

**Notable Event Report**

| Title of Event                      |   |   |             |
|-------------------------------------|---|---|-------------|
| <b>Event Title:</b>                 | Minor Electric Shock from Milwaukee Heat Tool – Model 1400- No Injuries |   |             |
| <b>Date and Time of Occurrence:</b> | 8/17/2016 @ 10:30am   | <b>Notable Event Number:</b>              | ENG-16-0817 |
| <b>Event Location:</b>              | Hall B  | <b>Date Notable Event Report is Due*:</b> | 9/16/2016   |

\*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.**

A worker experienced an electrical shock when they were using a Milwaukee brand heat tool on heat shrink tubing for a new wire connection. At that time, the worker's finger was touching the metallic end of the heat tool before it was hot, while their elbow on the same arm was in contact with an electrically grounded cabinet. The worker discontinued the use of this tool, and obtained another type of heat tool to complete the work.

There was some delay in reporting and investigating this event, partially attributed to the worker's scheduled vacation. When the individual returned to the Laboratory on Tuesday August 23rd, they were evaluated by occupational medicine and released without restriction.

The tool was subsequently tagged out of service. There are no visual indications that this equipment had been damaged. A review of the Consumer Products Safety Commission website did not indicate any recalls for this product condition. Additional investigation revealed that while the tool is labeled Milwaukee, it was manufactured by Wagner Spray Tech. Procurement records were reviewed and the purchases for this model heat tool were made approximately 2 years prior. An all-staff email has been distributed to administratively tag all similar heat tools for proper inspection and disposition.

Upon review of the equipment rack in which the worker was using the heat tool, the 120 volt outlet being used was not Ground Fault Circuit Interrupter (GFCI) protected. If the power source for this tool were GFCI protected by a Class A GFCI, a shock may still have occurred, but it would have been limited to the specifications of the GFCI trip circuit (4-6 mA trip current level).

Additional details are located in the "Witness Account" section.

Initial bench testing at Jefferson Lab:

All six of the Milwaukee Heat Tools – Model 1400, which were collected by ESH after the event, were bench tested. Only the defective tool measured 120 volts at the metallic tip of the heat gun to ground when plugged into a wall receptacle and with the tool's power switch turned on.

A resistance measurement on the defective tool measured 0.4 ohms between the hot side of the two prong plug and the metallic tip of the heat gun when the heat gun was unplugged from the wall receptacle and with the tool's power switch turned on. Below is a table dictating the different measured values between the defective heat tool and the other (5) non-defective heat tools. Without disassembling the defective heat tool; the measured results of the table below gives indication that there is unwanted continuity between an internal electrical conductor and the metallic tip of the heat tool.

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

| Tool switched 'off' | Location of meter leads              | Defective tool | Non-defective tools |
|---------------------|--------------------------------------|----------------|---------------------|
|                     | Hot plug end & neutral plug end      | open           | open                |
|                     | Hot plug end & metal tip of tool     | open           | open                |
|                     | Neutral plug end & metal tip of tool | 40 ohms        | open                |
| Tool switched 'on'  | Location of meter leads              | Defective tool | Non-defective tool  |
|                     | Hot plug end & neutral plug end      | 40 ohms        | 40 ohms             |
|                     | Hot plug end & metal tip of tool     | 0.4 ohms       | open                |
|                     | Neutral plug end & metal tip of tool | 40 ohms        | open                |

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

|   |   |
|---|---|
| <b>Root Cause:</b>                                      | <p><u>Equipment Difficulty:</u></p> <ul style="list-style-type: none"> <li>Initial thought is that the tool is defective. The tool was being sent back to the manufacturer for further analysis, and post-inspection report.</li> </ul> |
| <b>Contributing Causes:</b><br>(List as many as apply.) |   |

| Extent of Condition Check   | JLab CATS Number | Target Date                                | Action Owner   |
|---|------------------|--|--|
| Survey the lab for the same exact brand/model heat gun (Milwaukee Model 1400 Heat Tool) and deliver all to ESH at trailer 35. | NA               | Complete                                   | All hands email sent out on August 22 <sup>nd</sup> . Since then a total of six heat tools were turned in. |
| Does this event involve failed equipment?   | Yes              | Is there similar equipment in other areas? | Yes  |

| Corrective Action(s)  | <u>JLab CATS Number</u> | Target Date | Action Owner                |
|---|-------------------------|-------------|-----------------------------|
| Send the defective Heat Tool to the Wagner Quality Control Department for further investigation. Depending on the outcome of the analysis done by the Wagner corporation, initiate further corrective action(s) as deemed necessary.<br><br>Evidence of Completion: Report from Wagner Corporation.   | NE-2016-14-01-01        | 12/31/2016  | Todd Kujawa                 |
| Discuss the policy on GFCI usage with the Electrical Safety Committee (ESC) meeting.<br><br>Evidence of Completion: ESC written determination and corresponding ESH manual chapter language.  | NE-2016-14-01-02        | 12/31/2016  | Todd Kujawa                 |
| The policy of reporting electrical shocks to Occupational Medicine and following up with an immediate visit does not appear in the appropriate section (OCC. Med.) of the ESH manual. This policy should also be reviewed to be populated in other lab media venues (e.g. SAF100).<br><br>Evidence of completion: Revised ESH manual chapter, and any corresponding orientation training to include the responsibility to promptly report electrical shocks to Occupational Medicine. | NE-2016-14-01-03        | 12/31/2016  | Johnie Banks<br>(Occ. Med.) |

| Lessons Learned (Confer with Lessons Learned Coordinator)<br>(Use attachment as necessary)  | <u>Lessons Learned Number</u> |
|---|-------------------------------|
| Electric shock events, of any magnitude, occurring at Jefferson Lab must be reported followed by an immediate visit with Occupational Medicine. | 969                           |
| When a tool is known or suspected to be defective, it must be tagged and taken out of service immediately.                                      | 969                           |

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

The following is a personal statement about the electrical shock incident that occurred on August 17<sup>th</sup>, 2016:

I am currently on assignment to Hall B as a technician, for the Solenoid and TORUS systems. As a part of my job tasking, I install connectors on the end of conductors to power the magnets. On the morning of 17 August, around 10:30 A.M., I was installing heat shrink to add a protective layer on the conductors, and a part of this process requires the use of a heat gun. While I was using the heat gun, my right index finger came in contact with the metallic end of the heat gun, at that moment I felt an electrical shock from the end of my finger to my right elbow, which was resting on the grounded rack frame. This caused an impulsive movement of my right arm, breaking contact with the frame and the end of the heat gun. At this moment, I stopped using it and realized that the plug didn't and was not designed to have a ground prong on it and found another heat gun that had a ground prong. I completed this task and other tasking before leaving the hall that day. The next morning, Thursday August 18<sup>th</sup>, I saw the same model heat gun in the EES Fabrication Shop, and inquired as to the design of the heat gun, telling the EES Fabrication Shop Supervisor of my experience from the day before. We used a multimeter on the metallic end of the gun to measure voltage to see if it was designed to have any voltage present during

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

normal operations and found that there was no voltage present. At that time, I went to Hall B to get the defective heat gun and bring it up to the shop to evaluate it. While in the hall, I performed the same voltage test and found that there was 15 volts AC on the metallic end, confirming it was defective. I removed the heat gun and gave it to the EES Fabrication Shop Supervisor. I was on vacation Friday, but did receive notification from the Operations Group Leader that I would need to report to Occupational Medicine when I return to work on Tuesday.

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

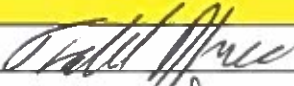
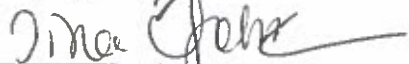
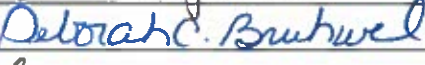



| Emergency Notifications Made (Subsequent to the Event): | Date       | Time  |
|---|------------|-------|
| Fire, Rescue & Emergency Medical: (9-911)               | NA         |       |
| Guard Post: x5822; 269-5822                             | NA         |       |
| Occupational Medicine 269-7539                          | 8/23/2016  |       |
| ESH&Q Reporting Officer: 876-1750                       | 8/19/2016  |       |
| Crew Chief 630-7050                                     | NA         |       |
| Industrial Hygiene: 269-7863:                           | NA         |       |
| Other: Steve Neilson                                    | 08/19/2016 | 12:00 |

|  |   |
|--|---|
| <p><b>Confirmation Review Distribution:</b><br/>         Investigation Team Members<br/>         Affected Division Managers<br/>         ESH&amp;Q Reporting Officer</p> | <p>It is asked that you review and provide comments to this document to the Lead Investigator (denoted on Page 1) within 2 days. Your comments will be reviewed and incorporated as appropriate. Thank you for your consideration in this matter.</p> |
|--|---|

**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      | Todd Kujawa    |   | 9/21/16 |
| ESHQ Reporting Officer | Tina Johnson   |  | 9/21/16 |
| SME                    | Debbie Bruhwel |  | 9/23/16 |
| DSO Engineering        | Paul Collins   |   | 9/21/16 |

**Acceptance/Acknowledgement of Facts**

|                                       | Print     | Signature  | Date:   |
|---------------------------------------|-----------|--|---------|
| Associate Director/ Department Manger | Will Oren |  | 9/21/16 |

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

**Documentation of Findings: (To be Completed by ESH&Q Reporting Officer)**

|                                |   |
|--------------------------------|---|
| <b>Notable Event Number:</b>   | ENG-16-0817   |
| <b>CATS Number:</b>            | NE-2016-14  |
| <b>Lessons Learned Number:</b> | 969   |
| <b>ORPS Number:</b>            | SC--TJSO-JSA-TJNAF-2016-0005  |
| <b>NTS Number:</b>             | N/A   |
| <b>CAIRS Entry:</b>            | N/A   |
| <b>DOE Cause Code:</b>         | A2 Equipment Material Problem, B6 Defective/ Failed, C01 Defective or failed part within tool |
| <b>ISM Code:</b>               | Provide Feedback and Continuous Improvement   |

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>                              | 8/23/2016                         | <b>Time:</b>   | 9:00am  | <b>Location:</b> | TEDF 2559 |
| <b>Required Attendees: (Print Name)</b>   |                                   |  | <b>Optional Attendees: (Print Name) Present</b> |                  |           |
| <b>Lead Investigator:</b>                 | Todd Kujawa                       | <b>Associate Director:</b>   | Will Oren                                       | Notified         |           |
| <b>ESH&amp;Q Representative:</b>          | Tina Johnson                      | <b>TJSO Observer:</b>  | Steve Neilson                                   | Present          |           |
| <b>Supervisor of involved persons(s):</b> | Paul Vasilaus / Ernest Stallworth | <b>Subject Matter Expert(s), Facility/Equipment Owner as applicable:</b> |   |                  |           |
| <b>Involved or impacted person(s):</b>    | Joseph McClure                    | Debbie Bruhwel (EESSUP)  |   |                  |           |
|   |                                   | Paul Collins (DSO)   |   |                  |           |
| <b>Witness(es):</b>                       | Mark Lester                       |  |   |                  |           |

| Agenda<br><i>(Ensure the pace of the meeting allows time for accurate note taking.)</i>   | √ 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. | √             |

|   |   |
|---|---|
| 7. Compensatory Actions Required? If "Yes" determine responsibility and include confirmation documentation.                                 | √ |
| 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> 8/25/2016            |       |
|-----------------------------------|----------------|--|-------|
|                                   |                | (Within 24 hours of Fact Finding Meeting.) |       |
| Role                              | Name           | Department/Group                           | Phone |
| Lead Investigator                 | Todd Kujawa    | ESH  | 7006  |
| SME                               | Debbie Bruhwel | EES  | 7210  |
| ESH&Q Reporting Manager           | Tina Johnson   | ESH&Q                                      | 7611  |
| Engineering DSO                   | Paul Collins   | 12GeV                                      | 5981  |
| <u>TJSO Observer</u>              | Steve Neilson  | TJSO                                       | 7215  |

| Environmental Aspects                              |   |
|--|---|
| <b>Type of Material Released:</b>                  | <b>Quantity:</b>                            |
| <b>Source:</b>                                     | <b>Time Flow was Halted or Controlled:</b>  |
| <b>For Investigation Team (√ All That Apply):</b>  |   |
| <input type="checkbox"/> Reportable Quantity       | <input type="checkbox"/> Impact Ground/Soil |
| <input type="checkbox"/> Storm Water Channel/Drain | <input type="checkbox"/> 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> 8/23/2016 | <b>Time:</b> 1452 |  |
|   |                        |                   |  |

## 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> 8/23/2016 | <b>Time:</b> 1452 |
|----------------------------|------------------------|-------------------|

Tue, Aug 23, 2016 02:52 PM

**From :** Tina Johnson <cjohnson@jlab.org>

**Subject :** ORPS/NTS Determination: Employee Receive Minor Shock While Using a Heat Gun

**To :** Steve Neilson <sneilson@jlab.org>

**Cc :** Paul Collins <paulc@jlab.org>, Harry Fanning <fanning@jlab.org>, Todd Kujawa <kujawa@jlab.org>

Steve,

As you know, on Wednesday, August 24, 2016, an Accelerator Operations staff, assigned to Engineering, was sitting on a stool using a Milwaukee brand heat gun while applying heat shrink tubing. The heat gun was plugged into a permanent outlet near the equipment racks in Hall B. The worker inadvertently touched the metallic end of the heat gun while it was powered on and experienced a shock (~120V AC) that traveled through his elbow within the same arm. The tool had been operating only for a short period and therefore the metal tip end did not present a burn hazard at the time of worker contact. Since the event the tool has been tagged out of service.

On Friday, August 26th, an electrician tested the gun and discovered 120 volts present at the metal tip of the gun with reference to ground. An all staff email with detailed information on the specific heat gun was sent out yesterday. Workers were requested to check their heat guns and if they have this particular model heat gun, to place an administrative tag on the gun and bring it to Trailer 35. When the investigation into the short has been completed, the heat guns will be returned if it is safe to do so.

The Lab has determined that this is a Notable Event and ORPS Reportable:

***Subgroup E Hazardous Electrical Energy Control.***

***# SC Criterion***

***(1) 2 Any unexpected or unintended personal contact (burn, injury, etc.) with an electrical hazardous***

The Lab will complete the reports within the allotted time frame. Please note that the Fact Finding meeting was held this morning, as the employee was away from the lab on scheduled vacation. Upon his return to work this morning, the employee reported to Occupational Medicine for evaluation and was cleared to return to work.

In the meantime, if you have any questions or concerns, feel free to contact me.

|                           |                        |                   |
|---------------------------|------------------------|-------------------|
| <b>10 CFR 851 Screen:</b> | <b>Date:</b> 8/23/2016 | <b>Time:</b> 1452 |
|---------------------------|------------------------|-------------------|

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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