



# HTIS

Hazardous Technical Information Services

## BULLETIN

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## DoD Minimizes the Use of Hexavalent Chromium

*By Abdul H. Khalid, Chemical Engineer, HTIS*

The Department of Defense (DoD) has finalized a rule to minimize the use of hexavalent chromium ( $\text{Cr}^{6+}$ ) throughout DoD. Hexavalent chromium is a heavy metal that is used in the metal plating processes to coat, paint, and protect base metals.  $\text{Cr}^{6+}$  is also an excellent corrosion inhibitor that is used in numerous DoD weapons systems and platforms, as well as in a variety of marine, automobile, aircraft, and computer systems. Even though  $\text{Cr}^{6+}$  possesses desirable qualities, it is recognized as an inhalation carcinogen by the National Toxicology Program (NTP) and the U.S. Environmental Protection Agency (EPA).

In response to the serious human health and environmental risks associated with its use, there has been an increase in the number of national and international restrictions for controlling  $\text{Cr}^{6+}$ . In 2006, the U.S. Occupational Safety and Health Administration (OSHA) lowered the permissible exposure limit (PEL) ten-fold, from 52 to 5 micrograms-per-cubic-meter, making it among the most stringently regulated materials used in manufacturing and maintenance operations.

In 2003, the European Union (EU) adopted directive 2002/95/EC, commonly referred to as the Restriction of Hazardous Substances Directive (RoHS), that restricted the use of certain hazardous substances in the manufacture of various types of electrical and electronic equipment. The Directive became effective in July 2006, and Hexavalent Chromium was among the six restricted hazardous substances. This Directive is closely linked with the Waste Electrical and Electronic Equipment (WEEE) EU Directive

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(2002/96/EC), that sets collection, recycling, and recovery targets for electrical goods, and is part of a legislative initiative to solve the challenges associated with the large volumes of toxic e-waste.

In the U.S., defense-related industries are minimizing or eliminating the use of hexavalent chromium where proven substitutes are available. Such restrictions and industry practices have decreased the availability of materials containing Cr<sup>6+</sup>. The DoD and industry have made substantial investments in finding suitable replacements for hexavalent chromium. DoD has invested over \$70 million to find substitute materials and processes, and to evaluate control technologies to further protect workers and reduce the costs of asset maintenance.

Becoming effective on May 5, 2011, this final rule on Cr<sup>6+</sup> codified DoD's policy for addressing the serious human health and environmental risks related to the use of hexavalent chromium. The rule prohibits the delivery of items containing more than 0.1 percent by weight of Cr<sup>6+</sup> in any homogeneous material under DoD contracts, unless there is no acceptable alternate.

The rule was revised to minimize effects on small businesses, and only affects deliverables that contain greater than 0.1% hexavalent chromium, not in-plant hexavalent chromium processes or deliverables containing the metal chromium. The rule is primarily aimed at coatings. Consequently, the rule has no effect on conversion coatings; hard chrome plating; chromic acid anodizing; most chromate metallic ceramics; and chromate washes, etches, pickling, etc.

The primary coatings used by DoD affected by the rule are chromated primers (for aircraft skins); chromated primers (for components); aircraft fuel tank internal coatings; wet install fastener sealants (used on Naval aircraft); other chromated sealants (used to seal panels, covers, electronics, etc.); and chromated metallic-ceramic paints used in turbine engines. The above materials are used primarily by the large aerospace companies such as airframe manufacturers; engine manufacturers; and missile and spacecraft manufacturers.

As a result of DoD's strategy and final actions, the Defense Federal Acquisition Regulation Supplement (DFARS) 223 and 252 were amended to implement the requirements for minimizing the use of materials containing Cr<sup>6+</sup> in products acquired by DoD. The full text of this rule is available online at: <http://www.gpo.gov/fdsys/pkg/FR-2011-05-05/html/2011-10882.htm>.

For additional information on this final rule, interested personnel can contact:

**Ms. Amy Williams**

Defense Acquisition Regulations System  
OUSD (AT&L) DPAP (DARS)  
3060 Defense Pentagon, Room 3B855  
Washington, DC

PH: 703.602.0328

FAX: 703.602.0350

**References:**

1. Defense Federal Acquisition Regulation Supplement; Minimizing the Use of Materials Containing Hexavalent Chromium (DFARS Case 2009-D004, DoD Final Rule, Federal Register, May 5, 2011, Vol. 76, No. 87, pages 25569-25576; full text document at: <http://www.gpo.gov/fdsys/pkg/FR-2011-05-05/html/2011-10882.htm>.
2. Subpart 223.73-Minimizing the Use of Materials containing Hexavalent Chromium, website at: [http://www.acq.osd.mil/dpap/dars/dfars/html/current/223\\_73.htm#223.7303](http://www.acq.osd.mil/dpap/dars/dfars/html/current/223_73.htm#223.7303)
3. The Emerging Contaminants Directorate's potential risk management options (RMOs) for DoD program managers, website at: <http://www.denix.osd.mil/cmrm/ECMR/Hex-Chrome/TheBasics.cfm>
4. Eliminating Cr from Medium Caliber Gun Barrels, website at: <http://serdp-estcp.org/News-and-Events/In-the-Spotlight/Eliminating-Cr-from-Medium-Caliber-Gun-Barrels>.

## DoT News

### New Fuel Economy and Environmental Labels

*By Abdul H. Khalid, Chemical Engineer, HTIS*

The U.S. Department of Transportation (DoT) and the U.S. Environmental Protection Agency (EPA) published a new historic national car rule for new fuel economy and environmental labels on new vehicles.

According to the EPA, this rule will help consumers take advantage of the increased fuel efficiency standards on new vehicles that will enable them to realize considerable savings over the life of the vehicles. The new fuel economy labels on each new vehicle will provide more comprehensive fuel efficiency informa-

### To Our Readers —

Beginning in January 2012, with our next issue, you will receive the Bulletin on quarterly in lieu of bimonthly. Your response to our survey this past winter indicated that the Bulletin serves as an important informational resource for you and your colleagues. To balance mission needs consisting of the HELPLINE that provides answers to your daily regulated materials challenges, and the Bulletin, we determined that this new publication cycle best meets the needs of you the reader and our HELPLINE customers.

tion, including estimated annual fuel costs, savings, and information on each vehicle's environmental impact. These improvements will give consumers better, more complete information to consider when purchasing new vehicles that are covered by the increased fuel economy standards. The improved fuel economy labels will be required to be affixed to all new passenger cars and trucks starting with model year 2013. The vehicle technologies and fuel types that are addressed in this new national rule are:

- Gasoline Vehicle
- Diesel Vehicle
- Compressed Natural Gas Vehicle (CNG)
- Hydrogen Fuel Cell Vehicle
- Flexible-fuel vehicle: gasoline-Ethanol (E85)
- Plug-In Hybrid Vehicle: Electricity-Gasoline

Consumers can use a calculator tool on the website at: <http://www.fueleconomy.gov/label/> to estimate green house gas (GHG) emissions associated with the production and distribution of the electricity used to charge electric vehicles (EVs) or plug-in hybrid vehicles (PHEVs) in their region of the country.

President Obama directed DoT and EPA to prioritize the development of new fuel efficiency and greenhouse gas emissions standards, resulting in the historic standards that are represented by these new labels.

The 2010 fuel economy rule, developed with input from major automakers, environmental groups, and the states, will dramatically increase the energy efficiency of cars and trucks built in model years 2012 through 2016, saving 1.8 billion barrels of oil over the life of the program and the average consumer \$3,000 in fuel costs.

In July, the President finalized the first-ever national fuel economy and greenhouse gas emission standards for commercial trucks, vans and buses built in 2014 to 2018. These standards are expected to save hundreds of millions of barrels of oil over the life of the vehicles covered, and promote the development and deployment of alternative fuels, including natural gas. The Administration is also developing the next generation of joint fuel economy/greenhouse gas emission standards for model year 2017-2025 passenger vehicles, and expects to announce the proposal in September 2011.

EPA Administrator Lisa P. Jackson said that "President Obama's work to shape a Clean Cars program is fostering a marketplace of cutting-edge American vehicles that are more fuel efficient than ever before. The EPA and DoT are creating a new generation of fuel economy labels to meet the needs of a new generation of innovative cars, and today's car buyers want the best possible information about which cars on the lot offer the greatest fuel economy and the best environmental performance."

U.S. Transportation Secretary Ray LaHood stated that "our new fuel economy and environmental labels are a win for automobile consumers and for the nation's energy independence. These labels will provide consumers with up front information

about a vehicle's fuel costs and savings so that they can make informed decisions when purchasing a new car."

The new labels are required by the Energy Independence and Security Act of 2007 and will provide:

- New ways to compare energy use and cost between new-technology cars that use electricity and conventional cars that are gasoline-powered;
- Useful estimates on how much consumers will save or spend on fuel over the next five years compared to the average new vehicle;
- Easy-to-read ratings of how a model compares to all others for smog emissions and emissions of pollution that contribute to climate change;
- An estimate of how much fuel or electricity it takes to drive 100 miles;
- Information on the driving range and charging time of an electric vehicle; and,
- The QR Code®, a registered trademark of DENSO WAVE INCORPORATED that will allow users of smart phones to access online information about how various models compare on fuel economy and other environmental and energy factors. This tool will also allow consumers to enter information about their typical commutes and driving behavior, in order to get a more precise estimate of fuel costs and savings.

#### References:

1. News Release, May 25, 2011, EPA, DoT Unveil the Next Generation of Fuel Economy Labels, website at: <http://yosemite.epa.gov/opa/admpress.nsf/0/9F473E018A34205E8525789A005D3518>
2. Fact Sheet: New Fuel Economy and Environment Labels for a New Generation of Vehicles, website at: <http://www.epa.gov/otaq/carlabel/420f11017.htm>
3. A New Fuel Economy Label for a New Generation of Cars, website at: [http://www.fueleconomy.gov/feg/label/docs/EPA\\_FE\\_Label-052311.pdf](http://www.fueleconomy.gov/feg/label/docs/EPA_FE_Label-052311.pdf).

## Environmental News

### EPA Increases Public Access to Chemical Information

By Abdul H. Khalid, Chemical Engineer, HTIS

On June 8, 2011, the Environmental Protection Agency (EPA) issued a policy on confidential business information (CBI) that allows for an increase in the public's awareness of, as well as, access to information on the potential risks posed by certain

chemicals substances. The EPA believes that not all Toxic Substances Control Act (TSCA) chemical substances should be entitled to confidential treatment, and that health and safety studies, as well as related information on many of the chemicals in the inventory list should be made available to the public under the new CBI policy. Therefore, the EPA has started removing confidentiality claims associated with studies related to the health and safety aspects of those chemicals, and notifying affected companies that the identities of some of their TSCA listed chemicals are no longer eligible for confidential treatment.

Under the new CBI policy, the EPA declassified confidentially claims for more than 150 chemicals to ensure that the public has more information about the health and the environmental impacts of those chemicals. According to the EPA, those 150 chemicals are contained in 104 health and safety studies, which the chemical industry claimed as being confidential. The EPA's unprecedented actions provide the public with greater access to information on chemicals that are manufactured and used in the United States. The chemical identity of the substances noted in these 104 studies will no longer be redacted, or kept from view. These chemicals are used in dispersant formulations, and other consumer products such as air fresheners, non-stick and stain resistant materials, fire resistant materials, nonylphenol compounds, perfluorinated compounds, and lead.

In 2010, the EPA challenged industry to voluntarily declassify unwarranted claims of confidential business information. At the same time, the Agency issued new guidance outlining its plans to deny confidentiality claims under TSCA for the identity of some chemical substances that appeared in required health and safety studies. Based on this guidance, in February 2011 the EPA notified a number of companies that it had determined that their CBI claims were not eligible for confidential treatment under TSCA, and that the EPA intended to make the information public.

Section 8 (e) of the Toxic Substances Control Act authorizes the EPA to review chemicals in the chemical substances inventory lists that are submitted by companies that manufacture, import, process, or distribute chemicals. Such companies are required to immediately provide notice to the EPA if they learn that a chemical presents a substantial risk of injury to health or the environment. A substantial risk refers to the probability that chemical substances can or will cause serious effects. The EPA reviews the chemical substances inventory lists, including health and safety study data as a part of its continuing efforts to protect the environment and the public health. As a result of these reviews, health and safety study data pertaining to the chemical substances inventory lists are made available to the public, as required under the chemical reporting requirements. TSCA Section 3(6) defines a "health and safety study" as any study of any effect of a chemical substance or mixture on health or the environment or on both, including underlying data and epidemiological studies, studies of occupational exposure to a chemical or mixture, toxicological, clinical, and ecological studies of a chemical or mixture, and any test performed pursuant to TSCA.

Steve Owens, Assistant Administrator for the EPA's Office of Chemical Safety and Pollution Prevention, stated that "this action to disclose the identity of more than 150 chemicals is an important step in the EPA's commitment to give the public access to critical information about chemicals that their children and family members may be exposed to. A health and safety study with the chemical name kept secret is completely useless to the public".

In addition to these actions, the EPA has taken other steps to make chemical information more readily available. For the first time the EPA has provided the public free access to the consolidated TSCA Inventory on the EPA and Data.Gov websites. The EPA also launched a new chemical data access tool that gives the public the ability to electronically search the EPA's database of more than 10,000 health and safety documents on a wide range of chemicals daily. The EPA plans to continue to take whatever actions are necessary to increase the public's access to chemical information.

#### References:

1. EPA Removes Confidentiality Claims for More Than 150 Chemicals / Part of continuing effort to protect Americans' health by increasing access to chemical information, website at: <http://yosemite.epa.gov/opa/admpress.nsf/1e5ab1124055f3b28525781f0042ed40/9f7964fcbca3824a852578a900574cea!OpenDocument>
2. Federal Register, Volume 75, Number 13, (Thursday, January 21, 2010), pages 3462-3463, website at: <http://www.gpo.gov/fdsys/pkg/FR-2010-01-21/html/2010-1105.htm>
3. Toxic Substance Control Act (TSCA) Section 8 (e) Notices, website at: <http://www.epa.gov/opptintr/tsca8e/>

## Occupational Safety & Health News

### Avoiding Occupational Hearing Loss

*By Philip Saunders, Chemical Engineer, HTIS*

Occupational hearing loss is damage to a worker's hearing that occurs while on the job. The damage may range from a slight loss of sensitivity to certain frequencies, to complete loss of hearing, and the loss may be permanent or temporary. In addition, this loss may be caused by exposure to loud noises (noise-induced hearing loss (NIHL)), exposure to chemicals that are ototoxic (i.e., damaging to the ears), or a synergistic combination of the two. This article discusses some causes of occupational hearing loss, describes when hearing protection is required, and provides some hearing conservation methods.

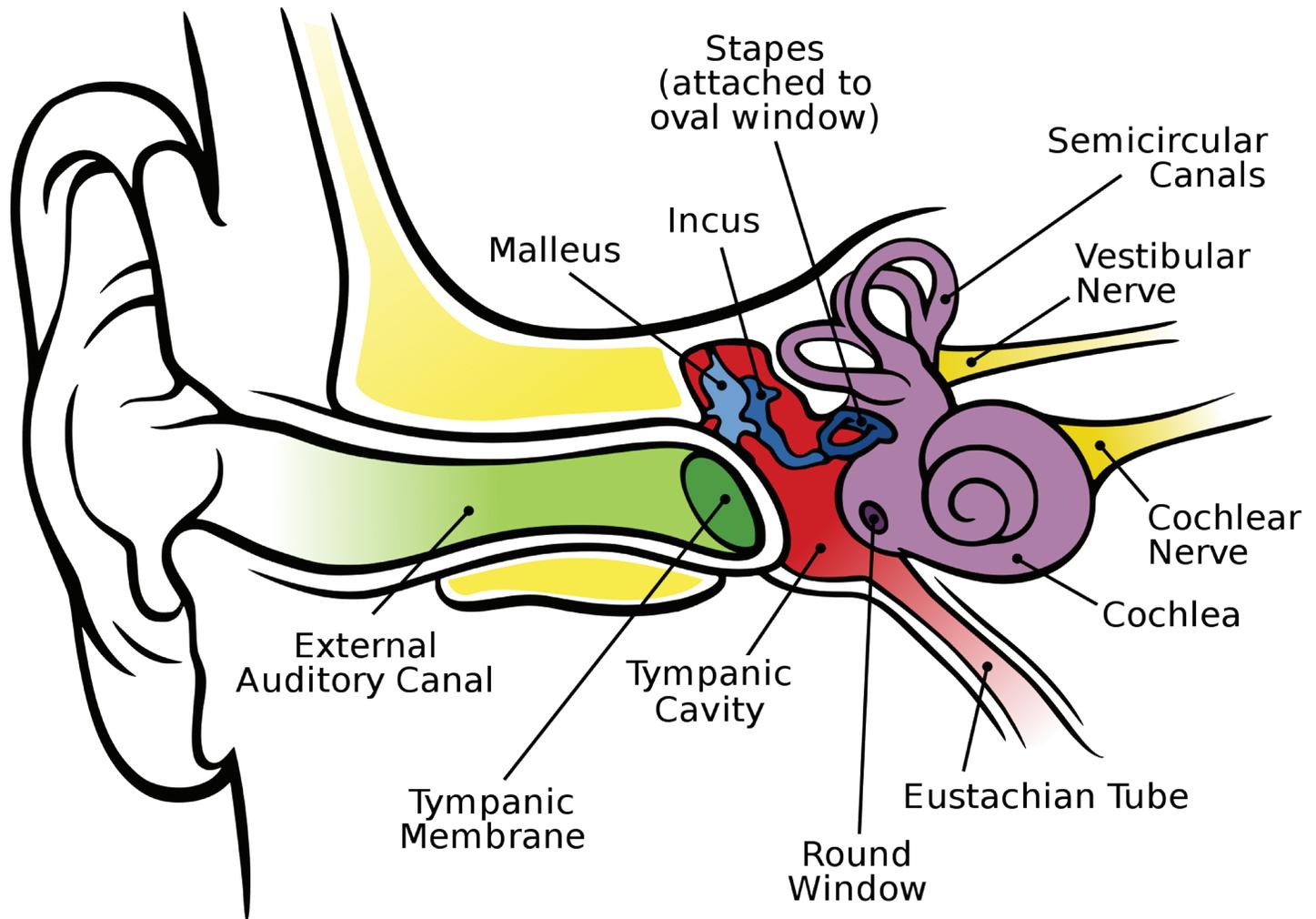
#### What Causes Hearing Loss?

Hearing occurs through a complex mechanism that converts pressure vibrations in the air (sound) to nerve signals to the

brain. When a sound is transmitted through the air, it enters the ear through the auditory canal and encounters the eardrum (the tympanic membrane). The eardrum converts the acoustic vibrations into mechanical energy and causes the auditory ossicles (the small bones in the middle ear - malleus, incus and stapes) to move. These movements cause the stapes to hammer against a window on the cochlea (the inner ear), and that hammering causes the fluid inside the cochlea to vibrate and push against small hair-like cells within the cochlea called stereocilia. These stereocilia are sensory nerves that convert the vibrations into nerve signals that the brain recognizes as sound.

exceeding 90 decibels (dB). However, repeated exposures to these noise levels may decrease the ability of the stereocilia to repair itself, and may cause the previously temporary hearing loss to become permanent.

In the most extreme cases, a single exposure to an extremely loud noise exceeding 140 dB may cause an immediate and permanent, but not necessarily total, hearing loss due to a traumatic injury to the ear. Keep in mind that the decibel is calculated using an exponential equation and that when comparing volumes in decibels, the rule of thumb is that an increase of



**FIGURE 1. Anatomy of the Ear**

In most cases, occupational hearing loss is noise-induced, and occurs when loud or high-intensity noises damage these stereocilia to an extent that the signal is weakened or totally absent. This is called Noise-Induced Hearing Loss, and may occur gradually due to extended or repeated exposure to loud noises, or it may be a sudden loss due to a one-time exposure to an excessively loud noise. NIHL may be a temporary condition that disappears after a short time, especially following a limited number of sustained exposures to noise levels

10 dB doubles the subjective volume of a sound. See Table 1 on page 6 for a list of noise levels associated with a number of noise generation sources as well as some regulatory and physical effect thresholds. Since a measured noise volume can depend on a variety of factors such as atmospheric conditions, building architecture, geography and other variables, the values shown in this table should be taken as approximate, and should not be used in lieu of taking actual measurements of workplace noise.

**TABLE 1. Noise Level Comparison**

NOISE SOURCE / NOISE THRESHOLDS	SOUND LEVEL
Breathing	10
Quiet Office	50
Conversational Speech	60 – 70
Noisy Restaurant, Street Traffic	70
Alarm Clock	75
Airplane at 1 mile	80
Handsaw, Telephone Dial Tone	85
<b>OSHA-Required Hearing Conservation Program</b>	85
Electric Drill	94
<b>Sustained Exposure May Cause Hearing Loss</b>	90
Train Whistle @ 500 ft	95
<b>Pain Begins</b>	120
Sandblasting, Rock Concert	115
Jet Engine @ 100 ft	140
<b>Chest Wall Begins to Vibrate</b>	150
<b>Ear Drum Breaks Instantly</b>	160
<b>Death of Hearing Tissue</b>	180
<b>Loudest Possible Sound Without Distortion</b>	194

**Information Compiled from:**

<http://www.controlnoise.com/decibel-chart/>

<http://www.gcaudio.com/resources/howtos/loudness.html>

NIHL is prevalent among individuals who work in occupations that expose them to loud machinery (e.g., aircraft engines, construction equipment) over an extended period of time. One other common, but less widely known cause of hearing loss is due to the physiological effects of ototoxic chemicals. While this is most often seen as a side effect of pharmaceuticals, a large number of chemicals such as organic solvents (e.g., benzene, xylene, carbon tetrachloride) and heavy metals (e.g., lead, mercury, cobalt) are known to have ototoxic effects, including temporary or permanent hearing impairment and tinnitus (ringing in the ears). It has been known for 1000 years that the use of mercury vapors to treat head lice may cause deafness, but not much is known about the mechanisms leading to hearing losses due to ototoxic chemicals. However, some studies of aromatic solvents have indicated that both the inner ear and the nervous system may be targeted by these chemicals.

Another concern is that exposure to such chemicals, when combined with exposure to noise, may create an additive (1+1=2) or a synergistic effect (1+1=5). As a result, exposure to these chemicals in workplaces with otherwise safe noise levels may combine to have a detrimental effect on a worker's hearing ability. This makes awareness about the effects of exposure to such chemicals in noisy workplaces even more important.

**When is Hearing Protection Required?**

The United States Occupational Safety & Health Administration (OSHA) established its Occupational Noise Exposure Standard

in 29 CFR 1910.95. In Table G-16 of this standard (reprinted below as Table 2), OSHA specifies the permitted daily noise exposure for an employee by specifying the maximum length of time that an employee may be exposed to a sound level during the course of a single day. For example, according to the table, employees may be exposed to noise levels up to 90 decibels for no longer than 8 hours per day, but they may not be exposed to volumes above 110 dB and below 115 dB for more than 15 minutes in a single day. When an employee works in an environment where the noise exposure permitted by this standard is exceeded, then the employer must implement controls that reduce the exposure to within the allowed exposure levels.

For situations where an employee is exposed to different noise levels during the course of the day, OSHA uses an equation that divides the duration of the exposure to a noise level by the permitted exposure duration for that volume. This is done for each exposure period, and all of the resulting values are combined. If the result of this operation is greater than one, then noise exposure controls are required to prevent hearing loss. For example, if during the day an employee is exposed to 99 dB for 1 hour and 91 db for 4 hours, then the calculation divides the 1 hour exposure by the permitted exposure length of 2 hours and divides the 4 hours exposure by the permitted exposure length of 6 hours. Since the sum of those two values is greater than one, noise exposure controls are required for all employees exposed to those sound levels.

In addition to requiring hearing protection to reduce noise exposures to within regulatory limits, OSHA requires employers to implement a hearing conservation program when employees are exposed noise levels that exceed an 8 hour time-weighted average of 85 dB. This program involves monitoring both noise exposure and the periodic testing of their employees' hearing. Also, employers are required to provide hearing protection to their employees when that 85 dB average is exceeded, but wearing the equipment is not required. However, if the noise exposure exceeds the limits in Table 2, then the employees must wear the protective equipment.

**TABLE 2. Permissible Noise Exposures**

DURATION PER DAY (h)	SOUND LEVEL (dB)
8	90
6	92
4	95
3	97
2	100
1.5	102
0.5	105
0.25 or less	110

Source: 29 CFR 1910.95, Table G-16

**How is Hearing Loss Prevented?**

As with many other occupational hazards, the most common approach for the prevention of hearing loss involves a three-

tiered strategy. The first and most preferred tier involves implementation of engineering solutions that reduce or eliminate exposure to loud noises and ototoxic chemicals. This includes the installation of abatement technology such as vibration dampeners that reduce machine noise, or the use of ventilation systems that prevent the accumulation of ototoxic chemicals. As part of this process, managers and workers should identify sources of noise that can be reduced or eliminated, and set goals and priorities for implementation of those goals.

When engineering controls do not work, the next step involves making administrative changes to the work rules and practices to minimize exposure to the causes of hearing loss. This might involve rearranging a worker's schedule or routines so that a minimum amount of time is spent in noisy areas, or it could just be a matter of prohibiting unauthorized people from entering certain areas. Administrative controls are less desirable than engineering changes since they simply adjust the jobs to the workplace, rather than adjusting the workplace to the workers' jobs as with engineering controls. Another reason that engineering controls are preferred is that changing work practices merely avoids the risk of hearing loss, rather than reducing or eliminating those risks from the workplace.

When engineering and administrative actions are insufficient or infeasible, the use of personal protection devices becomes necessary. For the purposes of noise abatement, this usually involves the use of hearing protection equipment such as single-use ear plugs, pre-formed ear plugs and/or earmuffs. The equipment used must be capable of reducing the employee's noise exposure to a level that is within the limits specified in Table 2. Prevention of exposure to ototoxic materials depends on the situation, but equipment such as respirators or filtration masks may be necessary.

### What Can You Do?

Many employees of the military services and other DoD agencies frequently work in high-noise occupations such as, ground personnel at airfields, workers in warehouses, and musicians in bands. Employees may also work in environments such as maintenance facilities where exposure to ototoxic heavy metals or organic solvents may occur. Employees can participate in protecting their own hearing through the suggestion of noise abatement technology or adjustments to their work routines to prevent or reduce exposures to noises, or by consistently wearing the personal protective equipment that is provided for their use, even when it is not required. If they are involved in the process, employees may be more inclined to comply with rules and changes that they had a role in shaping.

### References:

1. "Preventing Occupational Hearing Loss - A Practical Guide", National Institute for Occupational Safety and Health, October 1996, John R. Franks, Mark R. Stephenson, Carol J. Merry, <http://www.cdc.gov/niosh/docs/96-110/>
2. "Ototoxicity - The Hidden Menace", Center for Hearing Loss Help, November 2003, Neil Bauman, PhD: [http://www.hearing-](http://www.hearing-losshelp.com/articles/ototoxicaudiology.htm)

[losshelp.com/articles/ototoxicaudiology.htm](http://www.hearing-losshelp.com/articles/ototoxicaudiology.htm)

3. "Effects of Noise on People - Hearing Loss", Federal Inter-agency Committee on Aviation Noise, [http://www.fican.org/pages/noise\\_hearing.html](http://www.fican.org/pages/noise_hearing.html)
4. "Personal Protective Equipment", US Department of Labor, Occupational Safety and Health Administration, 2003: <http://www.osha.gov/Publications/OSHA3151.pdf>
5. "Hearing Conservation", US Department of Labor, Occupational Safety and Health Administration, 2002: <http://www.osha.gov/Publications/OSHA3074.pdf>

— Image Citation: "Perception Space - The Final Frontier", Lars Chittka, Axel Brockmann, *PLoS Biology* 3(4), April 12, 2005.

## OSHA Revises its Standards on General Working Conditions in Shipyards

By Abdul H. Khalid, Chemical Engineer, HTIS

The U.S. Occupational Safety and Health Administration (OSHA) recently declared that its shipyard standards did not provide workers adequate protection from hazards associated with current practices in shipyard workplaces. As a result, on May 2, 2011, OSHA issued a final rule revising its standards on general working conditions in shipyards. According to Dr. David Michaels, the Assistant Secretary of Labor for OSHA, this final rule is the result of collaboration between OSHA and the maritime industry, because both groups felt that the dangers associated with shipyard work needed to be addressed in a more stringent manner, in order to better protect workers, while at the same time balancing employers' concerns regarding the implementation of the new rule. The final rule became effective and enforceable on August 1, 2011 except for the provisions in Sec. 1915.89 that become effective and enforceable on October 31, 2011.

Working in the shipyard industry can be intense, because of the complexity of services and working conditions that expose workers to different hazards. Shipyard related work includes a variety of industrial operations such as steel fabrication, welding, abrasive blasting, and electrical work, pipe-fitting, rigging, stripping, and coating applications. Workers also operate and service complex machinery and equipment such as powered industrial trucks, cranes, and vessel systems.

Fourteen workplace safety and health categories are addressed in this final rule, which updates and clarifies provisions in the shipyard employment standards that had largely gone unchanged since OSHA adopted them in 1972. Such updates include establishing minimum lighting for certain work sites, accounting for employees at the end of job tasks or work shifts when working alone, updating sanitation requirements, and adding uniform criteria to ensure shipyards have an adequate number of appropriately trained first-aid providers.

In addition, OSHA added new provisions for the control of hazardous energy and motor vehicle safety. Until this final rule, the maritime industry did not have a specific standard to address the control of hazardous energy. Some employers have implemented portions of other lockout/tag out rules, such as 29 Code of Federal Regulations 1910.147, to protect their employees. Also, according to data from the Labor Department's Bureau of Labor Statistics' Census of Fatal Occupational Injuries, transportation incidents account for nearly 20 percent of all shipyard fatalities. The new rule's provisions seek to significantly reduce such incidents by requiring the use of seatbelts when operating motor vehicles in a shipyard. In summary, the revised rule requires:

- Shipbuilders to designate a "lockout/tag out coordinator" to oversee all logout/tag out measures when several employees are working in different sections of the same vessel or working on the same machinery.
- Employers to establish regular housekeeping practices to eliminate hazard to employees to the extent practicable to reduce the large number of slips, trips, and fall injuries that may occur at shipyard work places.
- Employers to implement more stringent standards that deal with safely for storing, or stacking materials, scaffolding materials, and drums.
- Employers to provide slip-resistant footwear to employees in situations where slippery conditions cannot be eliminated, and to designate walkways and working surfaces where potential slippery conditions exist.
- Employers to maintain easy and open access to fire alarm boxes, fire call stations, all firefighting equipment and exits. Employees should have easy access to ladders, staircases, scaffold, and gangways.
- Employers to store or dispose of all flammable and combustible substances such as paints, paint thinners, solvents, rags, scraps and wastes in covered fire resistant containers.

For the purpose of education and training of employers and employees with respect to this final rule, OSHA has updated a designated web page at: [http://www.osha.gov/dts/maritime/standards/general\\_working\\_conditions.html](http://www.osha.gov/dts/maritime/standards/general_working_conditions.html). This website also includes answers to frequently asked questions regarding the final rule, as well as the full text of this rule.

#### Reference:

1. Federal Register, Vol. 76, No. 84, Monday, May 2, 2011, website at: [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=FEDERAL\\_REGISTER&p\\_id=22043](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=22043)
2. News Release, May 2, 2011, "US Department of Labor issues final rule to protect shipyard workers Rule reflects advances in industry practices and technology", website at: [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=NEWS\\_RELEASES&p\\_id=19713](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=19713)

## NIOSH Must Approves Labels for Respirators

By Abdul H. Khalid, Chemical Engineer, HTIS

Respirators are personal protective devices worn over the face. At a minimum, respirators cover the nose and mouth to reduce the risk of inhaling hazardous substances or chemicals that are airborne, and present in the form of dust particles, or as infectious agents that may be in a gaseous or vapor form.

"The National Institute for Occupational Safety and Health (NIOSH) specifies minimum approval requirements for respiratory protective devices in Title 42 Code of Federal Regulations (CFR) Part 84. NIOSH reviews respirator approval applications that contain technical specifications, drawings, and other related information. NIOSH also inspects, examines and tests the respirators to determine that the applicable requirements are met for individual, completely assembled respirators, as described in §84.30(a)."

NIOSH recently released a fact sheet, titled, "NIOSH approval Labels-key information to protect you". In the fact sheet, NIOSH, which is a part of the Center for Disease Control and prevention (CDC) under the Department of Health and Human Service (DHHS), provides important information to assist users of respirators in their understanding of a respirator and its functions. Also included are the precautions that users need to exercise, as well as the limitations associated with respirators. The fact sheet also contains important information on NIOSH's approved configuration of components and respirator labels that serve to convey important respirator protection to users. NIOSH approval labels are described in 42CFR84 (§84.33), and the information that the labels provide and their locations differ depending on the respirator type.

A NIOSH full approval label lists the NIOSH approval number (TC column), protection level, component with part number, as well as the caution and limitation (C&L) statements in the form of a table or matrix of information. Each row of the matrix contains a unique approval number with intersecting columns identifying the protection, components, and C&L statements (designated by letters). The actual C&L statements are written below the matrix.

There are two main types of respirators that are used for protection against airborne contaminants. The first type of respirator is an air-purifying respirator (APR). APRs remove contaminants (particulates) from the air and filter out airborne particles. Some APRs (gas masks) are used to filter out chemicals and gases. These respirators are used in routine work activities. The other type of respirator supplies clean air from another source and is known as an air supplying respirator (ASR). ASRs include airline respirators having compressed air from a remote source, and self contained breathing apparatus (SCBA) having their own air supply. The ASRs are used infrequently or in foreseeable emergencies such as spill response, rescue or in escape situation. If respirators are the right type for a given situation, worn properly, and maintained correctly, they should provide proper protection.

### ECHA Reports on REACH and CLP

By Abdul H. Khalid, Chemical Engineer, HTIS

On June 30, 2011, the European Chemical Agency (ECHA), announced the availability of a report on the operation of Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), and on the Classification, Labeling and Packaging of substances and mixtures (CLP). The success of REACH and CLP regulations within the European Union (EU) is due to the efforts, commitment, and collaborative work between industry, stakeholders, the member States, the European Commission (EC) and ECHA. According to ECHA, the REACH and CLP regulations are working well and the various players responsible for the work are responding as required by the legislation. There are some lessons to be learned from the experience of implementing REACH and CLP. The report also contains a series of recommendations for improving the implementation of the legislation. Key lessons learned from the initial implementation of REACH and CLP are:

- The uncertainty over the number of registrations for the first deadline was a challenge to manage and more accurate estimates would be helpful in the future.
- Close working relationships with industry and stakeholders are vital to ensure success, and the Agency can help by providing stable tools and guidance.
- The interrelationship between the various elements of the two regulations is important, and has become increasingly apparent. For example, ambiguities in substance identification can lead to problems in forming Substance Information Exchange Forum (SIEF), evaluation and risk management activities.

This report states that data sharing is the key mechanism used to avoid unnecessary animal testing, and the analysis of the registration data shows that registrants made extensive use of these efforts. This includes the existing studies, or applying non-test methods to predict properties of substances instead of experimental testing. The report also shows that so far very few new animal studies were conducted for the purpose of registering phase-in substances. ECHA recommends that companies:

- Improve the quality of their documentation and related data;
- Provide justification for the waiving of testing; and,
- Conduct new animal test to ensure the safe use of chemical substances.

REACH is the European Union chemicals legislation that was adopted in December 2006 to improve the safety and health of

Employers must provide proper respirators for the particular hazards to which their employees are exposed, and conduct proper fit-testing and training on the use of respirators under the OSHA respiratory protection program at places of employment. Respirator manufacturers seek the approval for respirators from the U.S. National Institute for Occupational Safety and Health (NIOSH). The specific code that manufacturers comply with for the NIOSH approval is outlined in Title 42 CFR, Part 84.

Certificates of approval are issued for a respiratory protective device (RPD) that meets the applicable requirements. Certificates of approval are not issued for any individual respirator components, Section 84.30 (b).

Each certificate of approval includes labels to be provided by the applicant with each approved respirator assembly, Section 84.31(d). The applicant is the individual, partnership, company, corporation, association, or other organization that designs, manufactures, assembles, or controls the assembly of a respirator and who seeks to obtain a certificate of approval for the respirator, Section 84.2 (a).

The use of the NIOSH label obligates the applicant to whom it was issued to maintain the quality level of manufactured respirators, and to also assure that the RPD is manufactured to the drawings and specifications upon which the certificate of approval is based, Section 84.33 (f).

Approval labels contain important information to assist users in understanding the respirator, its protections, cautions and limitations, and approved configuration of components. NIOSH fact sheet # DHHS (NIOSH) Publication No. 2011-179 describes the labels and markings required under 42 CFR, part 84 and is available online at: <http://www.cdc.gov/niosh/docs/2011-179/pdfs/2011-179.pdf>.

In conclusion, the regulations and requirements are designed to ensure the safety of the users who are using market available respiratory products. The employers and the end users also have the responsibility to make sure that the respirators are used in accordance with OSHA regulations and the manufacturer's instructions. Remember, these respirators are meant for a specific use, and must not be misused or abused. For further information on respirators and their related publications, DoD personnel can:

**Visit the NIOSH website at:** <http://www.cdc.gov/niosh/>

**Call Toll Free at:** 1.800.232.4636; or,

**eMail:** [cdcinfo@cdc.gov](mailto:cdcinfo@cdc.gov)

#### References:

1. NIOSH approval labels: Key information to protect yourself, website at: <http://www.cdc.gov/niosh/docs/2011-179/pdfs/2011-179.pdf>
2. OSHA-Respiratory Protection e-Tool, website at: <http://www.osha.gov/SLTC/etools/respiratory/>

its people and the environment. The CLP regulation aligns the previous EU legislation on classification, labeling and packaging of chemicals with the GHS (Globally Harmonized System of Classification and Labeling of Chemicals) in order to facilitate international trade in chemicals and to maintain the existing level of protection for man and the environment. The GHS is a United Nations (UN) system that is used to identify hazardous chemicals, and to inform users of these hazards through the use of standard symbols and phrases on the packaging labels, as well as through Safety Data Sheets (SDSs). The CLP Regulation was published on December 31, 2008 and became effective on January 20, 2009. REACH and CLP are two independent EU regulations.

ECHA, formed in June 2007, enforces these pieces of legislation, prepares and publishes reports on the operation of the legislation as required by the REACH regulation to the European Commission (EC) every five years. This agency is comparable to the Occupational Safety and Health Administration (OSHA) in the United States.

The REACH regulation requires having scientific, reliable non-animal or animal test data, but the testing of chemicals on animals is a last resort when there is no other scientific reliable study or data showing the impact on humans and the environment. REACH regulations require that the companies have chemical data to share with other companies that make the same chemicals or products. These efforts will remove any potential for duplication of testing on animals.

In summary, although chemicals are present in nearly all manufactured products that are purchased and used every day, REACH and CLP, along with the collaborative efforts of those affected by these regulations, are striving toward making Europe a safer and healthier place for its citizens.

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## ARMY's Net Zero Vision — Energy, Water, Waste

By Fred Tramontin, PhD, Branch Chief, HTIS

The consumption of energy and water and the generation of waste are factors that are common to all DoD installations. In

an effort to wisely manage and conserve energy and water resources while reducing the generation of waste, Ms. Katherine Hammack, Assistant Secretary of the Army for Installations, Energy, and Environment (ASA)IE&E and her staff have developed the Army's Net Zero Installation Strategy. This strategy will allow the Army to manage its resources in a sustainable manner, allowing for an integrated or comprehensive approach with respect to its energy and water resources, as well as a reduction in its generation of waste. For the Army, the Net Zero Installation Strategy is a Force Multiplier, thereby enabling it to be a good and prudent steward of precious resources, while managing costs and providing its Soldiers, families and civilian workforce with a sustainable future.

On 10 Oct 2010 at a DoD Bloggers Roundtable, Ms. Hammack said: "the primary goal is a focus toward Net Zero, and when we talk about Net Zero, it's not only Net Zero energy, but it's Net Zero energy, water and waste. When you look at the term 'Net Zero' or a hierarchy of Net Zero, you must start with reduction, then progress through repurposing, recycling, energy recovery, disposal being the last."

Like the other Service components in today's environment, the Army faces significant threats to its energy and water supply needs both at home and abroad. Thus it becomes operationally necessary, financially prudent, and essential to accomplishing the mission to address energy security and sustainability.

Initially by 2020, 15 Army installations will be involved in the Net Zero initiative with a total goal of 25 Net Zero installations by 2030. The 15 pilot installations are divided into three groups of five installations each, and each group will serve as the pilot for either the Zero Net energy, Zero Net water, or Zero Net waste initiative.

As previously noted, the Net Zero approach consists of five interrelated steps:

1. Reduction,
2. Repurpose,
3. Recycling and composting,
4. Energy recovery, and
5. Disposal.

Reduction focuses on maximizing facility energy efficiency, implementing water conservation practices, and eliminating unnecessary waste generation. Repurpose involves diverting energy, water or waste to a secondary purpose with limited processes. Recycling or composting encompasses the management of the solid waste stream, development of closed loop water system, or energy cogeneration. Energy recovery occurs when unusable solid waste or thermal energy is converted from a waste water stream to energy. And disposal is the final step after the last drop of water, the last bit of thermal energy and all other waste mitigation strategies have been completely utilized.

Let us briefly look at the concepts of Net Zero Energy, Net Zero Water, and Net Zero Waste.

As a perspective to Net Zero Energy, one needs to consider the fact that in the U.S. government, the DoD is its largest energy consumer. In fiscal year (FY) 2008, DoD consumed 889 trillion site-delivered Btu (more than used by entire nations such as Denmark or Israel), and spent on the order of \$20 billion on energy. The majority of DoD energy consumption is fossil fuel based (coal, oil, natural gas, or electricity produced from these), often from foreign sources. DoD accounts for about 1.8% of total U.S. petroleum consumption and 0.4% of the world's consumption.

In light of DoD's current energy consumption, a Net Zero Energy Installation (NZEI) would be one that produces as much energy on site as it uses in a year's time. To arrive at this state, an installation begins by implementing aggressive conservation and efficiency efforts, while at the same time benchmarking energy consumption in order to identify more opportunities. The utilization of waste energy, or its "repurposing" would follow as the next step. Furthermore, boiler stack exhaust, building exhausts or other thermal energy streams can all be utilized for a secondary purpose, while co-generation is employed to recover heat from the electricity generation process. Renewable energy projects can then be used to meet the remaining energy needs. The Department of Energy's (DoE) National Renewable Energy Laboratory (NREL) generated a technical report (NREL/TP-7A2-48878, August 2010) that provides a guide for assessing and planning for Net Zero Energy at Military Installations (<http://www.nrel.gov/docs/fy10osti/48876.pdf>)

In the Net Zero Water strategy, an installation monitors and controls the consumption of freshwater resources, while returning water back to the same watershed in amounts equal to, or greater than that consumed during a year. After initiating appropriate conservation steps, an installation needs to direct its efforts toward achieving efficient water use, as well as ensuring that the distribution system is sound and effective. In order to have a sustainable water supply for the future, the Net Zero water strategy balances the availability of water with its use. This is not only a significant but also important approach, since the scarcity of clean potable water is becoming a serious issue in many developing, as well as developed countries. The collection of rain water and the recycling of discharged water are all means by which the need for municipal water or the export of sewage or storm water is reduced. Depending on an installation's location, desalination can be utilized to convert briny, brackish or salt water to fresh water suitable for human consumption or irrigation. In terms of global output, the United States ranks third in the world with respect to desalination. The Middle East, where energy is less expensive and environmental regulations are less stringent, is where most of the world's high capacity desalination projects are located. Most desalination plants in the U.S. process inland brackish water since seawater is more expensive to process, and will be a source of future growth as

costs decrease and technology improves.

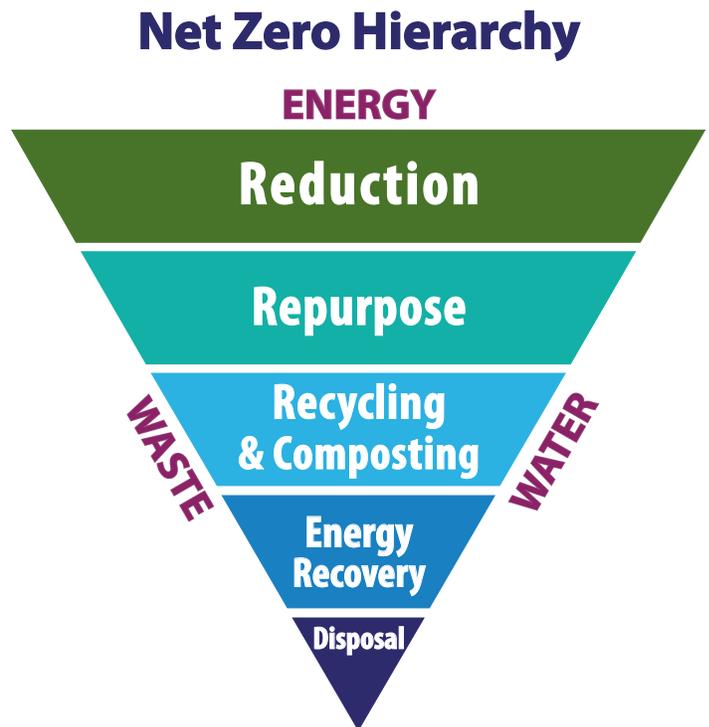
A Net Zero Waste installation is one that reduces, reuses, and recovers its waste streams by converting them to resources and giving rise to a zero landfill situation. Whether a Net Zero Waste or a Net Zero Energy installation, the basic approach is the same. "The components of Net Zero solid waste start with reducing the amount of waste generated, repurposing waste, maximizing recycling of waste stream to reclaim recyclable and compostable materials, and recovery to generate energy as a by-product of waste reduction, with disposal being non-existent."

The concepts of reduce what is not needed, reuse as much as possible, and finally recycle the remainder are all helpful for an installation to achieve its Zero Net Waste goal.

The graphic below illustrates the Net Zero Hierarchy beginning with the "reduction" step and proceeding thru successive steps until the final one, "disposal", is reached having effectively, efficiently and economically utilized the previous four steps.

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## DEFENSE LOGISTICS AGENCY

### Aviation

8000 Jefferson Davis Highway  
Richmond, VA 23297-5609

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Air Force Brig. Gen. Scott W. Jansson

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**Chief,**  
Hazardous Information Programs  
Edilia A. Correa

**Branch Chief,**  
Hazardous Technical Information Services  
Fred J. Tramontin, Ph.D.

**Editor, HTIS Bulletin**  
Leonard S. Lambert

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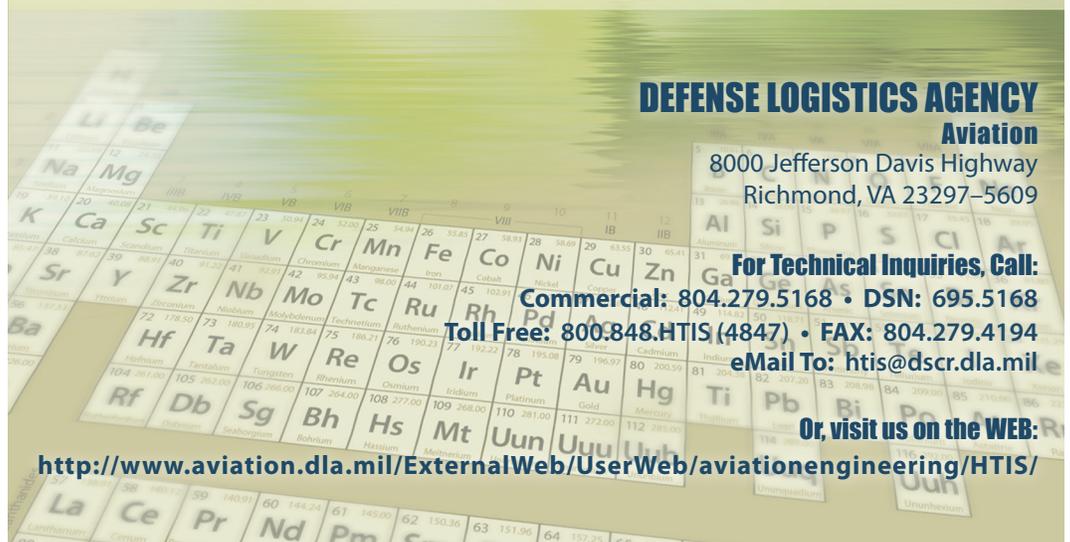
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The HTIS Bulletin is designed to keep DoD personnel informed of technical and regulatory developments on the environmentally safe management of hazardous materials and wastes.



## DEFENSE LOGISTICS AGENCY Aviation

8000 Jefferson Davis Highway  
Richmond, VA 23297-5609

**For Technical Inquiries, Call:**

**Commercial: 804.279.5168 • DSN: 695.5168**

**Toll Free: 800.848.HTIS (4847) • FAX: 804.279.4194**

**eMail To: [htis@dscr.dla.mil](mailto:htis@dscr.dla.mil)**

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