NEW

SPECIAL EDITION! SPECIAL EDITION! SPECIAL EDITION!

August 2012

Army Industrial Hygiene News and Regulatory Summary

Contents:

Editor's Note

Welcome readers to August's special edition of *the Army Industrial Hygiene News and Regulatory Summary*. The aim of this publication is to highlight the efforts of our profession and provide an opportunity for health and safety professionals across the Army to contribute original articles about new and on-going projects.

Look out for an announcement about future special edition during the next fiscal year. Everyone is highly encouraged to submit articles that you feel would be of interest to our audience.

This monthly newsletter is a subscriber based distribution. You can sign up to receive it using the contact information located on the last page.

Kind Regards,
Karla Simon
Editor

Biological Safety Cabinets vs Chemical Fume Hood

By Steve Munsell, Industrial Hygienist, AIPH

The term "hood" is often used to describe one of three difference types of ventilation equipment used in laboratories. Biological Safety Cabinets (BSC), Chemical Fume Hoods (CFH) and Laminar Flow Clean Benches (LFCB) are often collectively referred to as "Hoods", even by laboratory personnel who work with this equipment. The purpose of this article is to clear up the confusion regarding the nomenclature and functions of each of these pieces of equipment as they are fundamentally different.

BSCs are designed to provide protection of the product, the operator and the environment from aerosols composed of liquid droplets and or particulates including microorganisms.
LFCBs are not BSCs. Although they look similar to BSC they are distinctly different. They offer product protection only and do provide some protection to the operator or the environment and should not be used for work involving infectious microorganisms or volatile chemicals.

CFHs are designed to contain chemical vapors and gases generated during operations involving chemicals. They are not designed for working with microorganisms and do not provide protection of the product from the environment. While BSC air can be re-circulated CFH air is never re-circulated.

Another fundamental difference between BSCs, CFHs and LFCBs are the testing requirements. While all must be periodically tested to ensure they are functioning properly, the testing requirement for BSCs is much more involved than CHS or LFCBs. BSCs are divided into three Classifications (Class I, II, III) with Class II having multiple types. In addition to the numerous testing performed at the factory Class II BSCs needed to be "field tested" by National Sanitation Foundation certified testers. The tests must be performed on each cabinet at the time of installation and at least annually thereafter, whenever HEPA filters are changed, maintenance repairs are made to internal parts or when the cabinets have been moved. Pharmaceutical applications require testing every 6 months.

SAFETY

Range Safety: Taking the Lead Out

By Karla Simon, Industrial Hygienist, AIPH

In the fall of 2011, occupational lead poisoning drew the attention of the Office of the Deputy Chief of Staff of the Army, G-4. Some of the personnel working and training in shoot houses were identified, through medical surveillance, to have elevated blood lead levels. Subsequently, Operations Order 12-069: Guidance for Operating Indoor Firing Ranges (IFR) and Shoot Houses was released by U.S. Army Installation Management Command which directed garrisons to operate and maintain enclosed shoot houses and indoor firing ranges in accordance with OSHA guidance and Army Preventive Medicine regulations. The U.S. Army Institute of Public Health (AIPH) was contacted to develop supporting documents on controlling lead exposure because of its ongoing health assessments of shoot houses.

Where were the lead exposures coming from? Personnel were potentially exposed at the 95 shoot houses located at 26 active Army facilities, with an additional 14 at National Guard and Army Reserve locations. All components of the Army use shoot houses to train Soldiers in Military Operations on Urbanized Terrain (MOUT). The MOUT scenarios were also evaluated, however, the AIPH health hazard assessments focused only on live-fire operations because live-fire facilities demonstrated the "worst case" exposures.

Data gathered from eight surveys conducted by AIPH from 2001 to 2011 confirmed airborne lead exposures exceeding OSHA standards. The OSHA permissible exposure limits (PEL) for airborne lead is 50 micrograms of lead per cubic meter ($\mu g/m^3$) averaged over an 8-hour shift. In addition to the OSHA PEL, there is also an OSHA action level (AL) of 30 $\mu g/m^3$ averaged over 8 hours. Occupational exposure exceeding the AL trigger requirements for an employer to implement additional monitoring as a way try to reduce lead exposure before the PEL is reached. The surveys determined that most of the shoot houses surveyed lacked appropriate ventilation systems, personal protective equipment, and proper hygienic measures/work practices to effectively control lead exposures.

Range Safety Continued

To reduce the lead exposures occurring in shoot houses, AIPH developed the following:

- IH Shoot House Guidance Document
- Shoot House Checklist
- Lead Compliance Program Template
- Employee Information and Training Brief

The *IH Shoot House Guidance Document* standardized industrial hygiene assessments across the Army. It was designed as a companion to the *Shoot House Checklist*. Both documents provide field industrial hygienists with practical tools for evaluating and recommending controls for health hazard assessment associated with shoot houses. The *Lead Compliance Program Template* can be used by installations that have determined from air monitoring results that they need to implement a formal program.

Consideration of unique operational conditions and any other relevant site specific requirements must be included in this sample lead compliance plan. The *Employee Information and Training Brief* was developed to meet the OSHA Hazard Communication (HAZCOM) training requirement. This brief can be incorporated into an installation's HAZCOM program.

These four documents are based on the OSHA 29 CFR 1910.1025 Lead Standard, OSHA 29 CFR 1910.1200 Hazard Communication, and Army Regulation 40-5, Preventive Medicine. Contact the AIPH, Industrial Hygiene Field Services for more information or visit the Public Health Command website http://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/default.aspx .

Ergonomics Basics

By Donald Goddard, Ergonomist, AIPH

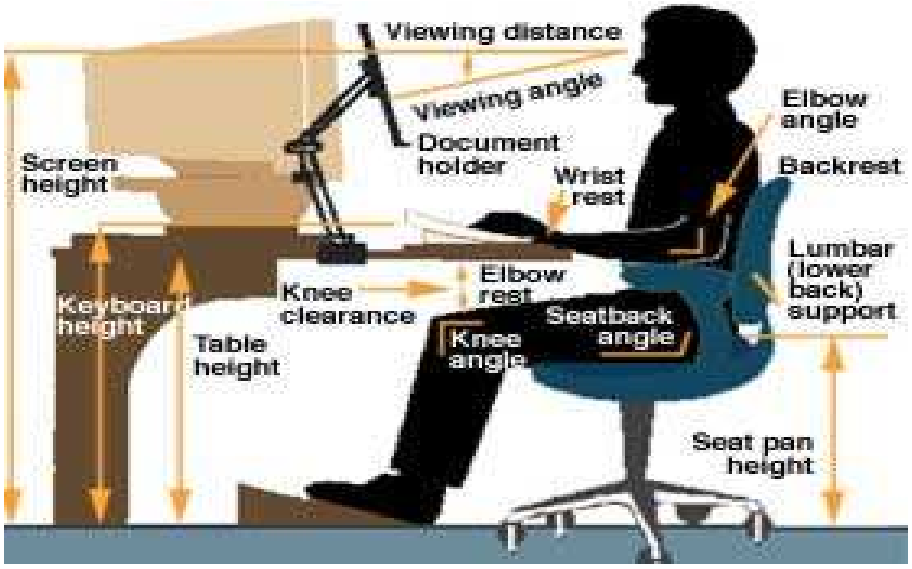
It's Monday morning. You arrive at work almost ready to indulge yourself with cup of coffee and a bear claw when your boss walks in. "The Pharmacy is reporting overuse injuries. Do you mind doing some ergonomic assessments for them?" A feeling of despair engulfs you as you wonder, "Where do I start"?

This is a common, understandable reaction for an Industrial Hygienist faced with the challenge of performing an Ergonomics evaluation. Unlike Industrial Hygiene, Ergonomics does not have the objective methods to sample and characterize exposures. Instead, there are numerous qualitative and semi-quantitative assessment tools, most of which are unvalidated. So, how does one navigate through the maze of information to developed and execute an Ergonomics assessment strategy?

To start with, it is helpful to understand that Ergonomics is concerned with exposures from mechanical energy that may adversely affect the health of musculoskeletal tissues. A few of the exposures involve external energy sources such as vibration, jolt and jerk that are quantifiable and have TLVs. But, the vast majority of ergonomic exposures occur as a result of performing physical activities that are dynamic and highly variable. Ergonomics is concerned with assessing and mitigating the internal biomechanical forces that are imparted to musculoskeletal tissues while workers engage in activity. This includes mechanical stresses associated with assuming non-neutral postures and contracting muscles as well as the cardiorespiratory work demands that may cause fatigue.

Ergonomics Basics Continued

Although current technology has not produced a special device that is capable of measuring these biomechanical forces and estimating injury risk, paper-based Ergonomic assessment tools can serve as crude proxies.



In general work activity can be divided into two broad categories—sedentary and non-sedentary. Sedentary work is usually associated with performing activities that have low cardiorespiratory demands, assuming static postures (sitting or standing) for long durations, and repetitively interacting with machines such as computers. If you need to evaluate sedentary work the Occupational Health and Safety Administration Computer Workstation Checklist is an excellent tool[1]. Though this checklist targets computer data entry tasks, it captures many of the ergonomic risk factors found in other sedentary activities.

Non-sedentary work includes tasks that demand higher energy expenditures, require movement and dynamic posture changes and often entail forceful muscular exertions. Force applications may be very diverse and include manual material handling, forceful tool exertions, crawling, kneeling, running, jumping, climbing and other heavy work. Global ergonomics assessment tools such as the Washington State Hazard and Caution Zone Checklists[2] or the Quick Exposure Check[3] are better tools to conduct an initial assessment of non-sedentary work.

Armed with these choices for conducting assessments of sedentary and non-sedentary work, you should be on your way to identifying Ergonomic hazards

Helpful Resources:

- - - - - - - - - - - - - - - - - -

[1]http://www.osha.gov/SLTC/etools/computerworkstations/pdffiles/checklist1.pdf

[2]http://www.lni.wa.gov/Safety/Topics/Ergonomics/ServicesResources/Tools/default.asp

[3]http://www.robensinstitute.com/tools.php

Filling in the Blanks through Mentoring

By Karla Simon, Industrial Hygienist, AIPH

Coming into civilian workforce as a DA intern ten years ago I had a lot of questions. How does an Industrial Hygienist support the Army mission? Which regulations do I reference? Better yet, am I headed in the right direction? Having senior people available to someone new to the health and safety profession helps ensure job satisfaction and performance, especially when everything is new: policy, procedures, Army culture and so forth.

Mentorship is vital to the growth and development of junior IH's and also to mid-career IH's. Our success is partially dependent on the people who have come before us. Particularly, their willingness to share professional experiences, to facilitate open ended discussions, and prod us when we just don't get it. As I have found out, knowledge about the things that work well and the best practices frequently are being held captive inside a senior IH's mind. It's usually something that seems so obvious to them, a quirk or nuance they have been using for years and now it has become second nature to them. Something like knowing about labor unions grievance process or knowing that on the first Friday of every month a particular shop has potluck during lunch and this would be a good time to make an appearance. Then there are the creative technical shortcuts that can make your life easier. Like placing sampling pumps into back packs and then putting that on a worker who is exposed to the harsh elements. Another ingenious idea is using a red wagon to transport IH equipment through a hospital. Why a red wagon? Most people have fond memories of red wagons and this can help employees' perceive an IH as more approachable.

Who can be mentor? The answer is easy, YOU! The US Army Public Health Command IH Mentoring Program pairs IHs and IH Technicians with mentors based on the number of years of experience, location and career goals. A mentoree maybe looking to achieve a specific goal like obtaining their CIH designation or something more simple like finding someone with similar professional interests. Then there are others who need guidance to help map out long term career goals. Individuals in the baby boomer generation are retiring. I'm talking about the ones who were around when the Army Institute of Public Health was a part of the US Army Environmental Hygiene Agency. The junior IH's kindly ask that before you go, please help to preserve the profession by taking them under your wings.

"The junior IH's kindly ask that before you go, please help to preserve the profession by taking them under your wings.

IH Case Study: Welding Curtain and Eye Safety

By Dr. Robert Kang, AIPH
And E. Christopher Brumage, Health Physicist, AIPH

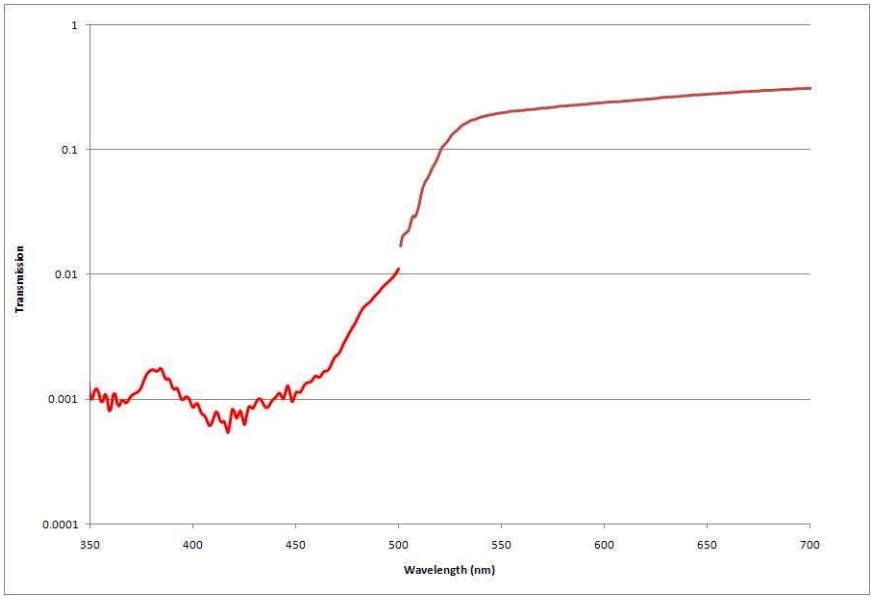
Last year, a welding school on an Army installation had changed its welding curtains to a more transparent type for better illumination of the work areas, to allow passers-by to quickly detect accidents, and to allow a better view of work areas for personnel who supervise and instruct welding students. As a result, welding instructors who were passing by the work areas had concerns that there must be a potential eye hazard because of the greater visible light transmission. Several instructors were so concerned that they visited the eye clinic to have their eyes evaluated. The installation industrial hygienist was having trouble convincing the instructors that the curtains were eye safe and were appropriately attenuating hazardous visible blue light and ultraviolet (UV) radiation. The industrial hygienist contacted the Laser/Optical Radiation Program (L/ORP) office of the USAPHC for support in evaluating the curtain.

The spectral transmission and optical density of the curtain were determined using a high intensity broadband light source and spectrometers that covered the UV and visible portion of the electromagnetic spectrum. The results showed that the curtain provided a high attenuation in the UV, violet, and blue portions of the spectrum and cut-on for wavelengths in the green through red portion of the spectrum. The results were analyzed against a list of all the welding processes including the type of welding (e.g., gas metal arc welding or shielded metal arc welding), type of shielding gas, and amperage that were used in the welding school. Studies of the hazards from different welding processes done by the L/ORP in the 1970's and 1980's and American Welding Society publications were also reviewed to determine the amount of protection required for the different processes.

While the curtain did not provide a high enough shade number required for protecting the eyes and skin close to the welding arc for long periods of time (i.e., the welding student), it provided a shade number high enough for exposures to the arc from a distance of approximately 1 to 2 meters, depending on the welding process, exposure time, and where instructors and passers-by might be located. The curtain is not meant to provide protection to a welder since welding masks with higher shades built in would be worn.

IH Case Study Continued

The plot below shows the measured spectral transmission of the welding curtain that was provided (note that the transmission axis is a log scale). The break in the curve is a result of changing spectrometers to cover the range of wavelengths.



Based on the findings, the welding instructors were reassured that while the arc can appear uncomfortably bright, viewing them through the welding curtain was not hazardous to the eyes. It was, however, also recommended that the welding instructors not to overcome their natural aversion response to the bright visible light and stare at the arc. Several reference articles and test results were provided to help allay concerns about the curtains. Misunderstandings such as this case are not limited to welding curtains. Common protective screens and filters for ultraviolet (UV) sources found in such facilities as research labs, hospitals, and electronics manufacturing are orange in color and have a very high visible light transmission. Greater concerns can arise from personnel using protective filters that are transparent. Common transparent materials like the glass used in windows and polycarbonate used in safety glasses are very good attenuators for a good portion of the UV spectrum (notice you don't get tanned or sunburned while in the car unless the window is open) and mid to far infrared spectrum. So, while it can be disconcerting to personnel who ar accustomed to a particular type of protective filter or are new to a job, it should be a goal in general to provide eye protection that offers the highest visible light transmission possible while still offering adequate protection to the source of concern. Personnel are more likely to wear eye protection and less likely to look around a barrier when it does not encumber the task at hand by being too dark.

A common military laser is the Nd:YAG operating in the near infrared at 1064 nm. Personnel using a Nd:YAG laser designator on a test range or during training may be surprised to have laser eye protection or training filter that is nearly clear (except for a light green tint) for a piece of equipment that has a hazard distance of 10's of km. A piece of Schott KG3 or KG5 filter glass is often used in scopes and laser eye protection for this type of laser because it has a high visible light transmission and also a high optical density at 1064 nm. Another example is CO_2 lasers which operate in the far infrared and are common in industrial settings and operating rooms.

IH Case Study Continued

Operators are adequately protected with standard polycarbonate safety glasses or panels. Personnel operating a laser cutting machine, for example, may be concerned that a laser that is easily slicing through thick sheets of steel is shielded only by clear panels. If there was a stray beam due to a misalignment or malfunction, it would char and melt the clear barriers rather than pass through them. A surgeon who is using a CO_2 laser for surgery is similarly protected by the clear face shield or glasses he/she is using.

According to the Bureau of Labor Statistics, 10 percent of the manufacturing jobs in the U.S are welding or welding related. Welders are exposed to intense light that contain UV, visible and infrared spectrum radiation as well as heat and fumes. Eye injuries account for 25 per cent of all welding injuries, making it the most common welding injury for welders. In addition, reflections of welding arc off shiny surfaces can be hazardous to the eye as far as 50 feet away. Occupational Safety and Health Administration (OSHA) requires the use of welding filters that meet ANSI Z87.1 standards (29 CFR 1910.133(b)) for welders as well as the use of welding screens/curtains/barriers to protect persons adjacent to welding areas (29 CFR 1910.252(b)(2)(iii)). In a recent case reported in Jan 2012 OSHA newsletter, a company was fined $30,000 for a repeat violation for failing to provide welding screens for employees.

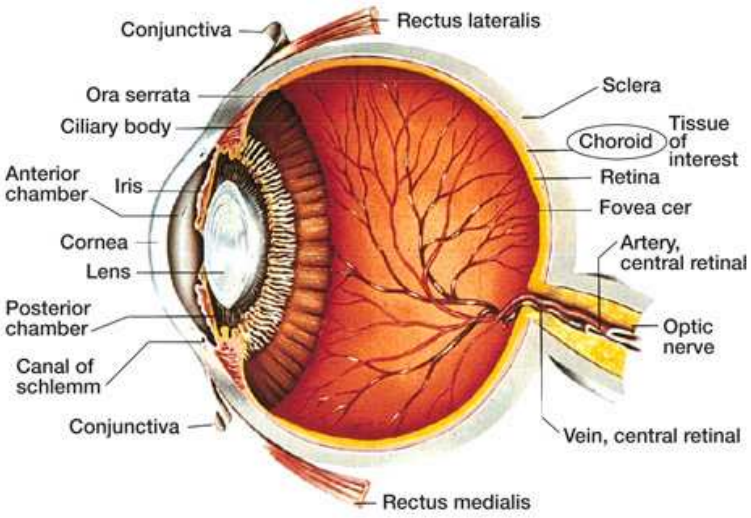
This case highlighted a number of issues which are important when considering optical radiation and eye safety. First, it is a misconception that a darker shade provides more protection against UV. It is important to use all optical filters as intended according to the manufactures information and to ensure that they meet national consensus standards like ANSI. It is also important to keep welding helmets and curtains properly maintained. Second, while an UV overexposure injury such as the common “welder’s flash” is well understood, the majority of eye injuries related to welding is from mechanical sources such as flying metal fragments from hammering and grinding.

Since these pre-job processes are often done with welding helmet up, it is important to wear ANSI compliant safety glasses or goggles under the helmet. Contact lenses can provide UV protection and are not specifically prohibited from use with welding but it should be remembered that they do not provide mechanical protection from metal fragments. Third, while the concern in this case was specifically related to UV protection, it is important to remember that both visible and IR radiation from welding can also cause eye damage.

IH Case Study Continued

Besides the risk of developing cataracts, there has been a number of reported cases of welding arc induced retinal injury to the macular. Welder's arc maculopathy or photoretinitis is similar to age-related macular degeneration which is one of the leading causes of blindness in elderly population. While most cases reported were reversible in a few months to a year, some cases progressed to permanent retinal damage and vision loss. Visible light and IR radiation penetrates to the retina and the damaging effects are considered to be cumulative through a person's life.

In summary, optical radiation hazards from the sun, sun tanning lamps, and lasers. In the case of welding, proper use of protective filters in a way to protect against both the radiation hazards from UV, visible and IR spectrum and the mechanical hazards is important. Welding protection also needs to be considered for instructors, apprentices, and co-workers in the working area through the proper use of welding screens and curtains. While safe, as recommended to the welding instructors in this particular case, one should avoid unnecessary exposure to bright lights and not look at welding arc through the welding curtains. For the same reasons, use of sunglasses with UV protection while outdoors in the sun is recommended to protect the eyes from long term damaging effects from optical radiation.



Connecting Wellness to Industrial Hygiene

By Karla Simon, Industrial Hygienist, AIPH
And BethAnn Cameron, Public Health Educator, AIPH

One positive shift in health discussions over the last decade has been the topic of wellness. Health promotion usually deals with a worker's overall "life style" which is directly related to illness & injury prevention. When wellness initiatives are integrated into worksite safety and health programs, they have a better chance of being accepted by employees. Workers can then make the connection between how what I do off the job affects my performance on the job.

Employees' lifestyles choices, including tobacco and alcohol use, can increases health risks because of the synergistic, cofounding and potentiating effects that tobacco and alcohol can have when combined with certain chemical exposures [1, 2]. This is where industrial hygiene can link workers health to wellness. What can we do to help workers make the connection? By providing opportunities and resources to employees to help nurture the body, mind, and spirit, and create awareness of healthy and positive lifestyle choices in order to reduce the incidence of preventable illness and injury.

Industrial hygienists can empower employees with knowledge, skills and tools to embrace and sustain a personal and organizational culture of health and wellness. Here are four key areas that can have an impact on workers health and wellness:

1. Physical Activity
2. Healthy Eating
3. Tobacco Cessation + Nicotine Replacement Therapy
4. Stress Management

Work-life balance also has an important contribution towards encouraging a healthier lifestyle. Change the way we work and the way we live to promote positive health. An Industrial Hygienist can serve as a peer mentor, a facilitator and change agent by introducing choices that will help those people who choose to seek healthy

Connecting Wellness Continued

behaviors and change unhealthy ones. This can be done through face-to-face interaction with workers when going out on a survey or by partnering with occupation health professionals to hand out information after a physical or respirator fit test. Leave brochures on smoking cessation, local health fairs, or work sponsored exercise programs in a conspicuous place at the worksite.

There are Federal agencies and commercial sites to support the healthy worker: MyPlate.gov; UCANQUIT2; Becomean ex.com; Mylast dip.com; ThatGuy.com; Rethinkyourdrinking.com.

Do You Know Your SEG?

By Paula Steven, Industrial Hygienist, AIPH
And Karla Simon, Industrial Hygienist, AIPH

Establishing a similar exposure group (SEG) is a basic tenet of Industrial Hygiene. Industrial Hygienists working for the DoD are cautioned in their approach to defining a SEG. Here's a bit of Army IH trivia: Did you know that both of the Defense Occupational and Environmental Health Readiness System-Industrial Hygiene (DOEHRS-IH) predecessor data repositories, Local Occupational Health Hazard Inventory (LOHHI) and Health Hazard Information Module (HHIM), did not have the SEG capability? It wasn't until 2007 that Army IH's gain the SEG functionalities that we have at our disposal today. DOEHRS-IH is the DoD business process model for the practice of industrial hygiene. The third step in DOEHRS-IH eight step process is establishing a SEG. This critical element of workplace exposure assessments helps manage resources and control hazards.

The AIHA defines a SEG as a "Group of workers having the same general exposure profile for the agent(s) being studied because of the similarity and frequency of the tasks performed, the materials and processes with which they work, and the similarity of the way they perform tasks". A SEG can consist of one person or individual workers may be members of *more than one* SEG. DOEHRS-IH is modeled directly after the AIHA exposure assessment definition of similar exposure group. An important point to consider is that DoD has a vast workforce and because of this, the AIHA model needed to be tweaked a bit to include some of the nuance of such a huge organization.

SEG Continued

The AIHA exposure assessment uses six common approaches for classifying a SEG. It is pretty straight forward (again, please remember these do not take into account DoD unique size):

1. Grouped by common process and agent
2. Grouped by common process, method, and agents
3. Grouped by common process, job classification and agent (be careful with this one, human resources does not classifying positions based on processes or exposures)
4. Grouped by common process, method and agent
5. Grouped by work teams
6. Grouped by non repetitive tasks

DOEHRS-IH has 67 common processes. A good starting point is to create a SEG for each process. Use a naming convention that includes the common process as part of the SEG's name is a helpful way to later identify the correct SEG when entering sampling data. It also makes it easier to remember and to find through the search function in DOEHRS.

There are frequent mistakes made by an IH when setting up a SEG. A SEG is *not* a stressor program. Knowing which stressors a worker is exposed to is part of the assessment strategy. Although firemen and welders wear respiratory protection, they cannot be included into the same SEG based on PPE. Another example would be the hearing protection program. Welders, carpenters, and avionics technicians may all be exposed to noise in a hangar; however these are separate exposure groups.

Another mistake of misclassifying a SEG is when an IH indiscriminately puts all employees in a building in the same SEG. An administration building probably does have a lot of pencil pushers inside but there are also the housekeeping and maintenance staff. Another example would be a clinic. Most of the employees are medical staff but each job classification can have very different exposures. A nurse's hazards are different from an X-ray technician, which is still different from a phlebotomist, which different from a psychical therapist, and so forth and so on.

PHONE:
(410) 436-3161

FAX:
(410) 436-8795

E-MAIL:
ihnewse@amedd.army.mil

We're on the Web!

See us at:

http://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/default.aspx

There are other telltale ways to find out that a SEG has been misclassified. Exposure data can be analyzed through statistical analysis to further check the homogeneity of a SEG. A lognormal distribution is a reasonable assumption to make when reviewing exposure data. Statistical analysis of the data that show exposure groups with a very large geometric standard deviation is a clue that the SEG may not have been set up appropriately. Try to *only* divide a SEG when it is statistically proven to be non-homogenous. Other reasons to reclassify a SEG is when there are outliers in the distribution of the data or sampling events that show one unique segment of the SEG exposure is greater than the occupational exposure limit. This is a red flag for further investigation.

Getting the SEG right is important. The consequences for misclassifying a workers exposure can be severe. The correct characterization of individuals' exposures allows an IH to adequately interpret the related risk and prioritize controls for those SEGs with unacceptable or uncertain exposures. Know your SEG because at some point you will have to defend your decision.