

Physics Department Incidents Log

Incident No.	2008- 01	Date of Report:	11/21/08
Reportable/Classification:	Not ORPS recordable per Event Categorizer Not a PAAA violation per PAAA Chair	Date of Incident:	9/18/08
Status	ESSH Committee Final Report		
Groups Involved:	PHENIX		
Lead Author:	M. Zarcone		

Description:

On the morning of September 18, 2008, Nuclear and Particle Physics Directorate personnel were conducting a Management Safety Observation & inspection of some of the labs of the Physics Building. The group of investigators stopped to inspect lab 2-93, which is assigned to the PHENIX Group. This lab is posted as a Radiological Materials Area, Controlled Area, Thermo Luminescent Dosimeter (TLD) required. Due to the radiological requirements, most of the inspection team had to stay outside the lab by the doorway where the occupants were asked to come out of the room for a safety discussion. One of the PHENIX graduate students happened to arrive for work at that time, and, finding the doorway blocked proceeded down the hallway to obtain a cup of coffee. When he returned, he found the crowd still at the door, and proceeded to enter the lab next door (2-91) to set his backpack down. Lab 2-91 is also posted as a Radiological Materials Area, Controlled Area, TLD required, and the student was not wearing his badge when he entered the room. His badge was on his desk in the lab 2-93, which he intended to retrieve as soon as the inspection team moved away. However, the team then moved in front of 2-91 and found the student, along with two other students, in the lab. They then asked all three of them to come to the door and proceeded to ask them a number of questions. One member of the inspection team noticed that the one student was not wearing his badge, although both of the other students were wearing their badges. When questioned, the student promptly went next door to retrieve his badge, but he had in fact been in the lab for a few minutes without it.

Although 2-91 was posted as requiring a TLD, there were in fact no sources in the lab at the time, and the student who briefly entered the lab without his badge knew this when he went in. His intention was simply to drop off his backpack and then retrieve his badge from the other lab. The student's Radiological Worker I training was also up to date, as was all of his other training for performing work in the two labs.

Root Cause: **A4B1C01: Management Problem – Management Methods Less Than Adequate – Management policy guidance/expectations not well defined, understood, or enforced.**

The root cause for this event was that the individual did not fully comprehend that the radiation control and protection rules have to be followed to the letter, not just when the hazard is present, not only in spirit. Management did not effectively convey and the student did not fully appreciate the requirement to be fully compliant with the TLD use regulations. Although he had taken the proper training, the student needed to have had his badge on before entering either room. He cannot leave the TLD in the Controlled Area overnight.

Contributing Causes:

1. Students use this room as both an office and an experimental laboratory.
2. Sources are not always used and much of the time the "TLD Required" restriction is not commensurate with the hazard.

During the past few years these labs have had their postings change from time to time. There have been times when the demarcation posting (indicating the beginning of the actual area controlled for radiation) has moved from the door to a point in the room, back to the door, as radiological conditions changed. This left times where a student sitting at his desk did not have to wear a TLD and other times when it was required. Additionally, there are times when the experimental program involves the use of the sources on the various work benches and then months when no radiological work was being done. While the students are properly trained and fully understand the need to wear a TLD when working with and around sources to record any exposure they may receive, management has not taken steps to ensure complete and unequivocal compliance even when the hazard is not present.

While all TLD wearers are trained that they "should" return their TLD to the badge board every day, in practice many do not. Badge boards are not always near the area where the TLD is required and many workers' jobs take them to multiple buildings. Many workers may be called on at any time during the day (and sometimes at night) to attend to some immediate problem in a

TLD required area where precious time may be lost if one has to drive across site to another building. As the consequences for not wearing a TLD in an area where the hazards exist can be significant, many opt to keep the TLD with them all the time or leave it in the office, near our desk, etc. In this situation, the individual had developed a habit of leaving his TLD at his desk in his workspace. While this was not a problem when the area was not controlled, the practice was not recognized as a violation by the individual when the posting changed.

Human Performance Analysis:

Preliminary root cause analysis:

The preliminary root cause determination for this event was that the individual did not fully comprehend that the radiation control and protection rules have to be followed to the letter, not just in spirit. In this instance, to be specific, the appreciation that when the entrance to an area is posted as "TLD required for entry" that one can't enter the area, pick up the TLD inside the area, and then put it on. The radiation control and protection rules have to be followed to the letter, not the spirit, of the rule.

The error that precipitated the event:

The error that precipitated the event was that the individual had left his TLD within an adjacent Lab, which also required a TLD for entry, on a previous entry into the adjacent Lab.

Contributing factors:

One of the contributing factors was what could be termed as a Latent Organizational weakness. The Latent organizational weakness was that the individual had his primary work space desk and computer within the Radiation Controlled Area Lab. As discussed in a meeting to review the event, it appears that the individual in question, as well as others, spend appreciable portions of their time inside the Lab when no radiation hazards (i.e. sources in use in the Lab) are present, and doing tasks that do not require them to be in the Lab itself. If the primary desk and computer space for the individual were not in the Lab (Radiation Control) area, the probability of the individual making this particular error would decrease. If entry into the Lab were limited to those times where the Lab facilities themselves are to be used, including the radioactive sources, the probability that the individual would either consider, or notice, the entry requirements would likely increase.

Corrective actions:

Individuals that work in Radiation Controlled areas, and hence are subject to Radiation hazard rules and regulations, need to be periodically reminded that Radiation related rules have to be followed to the letter of the rule. In this instance, the rule states that the TLD must be worn for entry into the area. Entering the area to any depth, for any period of time, without the TLD being worn is a violation of the rule.

The primary work space and computer for this individual, and others where the bulk of their time is spent doing activities that don't require them to be in a Radiation Controlled area need to be moved to a location outside of a Radiation area.

Determination of whether event was a violation or a deviation:

This event was a deviation rather than a violation. The points supporting this determination are that the individual in question had the appropriate radiation training, had a TLD, was aware of the entry requirement that the TLD be worn, and stated that while in the Lab he wears the TLD as required. As such, the individual appeared to believe that he was complying with the relevant rules. What led to the deviation was that the individual didn't sufficiently appreciate that for radiation control and protection rules the rules have to be followed to the letter of the rule, and not just to the spirit of the rule.

Corrective Actions (Group):

1. The student in question, as well as all other users of these labs, were instructed and will be reminded not to leave their badges in one of the posted laboratories but in an appropriate place as described in the training. (D. Morrison, completed 10/08)
2. The Group Leader and the P.I. discussed this incident with the entire group and reminded their personnel to use and store their TLDs properly. A badge board will be constructed and placed outside these rooms for storage when the TLDs are not being used. (D. Morrison, completed 10/08)
3. The Group Leader and P.I. must ensure that any other persons entering the room do not violate the requirements for entry into the controlled area space.

4. When sources are being used, workers must not expand the radiological footprint beyond the demarked Controlled Area.
5. The Group Leader and P.I. will re-arrange these rooms to delineate the Controlled Area from the non-Controlled Area in such a way that untrained people and those without a TLD cannot accidentally drift into the Controlled Area. This is most effectively achieved with a physical barrier. (D. Morrison, Due: 12/31/08)

Corrective Actions (Department):

1. This incident was discussed at a GSC meeting (M. Zarcone completed 10/30/08)
2. This incident will be discussed with the entire department at the next 'all hands' meeting. (M. Zarcone, Due 12/31/08)
3. All TLD wearers will be reminded of the need to comply with the letter of the rules for radiation safety. (M. Zarcone, Due 12/31/08)
4. Facilitate the readying of another room for moving the student desks out of the Controlled Area. (S. Marino, Due 2/28/09)

Lessons Learned (Group):

Postings that do not reflect the true nature of the hazard a given area have a greater potential for non-compliance. Individuals must be more diligent in wearing their radiation badges in posted areas, even when they know there are no radiological hazards present. TLDs must be returned to their appropriate badge boards when not in use, and retrieved whenever entry into a posted area is required.

Students or other individuals do not need to be working in a posted Radiological Controlled Area when doing routine computer work if other areas are available to them.

Lessons Learned (Department):

BNL, including the Physics Department, is a research organization that hires scientists and technicians to perform basic research. This differs from industry in that most work is not routine. On a daily basis the work evolves, goes off on tangents, changes direction. Scientists and technicians are prized for their ability to encounter situations, devise creative solutions to small and grand problems, and make judgments while keeping themselves and coworkers safe. Safety judgments are made continually in deciding on a solution, selecting tools, which procedure to follow, etc. In analyzing the problem, the individual at the highest level, considers the actual hazard and all of its ramifications. The first consideration is to mitigate the hazards within the authority granted them by the Experimental Safety Review (ESR) or work planning documents. All this needs to be done within the confines of the many Human Performance error precursors of time constraints, stress, extended hours, fatigue, current societal and financial pressures, etc. in a knowledge-based mode. While juggling the various factors in arriving at a solution, these prudent and often methodical people are very successful at doing their work safely.

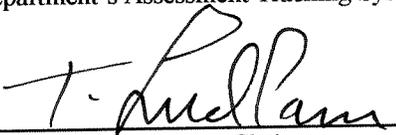
In the compliance world judgment is not an option. Rules, laws, and requirements the lab must contend with come from many sources, external as well as internal. Since there is no single expert that is fully aware of all the rules in all areas, many 'experts' from different areas determine the rules the workers must work within and provide training and controls. Volumes of information are condensed into 30 minute training sessions of 'rules' where the reasons and issues behind them are not completely explained. If the process were perfect, the rules and the reasoning behind them would be explained in such a way that individuals would incorporate them into their behaviors without reservation. The problem is that rules change, new rules are added, the training is not perfect, the demands come from different directions, from different sources, etc. It is difficult enough for those involved in the safety organizations to fully comprehend it all, nearly impossible for those who are not developing the subject areas, meeting to find the weaknesses, etc. Furthermore, the experimentalists and technicians must move out of their normal mode of doing work to one where you don't analyze, don't weigh the options, don't make prudent judgments, to a mode of blind compliance. It is not easy to switch modes of operation 'on the fly'.

How then do individuals deal with it all? They develop an individual concept of safety and compliance. As the collective group of workers is subject to the same organizational stimuli, we develop a safety culture. In our culture, the safety of the individual, equipment, and research program are given the top priorities. As in the ISM process we need to define the scope identifying the hazards, mitigate them through controls and training, work within the authorization given, and provide feedback for improving the process. In this, the laboratory has been very successful in informing and training and, generally speaking, this is now engrained in most of us as it has become intuitive. It makes sense to do things safely.

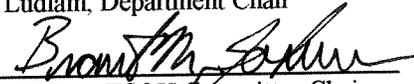
Compliance is not always intuitive. In areas where people understand the requirements, the requirements are enforced unequivocally, and they make sense, compliance is almost guaranteed. However, where compliance and mitigation of the actual hazards do not overlap, we are less successful. Driving is a prime example of this. We have, as a society, learned the motor vehicle laws but, if we "feel safe", regularly drive over the speed limit, without seatbelts, don't signal, etc. This behavior reinforces the "do things to the spirit, not the letter of the law. Unless the requirements are perfectly clear, are recognized by the individual, and emphasized regularly, people lapse back into knowledge based mode. This is where compliance that is not intuitive, not completely understood, not regularly emphasized, or open to interpretation becomes an issue.

It is management's responsibility to ensure compliance. It is a daunting task and difficult to achieve in a research environment. For this purpose, the lab has embarked in including Human Performance factors in all our documents, training, etc. Over time, I believe, compliance will improve as the instruments we use to train our people improves, our analysis and recognition of human factors in events and issues becomes more mature.

The above incident has been investigated and no further action is required. Corrective Actions will be entered into the Physics Department's Assessment Tracking System and tracked to completion.


T. Ludlam, Department Chair

11/24/08
Date


B. Johnson, ES&H Committee Chair

11/24/08
Date