that he could move the rack out of the way. It now appears that there was moisture already inside the metal receptacle box. The prongs of the removed plug had visible water drops on them. It is possible that the supply side terminal of the GFCI was wet, inside the quad box, which would not have been protected by the downstream, internal protection circuitry.

Regards,
Larry

On Aug 9, 2021, at 6:51 PM, Andrei Seryi <seryi@jlab.org> wrote:

From: Steven Hoey <hoey@jlab.org>
Sent: Monday, August 9, 2021 8:12 PM
To: Michael Maier <mmaier@jlab.org>
Cc: Steve Smith <sjsmith@jlab.org>
Subject: Fwd: Minor Shock in Test Lab Hi-Bay

Some initial info

Sent from my iPhone

Begin forwarded message:

> **From:** Tim Fitzgerald <tfitzger@jlab.org>
> **Date:** August 9, 2021 at 7:17:29 PM EDT
> **To:** Steven Hoey <hoey@jlab.org>, Bill Rainey <wrainey@jlab.org>
> **Subject: FW: Minor Shock in Test Lab Hi-Bay**
>
> Here you go.
>
> Tim Fitzgerald

Electrical Safety Program Manager
Jefferson Science Associates, LLC
12000 Jefferson Ave
Newport News, VA 23606
O: 757.269.7052
C: 619.392.9876
E: tfitzger@jlab.org
https://www.jlab.org

-----Original Message-----
From: Paul Powers <powersp@jlab.org>
Sent: Monday, August 9, 2021 6:07 PM
To: Tim Fitzgerald <tfitzger@jlab.org>; Tina Johnson <cjohnson@jlab.org>; Harry Fanning <fanning@jlab.org>; Bob Sperlazza <sperlazz@jlab.org>; Rusty Sprouse <sprouse@jlab.org>; Carroll Jones <jonesc@jlab.org>
Subject: Minor Shock in Test Lab Hi-Bay

To All,

This evening shortly after 5 PM, Carroll Jones reported that he received a call from someone in the Test Lab Hi-Bay that had received a minor electrical shock. The person reported it to his supervisor and to the best of my knowledge, reported it to Occ Med. Occ Med referred him to Port Warwick for an EKG. I believe the worker was an SRF guy. His supervisor was also informed and came down to investigate and make sure he was OK.

Carroll, Mike Sprouse and I went over to make the area safe. I located the circuit and locked it out. It appeared the cause was water condensation (water dripping) from overhead insulated piping that entered the receptacle. The person was shocked when he was trying to unplug a cord that appeared to be wet including the plug metal prongs. The area was left as it was when we arrived in case someone wants to see it. Carroll and the victim both took pics of the area. I asked the victim to write up a statement of what happened because that has been useful in the past.

I am willing to be part of the investigation team if desired. I'm free after lunch for the initial fact finding meeting.

Paul

FW: Work Order - I slip the W/O so you can read the entire thing

Tim Fitzgerald <tfitzger@jlab.org>
Wed 8/11/2021 12:42 PM

To: Daniel Gautier <gautier@jlab.org>; Steven Hoey <hoey@jlab.org>; Tina Johnson <cjohnson@jlab.org>; Brittany Kelly <bkelly@jlab.org>

Here is the Work Request that was submitted by Josh prior to the shock incident. One thing to note is that the GFCI was already tripping.

Tim Fitzgerald
Electrical Safety Program Manager
Jefferson Science Associates, LLC
12000 Jefferson Ave
Newport News, VA 23606
O: 757.269.7052
C: 619.392.9876
E: tfitzger@jlab.org
https://www.jlab.org

Jefferson Lab

From: Bob Sperlazza <sperlazz@jlab.org>
Sent: Wednesday, August 11, 2021 12:35 PM
To: Tim Fitzgerald <tfitzger@jlab.org>
Subject: Work Order - I slip the W/O so you can read the entire thing

Service Request: 79359 Owner/Supervisor: 246795 Mike Sprouse

Address Information

Service Address:
Formatted Address:
Street Address:

User Information

Reported By: 360704
Name: Joshua Oman
Phone: 6648
E-mail: joman@jlab.org

Service Request Details

Summary: Condensation dripping on electrical outlet
Configuration Item:
Target Description:
Details: On the West wall, next to the cryo-cabinet, which is next to the roll up garage door. There is a 2 gang galvanized steel electrical box that has one GFCI and one normal outlet. The normal outlet is run through the GFCI. There is condensation dripping down from a liquid nitrogen pipe onto the electrical box, causing the GFCI to trip out. The label on the box is AP-Lab-17/6.

- Schedule Considerations -
-Explanation: I would assume someone would want to lockout/tagout the breaker for this, but that isn't my decision to make. Because without taking out the GFCI and other outlet, you may not know how much damage may have been caused or how many times this has happened.

- EH&S Considerations -
-Minimum Access Training Requirements: Gert
-Other Requirements or Special Conditions: Lock & Tag System(s) [Lockout/Tagout for the breaker.], Other [The label on the box is AP-Lab-17/6.]

- Project: C7502W
- Org: SRFOPS

r again.

Owner Group: FMM

Status: WORKING

Attachments

City:

State/Province:

Affected Person: 360704

Name: Joshua Oman

Phone: 6648

E-mail: joman@jlab.org

Classification: FM \ FMI \ MECH \ HVAC \ HVACR

Description: Mechanical : HVAC : Repair/Maintenance

Reported Priority: 5 High

Internal Priority: 5

Create WO Options: CHILD

Asset:

Location: 58 Test Lab

Related Work Orders | Filter | 1 - 1 of 1 | Download

Wo Num	Status	Total
579176	APPR	