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CP-12
SAFETY & OCCUPATIONAL HEALTH

Hershell E. Wolfe (Hew)

Message from Mr. Wolfe

Deputy Assistant Secretary of the Army, ESOH and Functional Chief, CP-12

Health Physicists

Health physicists are critical to the continued safe use of radioactive material within the Army. They work with other professionals to provide the expertise to support operational military and peacetime uses of radioactive material. Within the Army, you can find health physicists in a broad range of activities.

They support environmental programs, medical uses, lifecycle management of radioactive commodities, research development, training and testing. The Army radiation safety program is one of the widest-ranging programs in the world. The Army uses of radioactive material range from license-exempt amounts of radioactive material to highly enriched uranium. This complex program requires a diverse, experienced and competent set of health physicists to ensure the material is safely used and that the use is in compliance with all regulatory requirements.

Health physicists are also instrumental in ensuring our non-ionizing radiation sources are used safely. The Army is rapidly expanding the number of lasers and radiofrequency sources in use. We are also seeing a paradigm shift in the way the Army uses some of these sources. We now intentionally direct lasers and radiofrequency waves toward people in escalation-of-force devices instead of first using lethal force. To support this increase in the use of these systems, web-based videos and blackboard courses are in development and will be fielded in the next two years.

BG Timothy Edens

Message from the DASAF

Timothy J. Edens
Brigadier General, USA
Director of Army Safety/Commanding General, USACR/Safety Center
Fort Rucker, Ala.

Doing it Right the First Time

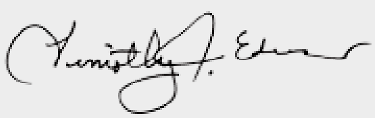
Health physicists and radiation safety officers work together to ensure the safe use of radioactive materials across the Army. Training is key to ensuring both HPs and additional duty RSOs are able to adequately perform their jobs.

This year, TRADOC rolled out the first major change in Army radiation safety training in more than 30 years. This training is shorter and focused on critical tasks RSOs need to perform.

The primary reason the Army has incidents where our compliance fails to meet regulatory standards is failure to perform a job as required. We have had accountability issues, transportation violations and broken devices simply because a Soldier or civilian did not perform an operation as instructed or written in a technical manual.

I challenge all leaders, Soldiers and civilians to work together to improve these areas. Doing it right the first time is the Army way, and it will become increasingly important as we enter a more austere resource environment.

Army Safe is Army Strong!



Dr. Brenda Miller

Where are we?

Dr. Brenda Miller
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HPs: the Army's Specialists in Radiation

Health physics is the profession concerned with the recognition, evaluation and control of health hazards to protect Soldiers, civilians and the environment against the harmful effects of ionizing and nonionizing radiation while making the many benefits of the use of radiation available to accomplish the Army's mission.

The Health Physics Society often refers to health physicists as "specialists in radiation safety." A Health Physics Society recruiting publication lists research, environmental health physics, education (training), medical health physics, industrial and applied health physics, radiation safety officers and regulators/policy as the types of jobs in which HPs engage. The Army uses HPs in all these areas.

Unlike some other CP-12 career programs, there is a military occupational specialty for HPs. Civilian and military HPs work closely to ensure Soldiers, civilians and their Families are protected in the workplace and surrounding community. There is currently a shortage of HPs, which is expected to increase in coming years. The Health Physics Society has engaged several universities, the Department of Energy and the Nuclear Regulatory Commission in meeting this demand. The Army is monitoring these efforts and developing qualified HPs through the CP-12 intern program.

Our HP careerists provide a unique demographic among the CP-12 career field. The Army currently has 95 HP positions, and they are evenly split between safety-related and non-safety-related positions. Nationally, about 10 percent of HPs are certified. The Army exceeds the national average with 15 percent of our HPs having achieved certification.

Safety Professionals: The Army's Force Multipliers

Dave Henderson
Deputy Safety Director
United States Army Reserve Command
Fort Bragg, N.C.

Many Soldiers in the Army consider safety a four-letter word. They believe safety hinders training, but nothing could be further from the truth. The integration of safety in all aspects of training and real-world operations helps ensure mission success and force protection.

In the 1960s, the Army aviation community recognized the need for full-time safety professionals to assist commanders. These active-duty Soldiers conduct intensive aviation safety training, attain an additional skill identifier and work as full-time safety officers at the company level or higher. They assist the commander in the implementation of the unit safety program, risk management, identifying trends/conducting analysis and conducting accident investigations.

For many years, units outside the aviation community had civilian safety professionals at division or higher levels and Soldiers serving as additional duty safety officers below the division. In early 2000, the Army recognized the need for a full-time safety professional at the ground level. The safety professional is not simply someone walking around with a clipboard, but a valued member of the team. They are highly trained professionals who work with Soldiers on a daily basis, including on real-world deployments.

Cut Line: U.S. Army Sgt. 1st Class Hugo Romero, left, and Master Sgt. David Gonzalez, along with Richard Cunningham, center, a U.S. Army Reserve Command Safety Office employee, inspect a non-potable water storage tank during Warrior Exercise (WAREX) 78-13-01 at Fort McCoy, Wis., May 3, 2013. Romero, Gonzalez and Cunningham met with Soldiers and inspected field conditions during WAREX to ensure safety standards set forth by the 78th Training Division were being utilized. (U.S. Army photo by Spc. Michael McDevitt/Released)

Safety professionals are proficient in not only military operations, but also many civilian areas such as safety program management, fire safety, electrical safety, ergonomics, industrial hygiene and several federal Occupational Safety and Health Administration requirements. The Army requires all safety professionals be trained in 34 safety skills to receive the Career Program safety certificate, recognized by the American National Standards Institute.

"The Professional Certificate Program in Safety and Health is a credential commanders may recognize when an individual has completed all required Level I training," said Dr. Brenda Miller, the senior safety adviser at the U.S. Army Combat Readiness/Safety Center.
Not all safety professionals in the Army Reserve or the active Army have completed the training required to be awarded the CP-12 certificate. A panel of senior safety professionals reviews certificate applications quarterly.

At this time, 74 percent of all safety professionals in the Reserve Command meet the standard and have the CP-12 certificate, with many other professionals working toward completion. The total Army percentage is just over 66 percent. The unit safety professional is a highly trained, experienced member of the team that is a definite force multiplier.

"These safety professionals are multi-functional and multi-dimensional, and they, more than ever, are an essential component of readiness," Miller said.

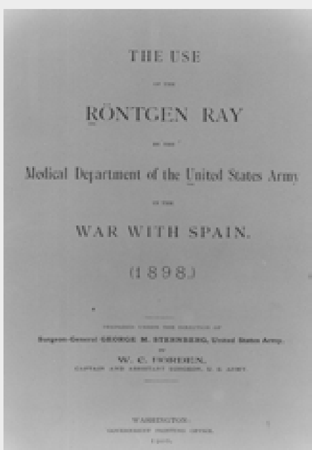
Army Radiation Safety: A Brief History

Greg Komp
Senior Health Physicist
Army Safety Office
Fort Belvoir, Va.

Have you ever wondered about the origins of something? As the Army's radiation safety officer, I've been asked about the history of the Army Radiation Safety Program and how we got to where we are today. I originally thought that would be an easy answer; just head for the history shelf and do a little reading.

Boy, was I wrong! I've been working on the answer to that question for a couple years and still have some pretty large gaps, although I have learned the Army was often at the front of developing radiation safety programs.

Along my journey I discovered that in 1898, Army Capt. Borden developed the first guidelines for safe use of x-rays, shortly after their discovery. In 1900, he published those guidelines in The Use of the Roentgen Ray by the Medical Department of the United States Army in the War with Spain (1898).


THE USE

RÖNTGEN RAY

Medical Department of the United States Army

WAR WITH SPAIN.

(1898.)

Surgeon-General GEORGE M. STERNBERG, United States Army.

W. C. BORDEN.

These were some of the measures he proposed to protect patients:

- Exposure should never exceed 30 minutes
- The X-ray tube should never be closer than 10 inches (25.4 cm) from the body
- Repeated exposures should never be made within three days of previous exposures

Guidelines have gotten tighter since then, and we've extended them to both patients and medical staff who work with x-rays. Our equipment has also improved from those days.

The Army was significantly involved in the Manhattan Project, with most activities falling under authority of the Manhattan Engineering District. Many early health physics and industrial hygiene practices were developed at the various laboratories involved in the project. The Army also led teams during the first surveys of Hiroshima and Nagasaki. One picture I found was very similar to one I have from my father's war album. I know he provided security for Hiroshima; I wonder if he was part of these early entries.

Another discovery I made was the 1st Radiation Safety Support Team. This team, later reorganized as the 1st Army Chemical Unit, provided many of the radiation surveys and dosimetry in support of weapons tests in Nevada and the Pacific. In 1956, the Army Chemical Corps was assigned additional missions for health physics missions, training, and disposal of radioactive wastes.

They established one of the first courses to train radiation safety officers, and the Atomic Energy Commission was provided 50 slots per year for their personnel. In the 1960s, responsibility for licensing, control and disposal was transferred to the logistics community. The deputy chief of staff for logistics managed licensing and control, the Army Chemical Corps Material Command managed disposal, and the surgeon general was responsible for health effects and medical uses. In 1980, these programs (except medical use) were transferred to the Army Material Development and Readiness Command.

In 1999, the Army established the Army Radiation Safety Office. This was the first time the Army had a centralized program that included all radiation safety programs. The Army still decentralizes the execution of these programs, but it has a single point of contact at the HQDA level. Today, the Army has around 500 additional duty radiation safety officers managing local programs, and 95 health physicists managing more complex programs and radioactive commodity programs, making it the largest radiation safety program in the world.

The Army Health Physicist's Role as Laser Safety Officer

Tim Mikulski
CHP, Health Phicist
Army Safety Office
Fort Belvoir, Va.

Many Army health physicists wear several hats. They support both the ionizing and nonionizing radiation safety programs. The nonionzing program covers lasers and electromagnetic radiation to include radiofrequency, millimeter and microwave radiation emitting devices. Army HPs that work on the safety of laser systems are often classified as laser safety officers.

The LSO has authority and responsibility to effect knowledgeable evaluation and control of laser hazards, implementation of appropriate control measures, and monitoring and enforcement of required standards and regulations. Units must have an LSO on staff if their laser program includes a class 3B laser, class 4 laser, and/or a laser system that has a military exemption (76EL-01DOD) from the Food and Drug Administration.

Army HPs help determine if the lasers being used require a laser safety program. The HP can provide guidance and support to ensure Soldiers, civilians and contractors are using lasers properly and for their intended purpose. The goal is to ensure users and their fellow Soldiers and coworkers are safe.

HPs can help with all parts of the laser lifecycle program, beginning with research, testing and eventual fielding. Laser systems must be reviewed by the U.S. Army Institute of Public Health prior to use. The HP can use information in the USAIPH Nonionizing Radiation Protection Studies to ensure engineering safeguards are understood and used by researchers and/or users. If additional measures are needed, including administrative procedures and personal protective equipment, the HP can ensure they are in place.

Once initial research and testing is complete, the program manager works with the LSO to ensure the laser system is ready to be fielded. Laser safety information must be integrated into technical manuals and tactics, techniques and procedures so Soldiers can safely use the laser system. The LSO can help with training on topics such as how the laser system works, laser classification systems, laser safety, and steps to take if there is an incident, accident or injury.

The LSO helps range safety officers when testing laser systems on Army ranges. The LSO makes sure the range is set up to operate lasers safely based on the systems' nominal hazard zone. The LSO must make sure those testing the laser and others on the range are not at risk. The LSO must also inform the Laser Clearing House if the laser is directed above the horizon. Guidance for the LSO on safe use of lasers on ranges is covered in Army Regulation 385-63, Department of the Army Pamphlet 385-63, Military Handbook 828B, and American National Standards Institute Z136.6. Additional range safety information is provided by the TRADOC TCM-Live website, https://srp2.army.mil/RangeOperations/RangeSafety/default.aspx, and a good resource is the Laser Range Management Toolkit, https://srp2.army.mil/RangeOperations/Pages/RMTK%20Tools.aspx.

Lightweight Laser Designator Rangefinder, AN/PED-1

Lasers are a big part of our industrial base, and the HP must work with operators to review and ensure laser safety is in place, that systems meet FDA requirements for safe use, and that the Army is in compliance. The HP can provide training to include wavelength, power output and awareness for workers to understand the risks they face using different laser systems.

Lasers are also used in Army medical treatment facilities. The HP or nuclear medical science officer (MOS 72A) supports medical staff to ensure lasers are being properly used to help with diagnosis and treatment. Proper engineering and administrative safeguards need to be in place along with proper PPE so those working with lasers and patients are safe.

If someone is injured, the key is to seek medical attention immediately. The attending physician must call the DOD Laser Injury Hotline to consult with an ophthalmologist who has experience in treating laser eye injuries. The Army HP can help with reporting and follow-up to ensure the same type of accident never happens again. The DOD Laser Injury Hotline is as follows:

- ESOH Service Center: (800) 473-3549, DSN 798-3764 or COMM (937) 938-3764
- Email: esoh.service.center@wpafb.af.mil
- Laser Injury Electronic Reporting Form: https://hpws.afrl.af.mil/dhp/OE/ESOHSC/laserinjury/
- Laser Injury Database: https://hpws.afrl.af.mil/dhp/OE/laserinjury/

Lessons Learned from the Installation of a New Linear Accelerator

LTC David J. Phillips
Chief, Health Physics Service
Madigan Army Medical Center
and **Danny L. Rice**
Former Command Radiation Program Manager
Western Regional Medical Command
Joint Base Lewis-McChord, Wash.

In a major military medical center, the health physics staff ensures the safety of hospital staff and patients from ionizing and non-ionizing radiation. Responsibilities include: managing the license from the Nuclear Regulatory Commission for the use of radioactive materials for diagnosis and treatment of diseases, providing radiation safety training, monitoring occupational exposure, performing contamination surveys, disposing of radioactive waste, conducting X-ray system compliance testing, calculating radiation shielding requirements, ensuring laser and radiofrequency hazard safety, and many other tasks.

Among the most complex tasks the health physics staff performs are shielding analyses and inspections for the installation of new diagnostic and therapeutic X-ray systems. A shielding analysis determines the thicknesses and types of material required in each barrier – wall, ceiling, floor, window, or door – of a treatment room in order to reduce the radiation exposure in areas outside the treatment room to regulatory limits. A shielding analysis takes into account many factors, including the type of radiation source, the number of patients per day, the variety of treatments performed, existing shielding, distances from the radiation source to the protected area, occupancy in adjacent areas, and other parameters. Many factors may be known, such as the maximum machine output, but many other factors require assumptions, such as the occupancy of a room beyond the shielded area.

Madigan Army Medical Center at Joint Base Lewis-McChord in Washington state recently completed the installation of a new Varian Trilogy Silhouette Linear Accelerator (LINAC) for cancer treatment in the radiation oncology service. A LINAC delivers a high-energy targeted beam of electrons or X-rays that can be shaped to destroy cancer cells while largely sparing surrounding healthy tissue. There were several lessons learned throughout all phases of the project, from design through final inspection.

First, it is essential to verify all design assumptions, even if verification causes increases to the overall project timeline and cost. At Madigan, the first shielding analysis was performed in October of 2011. The original shielding analysis did not identify a requirement for additional lead shielding above the LINAC; it determined that the primary and secondary concrete shielding already in place would provide sufficient barrier protection. Construction was not able to begin, however, until October of 2012. The radiation safety officer (RSO) in charge of the health physics staff was then asked to certify the original shielding analysis so that construction could commence. The RSO and the medical physicist determined that a new shielding analysis was required; in the span of time since the completion of the original shielding analysis, certain assumptions and cancer treatment modalities had changed. The new shielding analysis identified the need to add up to 1-1/2 inches of lead on top of the concrete secondary barrier above the LINAC, and 1/4 inches of lead on top of the concrete primary shielding above the LINAC. The RSO's requirement for a new shielding analysis introduced delays to allow for contracting and completion of the shielding analysis, updating of architectural plans, and fabrication of the lead shielding, for a total additional cost of close to $250,000. Verification of assumptions, while costly, ensured the most up-to-date design parameters.

Figure 1. Lead with a thickness of 7/8-inch on wall where 1-inch thick lead was specified.

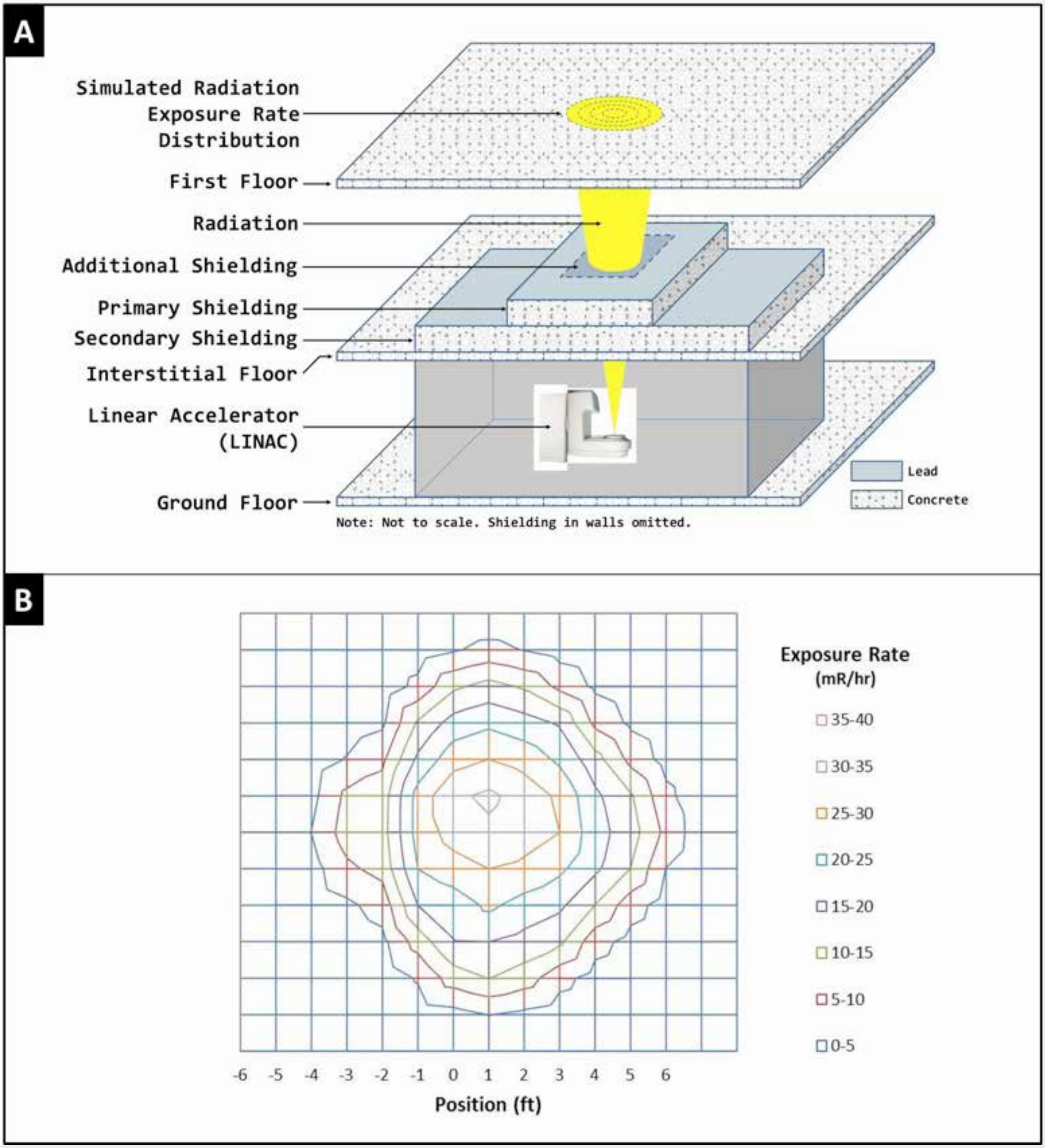


Figure 2. (A) Schematic of the facility. The measurement location is indicated by the "Simulated Radiation Exposure Rate Distribution." (B) Measured exposure rate distribution.

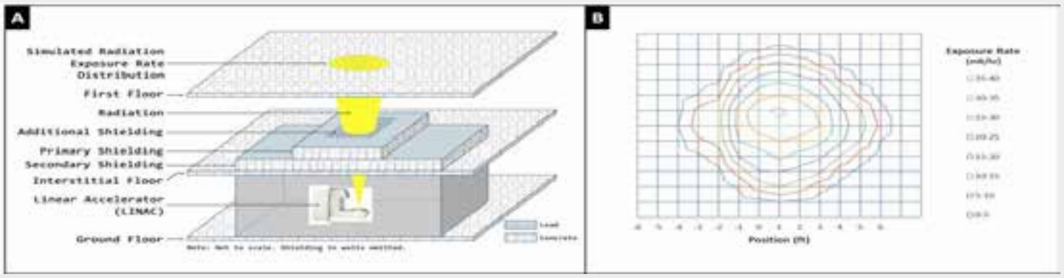


Figure 2. (A) Schematic of the facility. The measurement location is indicated by the "Simulated Radiation Exposure Rate Distribution". (B) Measured exposure rate distribution.

Second, health physics inspections are critical throughout the shielding installation phase. One key deficiency identified during an inspection was the installation of lead shielding on two walls that did not meet the thickness specifications in the shielding analysis. For one wall, 1-1/2 inches of lead was specified, but the contractor installed interlocking lead blocks with a thickness of only 1-3/8 inch. In another wall, 1 inch of lead was specified, but the contractor installed interlocking lead blocks with a thickness of only 7/8 inches. See Figure 1. Upon investigation, the lead supplier stated that his thickness tolerance for the lead bricks was ±1/8 inch. To meet the proper lead thickness specifications, the vendor, at his own expense, installed drywall lined with 1/8-inch thick lead on top of the lead bricks. Other additional deficiencies were also identified and corrected as a result of the inspection. Thorough health physics inspections therefore ensured that the installed lead met the shielding analysis specifications.

Third, accurate as-built facilities drawings are essential for the shielding analysis. The shielding analysis was based on facilities drawings that showed 70 inches of concrete shielding above the LINAC. After installation and commissioning of the new LINAC, radiation exposure rate measurements were recorded on the first floor above the LINAC. See Figure 2A for a schematic of the facility and the first floor measurement location. See Figure 2B for the actual measured exposure rate distribution. Using the measured exposure rates and a design patient workload of 50 patients per day, a weekly time average dose rate (TADR) was calculated. When compared to the design TADR from the shielding analysis, the calculated TADR was higher. The calculated TADR indicates that the effective thickness of concrete shielding above the LINAC is only 64 inches, not 70 inches, as used in the shielding analysis. One possible cause of the high calculated TADR is a discrepancy between the distances in the facilities drawings and the actual as-built distances. Another possible cause is unknown duct work that may run through the primary shielding that would reduce the concrete thickness; no elevation drawings were available to show the cross-section of the primary shielding. It is also possible that the actual density of concrete in the facility is less than the concrete density of 147 lb/ft3 that was assumed for the shielding analysis. In order to reduce the calculated TADR to the design TADR, the daily patient workload has been reduced. Some patients may therefore have to be referred to the civilian network for treatment. In order to meet the original design daily patient workload, it will be necessary to install a small section of additional shielding, approximately 8-feet by 8 feet, as shown by the shaded section in Figure 2A, at a cost of about $40,000. This cost is small when compared to the cost of referring patients to the civilian care network. Accurate as-built facilities drawings would likely have provided correct distances and thicknesses for the shielding evaluation, thereby eliminating the need for the small additional section of shielding.

The installation of the new Varian Trilogy LINAC at Madigan Army Medical Center has provided numerous lessons learned. These lessons include the importance of verifying design assumptions, the critical nature of health physics inspections, and the need for accurate as-built facilities drawings.

Interpersonal Relationships in Radiation Safety

MAJ Margaret Myers
US Army
Army Materiel Command
Huntsville, Ala.

At the last Army Radiation Safety Council, I was tasked to develop a consolidated radiation safety checklist. I received many checklists from different commands, and I am in the process of combining them into a coherent and easy-to-use document.

While working on it, I came to realize the regulations and guidance for safe use, storage, licensing, disposal, transportation, safety, design and inventory control of ionizing and nonionizing radiation sources are numerous and varied. A checklist is a good start, but more important is developing and maintaining a healthy and cooperative relationship between inspectors and licensees, Army radiation authorization holders, and radiation safety officers.

Many people dread being audited, whether it is OSHA, NRC, IG or within their own command. Army Materiel Command uses the term "site assistance visit" instead of audit, presumably to make people feel more at ease. Nevertheless, inspectors and licensees, ARA holders and RSOs have the same goal in mind, and that is to ensure safe use of radiation sources and compliance with all federal and DOD rules and regulations. Our primary mission is to protect the health and safety of Soldiers, civilian and contract employees and the public, while also protecting the environment.

Going through the different checklists from various types of commands, many items are similar because we all are required to follow the same rules and regulations. I found eight basic categories for radiation sources: management/command oversight, comprehensive safety measures, dosimetry and medical surveillance programs, instrumentation and surveys, safety training, shielding and design, and security and control. Depending on the size of the radiation safety program, it can be quite a task to inspect and maintain, especially if one has many sites under said program.

Each inspector has his or her own style, and I prefer to start with a checklist; it is hard for me to remember everything. The NRC has adopted the principle of "inspecting for performance" rather than exclusive reliance on records review. We should not do away with records review, of course, but what is the good of having a perfectly written SOP if no one understands it? This type of performance inspection should start before the inspector arrives, whether they are from higher command, NRC or other regulatory agencies. It is also vital for higher command RSOs/RSSOs to do the same. I talk to at least one AMC subordinate command RSO every week; likewise, I am in constant contact with the DA RSO. The communication is a two-way street with no judgments, but rather a cooperative environment with each trying to solve conflicts and inform the other.

At the time of inspection or SAV, if there is already a relationship established, the licensee, ARA holder or RSO will more likely be forthcoming. The inspector may also be more willing to develop a plan to correct or improve the program. It is human nature to be more cooperative with people we already know. Both need to put their egos aside because hiding faults and slamming people is not conducive to keeping people safe.

Furthermore, having relationships with peer RSOs, health physicists or other specialties will contribute to a successful radiation safety program. No one person knows everything there is to know about health physics or safety. Safety is a very broad spectrum. For instance, you may need an SME for chemical waste or rail transportation.

In conclusion, these interpersonal relationships are essential for a successful radiation program. We all need to remember that we are on the same team with the same goals. If you would like to contribute to the RSO checklist, please email me at margaret.c.myers2.mil@mail.mil.

The Foundation for a Good Radiation Safety Program

Gary Ziola
U.S. Army Communications-Electronics Command
Fort Hood, Texas

If you've made this pledge to yourself, listed below are 10 key elements that are the cornerstones for an effective radiation safety program, whether at a single unit, supporting facility or throughout the command.

1. Have accurate RSP records and maintain them on file

A good RSP starts with good recordkeeping, which often gets overlooked. The condition of your files says a lot about the condition of your program. Well-organized files speak volumes with regard to how you care about your job as a RSO and how much time you spend managing and administrating your RSP.

2. Keep your program inspection ready

Whether its inspection time or not, you should be ready. Administrating your RSP is a dynamic process which requires a consistent effort. Any deficiencies or oversights discovered should be investigated, reported and corrective actions taken to rectify the issue. Documenting the corrective actions and providing any recommendations for improvements ensures that when an inspector does eventually arrive on the scene, announced or not, only the unaware RSO is "surprised" by the outcome. One way of ensuring this is to conduct periodic internal inspections, including one-on-one observations of Soldier handling and using commodities containing radioactive sources.

3. Review and update

Periodic (at least annual) review of the current SOP(s), safety manuals, transportation requirements and other applicable TMs/TBs is good practice. Update these documents based on the latest requirements. Reviewing your last inspection report will also give you a clearer picture as to the condition of your RSP and which areas may need special attention. Any issues or concerns from that report should have been addressed and/or corrected, if needed.

4. Inventory, accountability and security

A radioactive materials inventory must be performed at least annually. Maintaining an inventory enables the RSO to properly establish and administrate an RSP that adheres to those items on hand and it also demonstrates cradle-to-grave accountability of licensed radioactive material IAW federal law. Implementing controls, both physical and administrative, is needed to safeguard against loss and/or unauthorized use and to ensure 100 percent accountability for radioactive items of supply. Retaining supporting documents for the acquisition, receipt, transfer and disposal of sources demonstrates good control of RAD material.

5. Be radiation knowledgeable

The U.S. NRC requires individuals receive radiation safety training commensurate with the level of potential occupational radiological hazards. A program for initial and periodic refresher training, along with general awareness training, is indispensable in meeting that goal. Having well-publicized POCs and telephone numbers to provide information and to answer questions is vital for such a sizeable military force. An across-the-board radiation safety training policy reduces risk to our Soldiers and civilians and helps to ensure their protection. What use are written policies and procedures when personnel are not properly trained to follow them?

6. Don't get complacent

Although the Army is undergoing a gradual reduction in items of supply that contain radioactive material, there is still a significant quantity to be dealt with. Lack of attention to detail and shirking responsibilities can lead to a non-compliant RSP. Not following established procedures and putting off routine tasks such as periodic radiological surveys, source leak tests, etc., can quickly lead to safety issues and program deficiencies down the road. In worst-case scenarios, work stoppage, potential fines and revocation of licensees all become legitimate possibilities.

7. Respond in an expedient manner

A process must be in place to investigate and minimize radiation incidents and accidents such as the damage and subsequent release of radioactive materials, loss of radioactive material, unusual/excessive radiation exposure and the like. This includes having a plan for providing assistance and advice in all radiation emergencies and supervision of any unique decontamination operations. All radiological incidents/accidents must be reported and documented, the causes noted and corrective actions taken. Only then can real-world recommendations be implemented to prevent reoccurrences.

8. ALARA and personnel monitoring

"As Low As is Reasonably Achievable" is the guiding philosophy when we speak about radiation safety. Personnel dosimetry, if required, in the form of a TLD (thermoluminescent dosimeter) or OSL (optically stimulated luminescence) ensures ALARA practices are being met and also creates a record that documents employees are receiving minimal exposure levels. A key component of a good radiation protection program is a solid adherence to ALARA considerations. ALARA considerations, such as time, distance and shielding, and the prevention of internal uptake have got to be put into practice and integrated into the RSP. Careful review of dosimetry reports to spot exposure problems and/or inconsistencies and conducting periodic radiological workplace surveys reinforces ALARA in a big way.

9. Have adequate resources

It takes resources to safely perform routine maintenance or have available adequate survey equipment (appropriate RADIAC and/or wipe media) to monitor for all isotopes used by the military. Sufficient signage and postings used to indicate the presence of sources of radiation or designated storage and maintenance areas are needed too. Did you know the Army's RSO Resource and Information Library, located at https://cecomsafety.apg.army.mil/rso2, can provide you with a multitude of radiation safety-related documents, references, worksheets and template SOPs to ensure you're kept up to date with the latest U.S. Army, federal and state requirements and guidelines. If you don't see what you're looking for on this website, it could be it may not be that imperative to your RSP after all.

10. Get one and all involved

All Soldiers should be duly involved in properly handling and caring for their equipment, and senior officers should be routinely kept informed on the state of affairs with regard to the RSP. New missions, equipment fieldings and/or RESET operations that may require the development of new/updated safety procedures should be addressed and acted upon accordingly. Ignoring issues and concerns until after a hazard exists does not bode well for your RSP.

So there you have it! Listed above are 10 things you can resolve to do in the coming year to help build a better foundation under your RSP.

Low-Level Radioactive Waste Program — The End of The Lifecycle

Kelly Crooks
Joint Munitions Command
Rock Island Arsenal, Ill.

Health physicists and radiation safety personnel are involved in all aspects of radioactive material management, including the end of the lifecycle, or disposal of radioactive waste. In general, low-level radioactive waste is unwanted radioactive material that is not high-level waste, which is essentially reactor fuel or special weapons-grade material.

So, most radioactive material to be disposed is LLRW, but it can include large-activity, high-hazard sources. In each case, the radioactive material is excessed and unserviceable. The most common radionuclides within the Army are tritium, depleted uranium, nickel-63, thorium-232 and radium-226. Examples of the Army's radioactive waste streams include:

- Operational: equipment Soldiers use that contain a radioactive component. Examples are howitzer and mortar fire control devices (H3), chemical agent detection equipment (Ni63 or Am241), and armor penetrating munitions (DU).
- Industrial: maintenance or production facilities that use gauges or detectors with various sealed sources.
- Medical: hospital wastes, mostly short-lived radionuclides that can be decayed in place. Can have sources associated with treatments such as Ra226 brachytherapy.
- Research and development: laboratory wastes of a variety of radionuclides in a multitude of physical and chemical forms, including mixed waste with hazardous chemicals and biological waste with animal carcasses.
- Testing: mostly fragments and residue from firing DU munitions into targets.
- Common commercial items: examples include exit signs (H3), smoke detectors (Am241) and electron tubes (various radionuclides).
- Legacy items: materials obsoleted by the Army but still turned in for disposal. For example, Ra226 paint on military vehicle instrument panels and radio dials.
- Environmental or decommissioning cleanups: contaminated soils and debris associated with free release of areas and Nuclear Regulatory Commission license terminations.

The Army LLRW disposal program is managed by the Joint Munitions Command Safety/Rad Waste Directorate at Rock Island Arsenal, Ill. The program is centrally funded, and JMC manages removal and disposal of excessed radioactive materials from every Army installation worldwide.

Each installation should have a designated radiation safety officer who manages collection and storage of excessed materials and provides JMC a comprehensive inventory of items for removal and disposal. The inventory goes to an HP at JMC for review. It should include the RSO's contact information (organization, contact person, site location and address, email address and telephone number); information on each item, to include the National Stock Number, item name, radionuclide, activity per item, item quantity, total activity of each radionuclide, and approximate weights and volumes of all items to estimate container and shipping requirements. The RSO must be familiar with military radioactive items to identify the radionuclide, its form, and type and level of radiation emitted to determine storage requirements. The JMC HP will use inventory information to determine the best means to safely, compliantly and cost effectively pack, ship and dispose of items.

The JMC HP project manager uses many skills in different areas to work each disposal action:

- Transportation: knowledge of DOD, domestic and international shipping regulations for packaging, marking/labeling and shipping papers for making military and commercial shipments (requires Department of Transportation and DOD training certifications).

- Radiation safety: ability to recognize and quantify hazards and assess risk, use proper personal protective equipment and handling techniques, and monitor radiation exposure.
- Instrumentation: identify the proper instrument for specific requirements, both field and laboratory, and know how to operate it.
- Volume reduction: knowledge of military end items and their radioactive components, and the tools required to disassemble for removal of the source module for disposal.
- Processing and disposal: knowing the preferred disposition of each material type, whether through recycle or burial, and the path to get it there.
- Contracting: ability to write a performance work statement for contractor support, estimate costs and oversee contractor performance (requires acquisition training and certification as a contracting officer's representative).
- Recordkeeping: maintain databases for inventories, project documents and surveys.
- Regulatory compliance: ability to interpret and apply regulations, maintain radiation and hazardous materials training, and obtain disposal and transportation permits.
- Support to combat theaters: ability to deploy to and operate in harsh environments directly supporting the theater command to retrograde contaminated vehicles and other damaged radioactive items.
- Physical demands: must be able to do heavy lifting and work in extreme heat and cold for long hours.

Waste management is a unique aspect of health physics. The JMC HPs have four-year science degrees with hundreds of hours of Army and on-the-job training on specific job requirements. It typically takes three to five years for a new hire to get up to speed on all aspects of radioactive waste project management.

Getting the dose rate off a packed drum to prepare for shipment. The yardstick is used to get the dose rate at three feet from the container for the transport index.

Surveying for alpha contamination on the plastic covering a large Ra226 source container prior to opening the covering and initiating processing procedures to pack for shipment.

What's New

Susan George
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Coursera, the Future of Online Learning

I learned about Coursera from a University of Virginia email announcing the start of the free Foundations of Business Strategy course. Curious about the possibility of taking Professor Lenox's course from UVA's Darden School of Business, I signed up. After completing the course, I looked for another opportunity to learn and found an equally impressive course, Data Analysis, taught by Professor Leek from the Johns Hopkins Bloomberg School of Public Health.

I am excited about taking Data Analysis because I will not only get a refresher on data management and applied statistical methods, I will also be learning how to use the R programming language. This course doesn't focus on the mathematical details behind the statistical methods; the focus is on finding the right data to answer questions and indirectly enhance critical thinking skills. Two possible safety program applications come to mind as I take this course. The first is the capability to design for prediction. Where will the next accident occur? The second area is learning why organizations have a successful safety program through data analysis.

I encourage all of you to explore the possibilities offered by Coursera. The future of lifelong learning is changing, so embrace the change. Develop or enhance critical skills needed for your future as well as the future of your organization.

Coursera partners with top universities worldwide with a vision of providing access to world-class education to everyone. Coursera has more than 400 courses available in over 20 categories created by 85 universities from 16 countries. Courses vary in length from four to 10 weeks. Go to www.coursera.org to sign up and explore.

Courses that may be of interest to CP-12s include:

- Saving Lives Millions at a Time: Global Disease Control Policies & Programs, Johns Hopkins University
- Critical Thinking in Global Challenges, The University of Edinburgh
- Epidemiology: The Basic Science of Public Health, The University of North Carolina at Chapel Hill
- Data Analysis and Statistical Inference, Duke University
- Content Strategy for Professions: Engaging Audiences for Your Organization, Northwestern University
- Introduction to Public Speaking, University of Washington
- Introduction to Systems Engineering, University of New South Wales
- Social Psychology, Wesleyan University
- First-Year Composition 2.0, Georgia Institute of Technology
- Writing in the Sciences, Stanford University
- Leading Strategic Innovation in Organizations, Vanderbilt University
- Energy, the Environment, and Our Future, The Pennsylvania State University
- How Green Is That Product? An Introduction to Life Cycle Environmental Assessment, Northwestern University

What's New

Bill Harris
CHP
U.S. Army Test, Measurement, and Diagnostic Equipment
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Army Dosimetry News
Occupational dosimetry changes

Almost 25 years ago, the Army completed its transition from film badge dosimeters to thermoluminescent dosimetry badges. At the time, the TLD was a vast improvement in technology, but new optically stimulated luminescent badges are currently being fielded.

Besides providing the same occupational dosimetry as the TLD, the OSL has greater sensitivity and can be re-read. These systems can provide in-theater support following an incident involving potential radiation exposure. Since OSL dosimeters are re-readable, onsite in-theater readings can be obtained using these resources with the dosimeters sent back to the Army Dosimetry Center for the final dose of record determination.

Fortunately for Army dosimetry users, the OSL uses the same holder as the TLD. This will facilitate the changeover, which should be essentially transparent to the user. Photos of the OSL basic dosimeter and the portable field reader are shown below.

Tactical dosimetry changes

For the first time, the Army has the capability of providing full-spectrum dosimetry for deployed Soldiers and civilians. The new PDR-75A RADIAC set includes the CP-696A field reader and DT-236A wristwatch-type dosimeter. The PDR-75A is a thousand times more sensitive than the first generation system and can be used in a wide range of scenarios, from full-scale nuclear war to new operational environments such as would result from the detonation of an improvised nuclear device or radioactive material dispersal device (dirty bomb). It also can be used in environmental disasters such as occurred during the Fukushima incident in Japan. Support for the new dosimeter is provided by the U.S. Army Dosimetry Center, an element of the U.S. Army Test, Measurement, and Diagnostic Equipment Activity at Redstone Arsenal, Ala. Dosimetry support services provided by the ADC are accredited to the ISO 17025 international quality standard by the National Voluntary Laboratory Accreditation Program.

ADC participation in The One Million U.S. Radiation Worker Study

The ADC participated in The One Million U.S. Radiation Worker Study, a major national effort to provide relevant, timely and needed health data on radiation risks derived from populations who received relatively high cumulative radiation doses, possibly accumulated over many years, and dating back as far as 70 years. The study includes the early Manhattan Project workers, military veterans who participated in above-ground nuclear weapons tests, early nuclear utility workers, industrial radiographers, and early medical personnel. The study is sponsored by the National Council on Radiation Protection and Measurements, a congressionally chartered, nonprofit organization that supports the scientific and public

Army Dosimetry News (Continuation)

aspects of radiation protection through independent analyses by leading scientists throughout the United States. The NCRP has provided names of potentially exposed Army radiation workers to the ADC, which maintains a repository of more than 14 million radiation exposure records dating back to 1954. A cross-reference database query was performed by the ADC, which provided the NCRP exposure data from positive matches. A formal NCRP report will be published at the conclusion of the study.

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