OCTOBER 2012

PPPL ESH&S Newsletter

Subcontractor Oversight

By Marissa Schaefer

Have you ever wanted to bring a construction contractor on site but weren't exactly sure what needed to be done from a safety perspective? You're probably thinking, "What's a construction contractor?" A construction contractor is a contractor who is making changes or additions to on-site structures or equipment. A construction contractor is not limited to constructing buildings; they could be installing HVAC systems, water lines, etc. This article will provide you with the basics, but for more in-depth information, please check out 'Construction Contractors' on the SafetyWiki. Before bringing a construction contractor on site, a Statement of Work (SOW) must be issued for the contractor. The SOW must include requirements for:

- A written site-specific ISM Plan or Health and Safety Plan (HASP). This is a document detailing the activities that the contractor will be engaged in, the hazards of those activities, and the control measures for the identified hazards. A Job Hazard Analysis (JHA) may be used as a substitute for an HASP as long as the JHA covers each major phase of the project.
- Any required drawing or specification that affects safety: scaffold engineering, excavation shoring, crane lift plans, etc.
- The name and qualifications of OSHA Competent Person(s).
- A company policy ensuring that workers not following safe work practices are subject to a disciplinary process.
- The name of a Designated Representative if different from the Competent Person.

Before any contractor can start work, the following is required:

- Approval of a site-specific HASP or JHA covering each phase of work.
- Material Safety Data Sheets (MSDS) for all chemicals provided 24 hours before being brought on site.
- Any required training documentation. Examples: operator certificates (crane, aerial lift, forklift, etc.), asbestos removal certificates, lead removal certificates, confined space entry training, etc.
- A pre-job brief must be held before the start of each new job task with all workers and affected PPPL personnel to discuss the scope of work, any hazards of the work and their control measures, and to instruct all workers to report safety concerns to the designated representative or competent person for action. All workers on the job must print their names on the JHA.

While a contractor is working onsite, the Procurement Technical Representative (PTR) must provide oversight.

- This duty is being re-emphasized as a result of the Skid Steer Corrective Action Plan. The PTR is responsible for knowing which ES&H requirements apply to contractors' work and for assuring contractors follow these requirements. To ensure the PTR is qualified for these duties, the Director of Procurement formally designates the PTR with the concurrence of the Responsible Line Manager (RLM).

Lessons Learned:

Many contractors populated PPPL this summer. Some lessons can be learned from these experiences, such as the need for contractor oversight and reporting unsafe actions. Contractors' work should be frequently observed to verify adherence to the provisions of the SOW, HASP, and/or JHA. This is especially crucial at the beginning of work. This summer, a number of employees raised concerns when they believed contractors were not working according to PPPL safety policies and procedures. This is a positive safety behavior and we strongly encourage employees to continue to report unsafe actions and to stop work when necessary per PPPL Policy P-012. ■

INSIDE:

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Shelter in Place Areas

By Kevin Rhoades

A component of the PPPL Building Evacuation Program has been implemented to enhance employee and visitor safety. The Site Protection Division has established "Shelter in Place" areas at the Laboratory. A Shelter in Place strategy may temporarily minimize exposure to an environmental threat (like a tornado, severe thunderstorm, hazardous material spill, or radiation event) by creating a safety barrier. The three designated Shelter in Place areas at PPPL are:

- The Emergency Services Building (ESB)
- The MBG Auditorium, LSB
- The D-Site Mock Up Building

Signs have been posted in these areas. These areas were established because they are in permanent structures, and have restrooms and water fountains nearby. These areas may be used by all PPPL'ers, and especially by those who are near exterior walls or windows, or those located in non-permanent modular buildings.

The most common shelter-in-place situation will be due to a weather emergency. Our region has had several weather-related watches and warnings this past year. During an emergency, instructions will be provided by Site Protection Division personnel. Instructions may be provided via the EVES speakers, e-mail, or other methods. A Shelter in Place event may be a long duration event. Staff with any medical needs should ensure that they take appropriate medications with them to the Shelter in Place areas. Remember, during a Shelter in Place emergency situation, all staff are encouraged to stay away from exterior walls and windows and non-permanent buildings. Questions regarding the Shelter in Place designated locations may be addressed to the Site Protection Division (Kevin Rhoades, Ext. 3166 or Dolores Stevenson, Ext. 3208). ■

SAFETY CONTEST CRYPTOGRAM

"UG QPBRSVZSR QPB RNXSED TPRE JS RQPYKE ... JD QPB QMG BUYKE KNGAR UE TPRE JS MBQPYKE."

— MUVVUNT MQBARMQBEK

U = I

The names of all entrants who correctly solve the cryptogram will be entered into a drawing for a $20 Gift Certificate to the PPPL Plasma Hutch!

SUBMIT YOUR ANSWER to ***dstrauss@pppl.gov*** *by Friday, November 16th. Safety Division members are not eligible.*

Congratulations to Cassandra Pugh, who won the July 2012 ESH&S Newsletter Safety Contest!

Personnel Updates to ESH&S Team

Samantha Burrows has joined the Safety Division as an Industrial Hygienist during Neil Gerrish's military service. Samantha graduated from the University of Central Missouri in 2011 with an MS in Industrial Hygiene. She recently worked as an Industrial Hygiene/Health Safety Associate with a consulting firm in Pittsburgh, Pa., with responsibilities including air sampling, noise monitoring (personal and area), asbestos background monitoring during the removal process, and generating sampling plans. Samantha received an Asbestos Building Inspector Certification and is a member of the American Industrial Hygiene Association (AIHA) and American Society of Safety Engineers (ASSE). ■

Samantha Burrows

NSTX Control Room Halon Discharge

By Ray Jeanes

Halon 1301 is a fire suppression agent. It is stored as a liquid but when released it immediately flashes to a gas. It works by interfering with combustion—not by displacing oxygen. This is important because it allows a fire to be suppressed without creating an atmosphere that does not support life. At one time PPPL had quite a few Halon systems; however, since Halon was determined to be an ozone-depleting gas, these systems have all been eliminated except for the one in the NSTX Control Room. A few have been replaced by FM-200 systems; most have been replaced with sprinkler systems. FM-200 is a very similar fire suppression agent that was developed as a Halon replacement because of Halon's detrimental environmental impact.

The Control Room Halon system is controlled by a Simplex fire alarm panel (S25) in the LSB Basement. S25 is linked with other Simplex panels throughout the site by a dedicated fiber optic network. On Monday morning, August 13, we had a serious problem with Simplex panel S16 in the Warehouse. Simplex had been called to service S16 but had not arrived yet when the Halon discharged in the Control Room for no apparent reason.

A subsequent investigation indicates that the problems with S16 had disrupted the information flow between panels and had interfered with the transmission of alarms to the Communication Center and with the use of the Emergency Voice Evacuation System (EVES) over the Simplex network. It also seems very likely that the problem with S16 caused a sequence of events that led to the Halon discharge although we may never know that for certain. Fortunately, such events are very rare. The Simplex system has been in service for a long time and neither we nor the Simplex service people we spoke with have ever known a problem on one panel to disrupt communication or to cause a problem on another panel before.

Under our service agreement with Simplex-Grinnell, their staff have replaced the components in panel S16 and S25 that they thought could possibly have caused or contributed to our problems. They cannot be certain because of the intermittent nature of the problems. None of the problems experienced in August have reoccurred.

It was evident in the aftermath of the Halon discharge that training was needed for people working in areas protected by Halon or FM-200 systems. While such training has been conducted in the past, it has been quite a long time since the last training, so the topic of training is being revisited.

Since the nature of the equipment in the LSB Basement has changed over the years and since the area is now provided with sprinkler protection we will be evaluating whether or not the gaseous fire protection systems in these areas should remain in service. ■

Lithium Experts Committee Chartered

By Bill Slavin

Lithium is one of the most interesting materials to enter the world of fusion science in recent years. It works on the plasma-surface interface to improve both confinement and stability. Unfortunately, lithium poses significant hazards to those working with it. The major hazards of lithium are related to its reaction with water or moist air that can result in serious consequences such as fire, hydrogen production and corrosive effects on human tissue. Because of the hazardous nature of lithium and the probable increase in the use of this material in fusion, the Laboratory has chartered the formation of a Lithium Experts Committee (LitEC).

Membership in the committee includes representatives from a cross-section of the Lab, including: Richard Majeski (chairperson), Robert Kaita, Michael Jaworski, Eugene Kearns, William Slavin, Angela Capece, and Howard Caruso plus a representative from Princeton University to be named later. The LitEC will be responsible for reviewing the safety aspects of lithium activities and proposals for new activities as well as promoting the development of improved approaches to lithium handling. ■

Don't Get Hooked by Phishing

By Jamie Alkhateeb and Jim Hirsch

A cyber attack is one of the most dangerous threats to PPPL. Whether committed with the intention of theft, sabotage, or other crimes, hacking is a serious problem. In 2011, malicious cyber attacks were up over 80 percent worldwide from 2010 and almost 40 percent of these attacks came via email, which included a link for the user to click on, commonly known as "phishing." Because cyber attacks present a true danger here at PPPL and at home, cyber security became the focus of the 2012 PPPL Emergency Exercise in which a phishing-type email was distributed throughout the Laboratory's network. This exercise was an important test of our computer defenses at PPPL and a reminder of the growing number of these types of attacks against intellectual property, sensitive information, physical computing infrastructure, and Laboratory operations. A notable example of this type of attack occurred in April of 2011 at Oak Ridge National Laboratory when a sophisticated and targeted phishing email forced Laboratory officials to shut down computer network systems for four weeks.

Common subjects used in phishing e-mails are:

1. Urgent postal matters, such as confirmations and alerts,
2. Banking or tax matters,
3. Airline and travel information and related billing.

Cyber security is everyone's responsibility at PPPL — reporting what you believe to be a suspicious activity or email on your computer can protect your information, laboratory information, and our computer networks from being compromised.

What you can do:

1. Do not open emails you weren't expecting,
2. Do not click on links,
3. Report suspicious activity.

Here are the steps to take if you suspect your computer has been affected:

1. Disconnect your computer from the network
2. Call the Help Desk (x2275)
3. Wait for further instructions from Information Technology

Do not try to fix the computer yourself as this may make matters more difficult for technical support. When in doubt call the Help Desk.

Staying vigilant and being aware of this type of threat are two ways of avoiding a successful cyber attack. For additional information, contact the Information Technology Department. ■

HANDLE WITH CARE: *Fluorescent Light Bulbs Contain Small Amounts of Mercury*

By Bill Slavin

Fluorescent lights, both the long tubes and the curly compact bulbs, have small amounts of mercury sealed inside. Metallic mercury poses health risks from inhalation or skin exposure including tremors, mood, memory, or coordination changes, and skin irritation or allergy. If fluorescent bulbs are broken, those small amounts of mercury can be released into the environment and may result in exposure if not properly handled. When working with bulbs, handle them carefully and store them in a sturdy container to prevent breakage. If a bulb should break, do not attempt to clean it up yourself – notify Environmental Services at x3380 for assistance. The broken glass should not be swept and standard vacuums can spread the vapor. The bulk of the broken glass will be gathered up while gloves are worn and a specially filtered mercury vacuum will be used to collect the remaining dust.

For home disposal of fluorescent bulbs, check your local hardware stores. Many of them have recycling programs. If a bulb should break at home, open windows and doors for five to ten minutes before cleaning up. While wearing gloves, scoop up the broken glass using a piece of stiff cardboard. Pick up any remaining dust or fragments with sticky tape and dispose in a sealed bag or container. Don't panic! The amount of mercury contained in a single bulb is not enough to cause you harm, but these best practices will help reduce your exposure. Pregnant women and children should, however, avoid exposure whenever possible. ■

Safety Training Seminar Held for New Class of Graduate Students

By Dorothy Strauss

In September, the Laboratory's Deputy Directors sponsored safety training, provided by the ESH&S Department, for seven new graduate students who will partner with PPPL employees on various research and experimental activities. The seminar, founded in 2000 by Rich Hawryluk, reinforces safe laboratory practices while providing an introduction to principal investigators and outlining the many resources available to ensure the health and safety of workers.

Following an introduction by Jerry Levine, Adam Cohen and Mike Zarnstorff shared their belief that safety must always be integrated into one's work. They encouraged the students to voice their concerns and put forward their ideas for improving safety around the Lab.

Rob Sheneman then provided information on environmental management, focusing on ways the students can contribute to the Lab's energy efficiency, waste management, spill and release prevention, and efforts to reduce greenhouse gas emissions.

Bill Slavin presented a hazard awareness review and emphasized hazards the students are likely to encounter during their time at PPPL, as well as their controls.

Al von Halle provided the group with a tour of the NSTX control room, the TFTR Test Cell, the Neutral Beam Power Conversion area, the Field Coil Power Conversion Building, and the D-Site Motor Generator area. Al explained the work that takes place in each area while pointing out safeguards in place to mitigate risks such as electrical currents, falling, radiation exposure, and pressurized gas.

The afternoon session resumed in the classroom, with Jamie Alkhateeb reviewing emergency preparedness practices in place here at the Lab, and explaining evacuation, shelter-in-place, and lock-down procedures. Jamie also touched on bicycle safety, driving obligations, cyber security, and the importance of reporting anything unusual.

Jim Chrzanowski (second from left) explains safe work practices in use in the NSTX-U coil fabrication shop.

Standing left to right: Lee Gunderson (University of Michigan, Ann Arbor); Jonathan Ng (MIT); Charles Swanson (Carnegie Mellon, Pittsburgh); Daniel Ruiz (Ecole Polytechnique, France). Seated left to right: Yuan (Sean) Shi (University of Hong Kong); Peter Bolgert (Marquette University, Milwaukee); Jacob Schwartz (UCLA).

Jerry Levine then reviewed project safety controls, giving the students a higher-level view of the systems in place to ensure proper project management, and their place within those systems.

An overview was then given on the principles of Integrated Safety Management (ISM), and specifics were supplied on required personal protective equipment (PPE) and how to obtain necessary PPE.

The students were taken on a second tour covering the S-109 machine shop, LTX, and the NSTX-U coil fabrication shop. Principal investigators, engineers, and technicians discussed some of the safety considerations in their working environments, including working in tight spaces, required training for machinery use, temperature extremes, and ventilation.

The course was well received by the students, and several members of the PPPL community contributed to its success, including: Adam Cohen, Michael Zarnstorff, Jerry Levine, Bill Slavin, Rob Sheneman, Fran White, Jamie Alkhateeb, Phil Efthimion, Bob Kaita, Mike Viola, Ted Frankowiak, Erik Perry, Jim Chrzanowski, Barbara Sarfaty, and Sue Hill.

The Graduate Student Safety Training course is held each fall at the beginning of the school year. ■

Lessons Learned – Subcontractor Food Handler at Another DOE Facility Cuts Hand & Requires Surgery

By Jerry Levine (Based on DOE Lessons Learned Database)

Lessons Learned Statement:

Avoid contact with sharp edges and wear gloves suited for kitchen operations when opening cans or containers. When the wrong tool is used, or the right tool is used improperly, as in this routine work task, hand injuries are likely to happen with possibly serious consequences.

Discussion:

A food handler was preparing for lunch in the kitchen prep area at another DOE Laboratory, opening a can of roasted red peppers using a swing-away type manual can opener - a common work task (see Figure 1). The lid on top of the can was not completely open, and while holding the can with the right hand the worker used the left hand to lift and bend the lid back, contacting the sharp edge of the partially opened can. This resulted in an approximate 1- inch long laceration on the palm side of the worker's hand between the bases of the 4th and 5th fingers.

Site emergency personnel responded, treated, and transported the worker to a local hospital for further treatment. The cut required five sutures to close the wound. The individual was referred to a specialist for further evaluation and it was determined that surgery was required to repair damage to a nerve leading to the little finger.

Figure 1

Analysis:

The can opener is a top cut opener that leaves a sharp edge on the can lid. Results of the onsite investigation indicated that the worker misjudged the clearance between the palm of the hand and the lid edge when grabbing at the lid. Although this job task had been performed several times the relative risk associated with the action was not fully recognized by the worker.

This type of can opener is a common tool that many employees may use in their kitchens at home or in a personal work area, so the lessons learned from this incident are not limited to the workplace.

Actions:

Figure 2

The area supervisor surveyed other food service facilities on the site to look for similar can openers in use. These manual can openers will be replaced with can openers that 1) remove can lids by their exterior seams, thus helping to eliminate blade contact with the contents of the can; 2) once opened, the lids have no sharp edges; and 3) the lid does not drop into the can so the food is never exposed to dirty or contaminated lids *(see Figure 2 for an example of a replacement can opener)*.

Promoting a "machine over muscle" work ethic is an effective way to reduce hand injuries. When this concept is incorporated into the work planning process, workers have an opportunity to evaluate what specific jobs can be conducted by using hand tools, machinery, attachments, etc. instead of direct contact with their hands. The following should be considered:

- Use the right tool for the job. Every tool was designed to do a certain job. Use it for its intended purpose.
- Avoid using your hands if there are other methods or tools available.
- Watch for changing conditions; pause work if unplanned situations occur.
- Think about ways to avoid hand injuries during pre-job briefs.
- Pay attention to the task.
- Avoid distractions.
- Wear appropriate gloves for the task.
- Use well-maintained tools.
- Avoid pinch points.

Safety is a state of mind. Always think when using a tool. ■

Earthquakes: Drop, Cover, and Hold On!

By Jamie Alkhateeb

As resident East-Coasters we know we are not immune to earthquakes and, although the Midwest and West Coast regions of the U.S. are more prone to earthquakes, we still need to know how we can protect ourselves during this type of event. In August of 2011, the East Coast was shaken by a 5.8 magnitude earthquake, which originated in Mineral, Va. The earthquake lasted for 45 seconds and shockwaves were felt as far north as Canada. Although the quake caused no major damage, no reported deaths, and no major injuries, millions of workers evacuated buildings or were sent home early, sparking confusion, traffic jams, and the feeling of, "What could I have done to protect myself?"

You cannot tell from the initial shaking if an earthquake will suddenly become more intense so if the ground below you begins to shake the best practice for protecting yourself is to 'drop, cover, and hold on.'

- DROP to the ground.
- COVER (e.g. take shelter under a desk or table).
- HOLD ON to your shelter and be prepared to move with it until the shaking stops.

If there is no table or desk near you, drop to the ground and if possible crawl to an inside corner of the room and cover your head and neck with your hands and arms. Earthquakes occur without any warning and may be so violent that you cannot run or crawl long distances. You are more likely to be injured if you try to move around during strong shaking so only move if necessary. If you have exited the building you were in either during or after the quake, do not reenter the building, as there may be hidden structural damage that cannot be seen.

When calling for help or trying to contact family and/or friends during this type of event, it is important to realize that phone networks may be overwhelmed or damaged by the quake, so calling may be delayed -- consider utilizing text messaging.

For more information on how to protect yourself during an earthquake, visit www.dropcoverholdon.org/. ■

(2012 Southern California Earthquake Center)

Ladder Safety – Don't Learn It on the Fly

By Neil Gerrish

Recently a Metals Worker at the Brookhaven National Laboratory suffered severe injuries after falling from a fixed ladder. The individual was working outside and, after losing his three points of contact, fell approximately 15 feet onto the pavement below. The Accident Investigation Board—working with limited information—determined that the accident was preventable. Just two of the contributing factors identified were: 1) that the work planning process was not utilized properly to identify hazards and implement adequate controls; and 2) the safety inspection process for the identification of unsafe conditions and practices was inadequate.

Before you climb any ladder, review the work to be done and identify potential hazards. Inspect the ladder and the area surrounding it. You should begin your climb only when you are certain it is safe to do so.

The Three-Points-of-Contact Climb

When climbing a ladder, it is safest to utilize three points of contact because it minimizes chances of slipping and falling. At all times, the climber must face the ladder and have two hands and one foot, or two feet and one hand, in contact with the ladder rungs and/or side rails. In this way, the climber is not likely to become unstable in the event one limb slips during the climb.

YOU SHOULD . . .

- *Remain focused on your climb.*
- *Stay off any ladder if you are overtired, prone to losing your balance, or not feeling well.*
- *Keep the center of your belt buckle (stomach) between the ladder side rails (or within the width of the rungs) when climbing and while working. Do not overreach or lean.*
- *Never jump or slide down from a ladder or climb more than one rung/step at a time.*
- *Use towlines, a tool belt, or an assistant to convey materials so your hands are free when climbing.*
- *Wear slip-resistant shoes with clean soles. Heavy-soled shoes will prevent foot fatigue.*
- *Read the safety information labels on the ladder.*

THE LADDER SHOULD . . .

- *Have a duty rating greater than the total weight of the climber, tools, supplies, and other objects placed upon it.*
- *Be taken out of service immediately if loose or missing parts are discovered.*
- *Be long enough so the climber does not have to stand on top step.*
- *Be placed on firm, level ground. (Straight ladders should be placed so the base of the ladder is 1 foot from the wall for each 4 feet of height.)*

A fall from a ladder can have devastating results. Before you do any ladder work, or start any cleaning or decorating tasks at home, inspect your ladder and the area around it, and keep these tips in mind for safe climbing. ■

Environmental Management System (EMS) Annual Surveillance Audit

November 12-16, 2012

From November 12-16, 2012 independent auditors from UL-DQS will visit the Laboratory to conduct the annual surveillance audit of PPPL's Environmental Management System (EMS). The annual audit is required in order to maintain ISO 14001 registration of our EMS. You may be interviewed by the auditors during their visit. Please review the following important information about PPPL's environmental management system in order to prepare for the audit.

The EMS follows a standard "Plan-Do-Check-Act" management approach similar to quality management systems and DOE's Integrated Safety Management System. PPPL's EMS provides a framework for assessing the environmental aspects and impacts associated with Laboratory operations, identifying and managing the legal and other requirements applicable to our operations, prioritizing activities that improve environmental performance, reviewing progress, and providing feedback to management.

Environmental Stewardship Policy

PPPL's Environmental Stewardship Policy (P-002) commits the Laboratory to using its EMS to fully comply with applicable environmental regulations, to prevent pollution in our operations, and to continually improve environmental performance. We implement this policy by integrating environmental requirements, pollution prevention, and continual improvement into our work planning and execution, and by taking actions to minimize the environmental impacts of our operations. We establish and communicate environmental responsibilities, provide environmental information to our workforce, and implement controls to mitigate environmental hazards.

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EMS Audit

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What Are My Environmental Responsibilities?

Implementation of the integrated ISM/EMS system requires awareness and participation by all employees. Everyone working at PPPL must perform their work to the best of their abilities. This includes being environmentally aware and safety-conscious. PPPL Policy P-087 identifies ES&H roles and responsibilities. Under this policy, all employees, students, visitors and subcontractors have the following environmental responsibilities:

- Comply with Laboratory policies, standards and procedures and with regulatory requirements.
- Be aware of the environmental impacts of your work and apply pollution prevention and waste minimization techniques. Purchase environmentally preferable products when they are available.
- Identify potential hazards, environmental concerns or unsafe conditions or practices in work tasks or at the work site, and implement or suggest controls to minimize risk.
- Respond to emergency situations, alarms, or occurrences in an appropriate manner. The easiest way to report an emergency is by dialing x3333.

New Activities and Operational Changes

An effective EMS must incorporate new activities and changes to an organization's facility and operations. PPPL's NEPA Review Procedure (ESH-014), Work Planning Procedure (ENG-032), and Job Hazards Analysis Procedure (ESH-004) are important steps for the identification, review and control of the safety and environmental impacts of work at PPPL. These procedures have a critical role in the EMS and provide guidance in making environmental protection decisions.

EMS and Sustainability Resources

More information about the Laboratory's EMS, including program documents and green purchasing guidance is available by clicking on the "Environmental Management System" link on the PPPL Employee Home Page (http://www-local.pppl.gov/erwm/EnvirMgmtSys.htm).

The Site Includes:

- A copy of PPPL's Environmental Management System Description Document;
- Links to applicable policies, plans and procedures;
- Details about how PPPL has integrated the EMS requirements into our ISM program;
- PPPL's environmental performance metrics;
- Links to other sustainability resources such as the ENERGYSTAR®, WaterSense® and the EPA Comprehensive Procurement Guide; and
- Ideas and resources to help you save energy and reduce your environmental impact at home.

Feedback

Everyone working at PPPL, employees, subcontractors, students and collaborators, can help improve our environmental performance and reduce our environmental "footprint." If you have concerns, suggestions, or comments about any of our environmental and energy programs, please use the SOS Drop Box on the Employee Home Page, contact Rob Sheneman (rsheneman@pppl.gov), or contact any member of the Environmental Review Committee.

ENVIRONMENTAL ASPECTS & IMPACTS

The ISO 14001 Standard uses several terms that employees may not be familiar with.

Environmental Aspects: "An environmental aspect is any element of an organization's activities, products or services that can interact with the environment." Examples at PPPL include energy and water use; chemical use, storage and disposal; waste generation; wastewater discharges; and air emissions.

Environmental Impacts: "An environmental impact is a change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services."

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PPPL

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