# Human Performance Improvement Report

Network Outage of December 14, 2011

Document Description: This report gives an explanation of the event and the error precursors which contributed to it. This report also includes the corrective actions.

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# Network Outage of December 14, 2011

Meeting Participants – Robin Beiss (Arlington Electric – Supervisor), Sharon Wiedmeyer (Arlington Electric – Electrician), Adam Walters (CS, Core Computing, Facility Operations), Jack MacNerland (CS, Core Computing, Computing Facilities Manager), Amy Pavnica (CS, SSO)

Description

On the afternoon of December 14, 2011, a T&M electrician was duplicating a power strip fitting on the side of frame #1110, located in the FCC2 Computer Room. She began to drill a small hole in the side of the frame.

In the next step, the electrician needed a die press to make a larger hole in the side of the frame. But because the frame was sitting so close to the adjacent rack, she could not fit in the die on the outer portion of the frame. To help make room, she opened up a floor tile that was sitting below the frame and attempted to loosen the bolts that held down the frame so that she could move the frame to the side, (about a half inch). This frame held three network switches, had electrical conduit going into the ceiling and numerous fiber cable connections. The frame weighed between 400-700lbs and had the power turned on. Many of the fiber cables were tight before this frame was moved. She did not contact the task manager/building manager before moving the frame.

She was now able to get the die in place and punch out the outline of the hole. However, she was not able to pop out the cut. So she stopped work and called her supervisor for a hole-saw drill. Her supervisor came to the building with the drill, but building management was not contacted before using it.

As she was drilling, the aluminum frame began to gum up her drill bit. As she was sawing, several people began to congregate around the area because they noticed that the network had failed. A Computing Sector employee tapped her on the shoulder and told her that she needed to stop work because they were having problems with the equipment. She then stopped her work. Some Computing Sector employees noticed that she was not wearing safety glasses while she was drilling. When she was later asked, she said that she was wearing her regular prescription glasses, but not safety glasses or goggles.

Soon after the incident, a networking switch chassis was removed from the frame and replaced. There were many metal shavings and small metal dust particles on the board of this chassis, as

well as around the immediate area. It is believed that as the dust and drill shavings were falling, they were pulled into the back of the chassis from the fans and shorted out the equipment. It is also believed that the vibration from the drilling caused the sensitive equipment to fail. When asked if she considered this beforehand, she stated that she thought that the frame was too heavy to vibrate, even without it being bolted down and that she did not think that the metal shavings would come in contact with the equipment since they seemed heavy enough to just fall to the floor. She also stated that the sawing was within the "U" channel of the rack and she thought that would help contain the fillings.

A couple of days after the incident, the electrician and her supervisor were interviewed by the three CS employees listed above. The electrician and her supervisor have a good working relationship, so it was thought that she would feel less intimidated by her supervisor's presence.

During the interview, the electrician stated that she knew that she needed to contact the building manager, who was also task managing the job. But she just wanted to get this phase of the job done by the end of the work day. She stated that this was supposed to be a quick job, but she said that she was not pressured externally from anyone to finish this job within a certain time-frame. But because things were not going as originally planned, and she kept getting interrupted, she became frustrated. She then put pressure on herself to finish the task as quickly as possible.

A hazard analysis was written for this particular job. But when reviewed by the SSO after the incident, it was discovered that the HA did not break down the particular steps for this task. Specific PPE, including safety glasses, was listed and the electrician did sign it. The electrician last had an ITNA performed in February, 2010 by Barry Fritz (AD). Although she has worked in the Computing Sector for many years, her training plan does not indicate that she has had the CS Computer Room Training, which is a requirement for anyone working, unsupervised, in any of the sector's computer rooms. The training document also emphasizes that before any modifications occur in the computer rooms, Facility Operations must first be notified.

It should be noted that a week before this incident, the same electrician was involved in an auto accident that occurred on Fermilab property. Her vehicle struck a tree. She did not go to the hospital, but her vehicle had significant damage. During this interview, she was asked if this played upon her mind as she was working in the subsequent days. She replied that she was able to move on, and that she was not distracted about the accident. She also said that she was not taking any medications.

<u>Error Precursors</u>

1. Time Pressure: Although self-inflicted, the electrician started the job believing that it would go quick.
2. High Workload: Arlington Electric is in high demand throughout the laboratory.
3. Interruptions: When the job was not going as planned, the electrician had to stop her work momentarily to retrieve the hole-saw drill.
4. Hidden System Response: An ITNA question does ask if the particular individual will be working in any of Computing Sector's computer rooms. However, this question only appears after the box is checked stating that the individual is a CS employee. Therefore, the ITNA for subcontractors from FESS would not show that they need the "Procedures for Performing Work in CD Computer Rooms". Also, the electrician's ITNA was performed by an AD ES&H employee. It would be pretty difficult for this individual to know all of the electrician's tasks and which areas of the lab they would work.
5. Unexpected equipment conditions: The aluminum frame was gumming up the electrician's drill bit. Also, she could not fit her die press in place because of the adjacent rack being too close to the frame that she was working on.
6. Lack of knowledge: The electrician thought at the time, that it would be okay to unbolt the frame. She did not know that by moving it while the network equipment in it was live, would cause a malfunction. She also did not realize that the equipment was as sensitive as it is. She believed that the frame was too heavy to vibrate enough to affect the equipment. She did not realize that the dust and chips that were created through drilling would be pulled into the equipment through the rear fans.
7. Imprecise communication: A hazard analysis was written for this job, but it was too generic to have much meaning. The specific tasks were not broken down in the description column of the HA. It was also discovered that the electrician had not been trained in the "Procedures for Performing Work in CD Computer Rooms". This is a requirement before working in any of the Computing Sector's computer rooms. When an employee's or sub-contractor's ID is issued or renewed, the building manager will give the individual access to the computer rooms only if this training has been completed. It is unclear how the individual was given access to the computer rooms without the proper training. There is some speculation that because the individual had been working in FCC for many years and because she has a reputation of being an exceptional electrician, her lack of formal training was simply an oversight. Also, the supervisor brought the electrician the hole-saw to the building without questioning her.
8. Stress: Electrician felt self-imposed stress to finish this job quickly.
9. Habit Patterns: Electrician has a reputation of being proficient at her job. She has a high work ethic and strives to get her work complete.
10. Assumptions: The electrician had an inaccurate mental picture of how the job should be performed.

11. Mindset: During the interview, the electrician repeatedly stated that she went into the job with the mindset that it would go rather easily, and that she would be able to complete it within a short time.

Corrective Actions

1. Hazard Analysis' need to be written specific to the task at hand. The very nature of an electrician's duties involves variations in task difficulty, equipment and method. In this case, a generic HA would not fulfill its intent to specifically list the hazards at hand. If done properly, the HA may have pointed out the difficulties that the electrician could encounter when maneuvering the die-press, drilling into the aluminum frame and the risk to equipment from drilling.
2. The ITNA question that triggers the computer room training was moved to the first page of the questionnaire, so that all Fermilab employees and subcontractors would have the opportunity to check this box, should it apply.
3. All persons working in the computer rooms need to have the training specific to working in the Computing Sector computer rooms. As of Dec. 22, 2011, the electricians are being trained and entered in the TRAIN database.
4. Communication needs to be made to the Key and ID Office personnel that states that no one can be given access to the Computing Sector computer rooms without first reviewing and signing the "Procedures for Performing Work in CD Computer Rooms". The completion of the training needs to be verified before access is given.