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UPDATE

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The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

OSHA Policies on Noise Control

Alice Suter, Ph.D.

Many of you may know that the U.S. Department of Labor/OSHA has recently made and then withdrawn an interesting policy change. Back in 1983, just after OSHA had issued the final version of the hearing conservation amendment, the Agency sent out a notice to its inspectors not to enforce the noise standard's requirements for feasible engineering and administrative controls until workers' time-weighted average exposure levels (TWAs) exceeded 100 dBA, and even then only if the other elements of the hearing conservation program, specifically hearing protectors, did not adequately protect them. This policy stayed in effect for 28 years although voices from the professional community, labor unions, and several organizations protested.

The result of OSHA's enforcement policy has been that the development and use of engineering noise control in this country has been virtually stagnant, at least in the workplace. The situation in the general environment isn't much better because EPA's Office of Noise Abatement has been closed since 1982, and any attempts to regulate or require labeling of noisy machines have died with it. That's not the case in Europe, Australia, and other parts of the world, where legislation and directives have provided incentive to manufacturers to make quieter equipment and employers to use it.

One of the arguments against the 1983 policy change is that OHSA implemented it without going through the public rule-making process, so its legality has been questioned. Another argument is that this policy is contrary to all other OSHA health and safety regulations, where engineering and administrative controls are the primary methods of hazard reduction. During this period, however, there were some major court cases, the outcome of which required OSHA inspectors to perform cost-benefit assessments if they issued citations for lack of noise control. So while the other industrialized nations have developed quieter products and processes, the American workplace remains noisy. In Europe and Australia noise control technology has greatly outpaced the U.S., as has the protection of workers against noise-induced hearing loss. Some American manufacturers market quiet products in Europe and noisy ones at home.

The OSHA noise standard lags behind those of the rest of the world in other respects. Out of some 25 nations, there are only 2 that use the OSHA 90-dBA permissible exposure limit (India and the U.S.) and four that use the 5-dB exchange rate (Brazil, Colombia, Israel, and the U.S.). Most others have adopted a limit of 85 dBA or below and the more protective 3-dBA exchange rate.

In more recent years additional litigation has taken place, going as far as the U.S. Supreme Court, which struck down the necessity of a cost-benefit analysis. Consequently, on October 19th of last year, OSHA published in the *Federal Register* the intention of changing its current policy by redefining the word "feasible" as it relates to the noise standard as "capable of being done." The Agency did say that if a noise control remedy threatened an employer's viability (the capacity to remain in business), it would not be considered feasible. OSHA encouraged the public to comment on the proposed change with a deadline of Dec. 20th 2010, which was extended to March 21st 2011.

CAOHC, along with NHCA and ASHA signed a coalition letter to Dr. David Michaels, the OSHA Director, supporting the recent policy change and requesting that the Agency continue to make improvements to the existing regulation. NHCA later followed up with detailed reasons for this support, including the points that workers

are continuing to lose their hearing despite compliance with the hearing conservation amendment, that workers often fail to wear their protectors or use them improperly, that hearing protectors can have an adverse effect on communication and the perception of warning signals, and that engineering controls can actually be less expensive in many situations because they are one-time rather than annual expenses. Also, there are many options available to OSHA to ease any resulting burdens on employers by giving long compliance times, exempting small businesses, and providing technical assistance. It is important to note that the feasibility issue refers to reducing time-weighted averages to 90dB TWA, not all noise exposures over 90 dBA.

Within a few weeks of its publication, there were objections from major business associations, such as the U.S. Chamber of Commerce and the National Association of Manufacturers, that the policy change was not needed and that it would have an adverse effect on jobs. These groups maintained that employees can be effectively protected with hearing protectors, and other elements of a hearing conservation program.

Also around this time President Obama issued an executive order directing the agencies to reexamine the need for regulations, and certain members of Congress took a negative interest in OSHA's proposed policy change. As a result of comments, the executive order and Congressional input, OSHA withdrew its policy on January 19, 2011, stating that this process required "much more public outreach"

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CAOHC®

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Chair's Message

By: Lee D. Hager

So What's New?

Actually, plenty – and thanks for asking! I'm taking the opportunity of this Chair's Message to give you all a little insight as some new (and newish) developments in the world of hearing conservation. Many thanks and kudos to Dr. Theresa Schulz, CAOHC Council representative for the American Academy of Audiology (AAA). It was Theresa's article in *Professional Safety*, the journal of the American Society of Safety Engineers (ASSE – also a constituent of the Council) that brought this idea to mind.

New Technologies

There has been a big increase over the past few years in technologies intended to help in our efforts to protect hearing. One of the largest areas of development in this area is individual fit testing for hearing protectors. Several companies have developed different approaches to help determine whether an individual user is getting enough protection from their earplugs (and yes, most of the systems will test earplugs but not earmuffs) to be safe in the noise they work in each day. At the recent National Hearing Conservation Association (NHCA) conference, Bill Murphy of NIOSH organized a day-long session where several of these systems were described and demonstrated. This appears to be a growing – perhaps a looming – advance in hearing conservation practice. For those of you with access to this publication, check out the article in the March issue of *Noise & Health* for a summary.

In addition, reductions in both size and cost have made electronics a viable supplement for some types of hearing protectors. Some allow outside noise in, controlled to a safe level (thus eliminating the "I can't hear my machine" excuse for not wearing hearing protection); some interface with different types of communication setups like 2-way radios or intercoms. Some integrate noise measurement instrumentation with the hearing protector, effectively providing a "protected exposure" that indicates the true noise dose getting to the workers' ear instead of the noise level measured outside. As the electronics get better, cheaper, and smaller, look for more and more of this kind of integration and more new developments in electronic aids for hearing conservation.

Hearing Testing Technologies

Another area of focus at the NHCA conference was the application of otoacoustic emissions (OAE) in hearing conservation settings. OAEs are very faint sounds that are actually generated by your hearing system – so faint that it's unlikely you can hear them, but detectable with specialized equipment. Most of the systems work by playing a sound into the ear, then "listening" for the OAE as a sort of echo. Measuring the sound coming out of the ear can give an indication of the health of the ear, and may be a more sensitive measure of early hearing loss than the audiograms we give today. Check out the 2011 NHCA Conference Proceedings for more information.

Pending Regulatory Changes

The EPA has been planning to change the way hearing protectors are labeled for several years – while it may not seem like it to you and me, this is actually a blink of the eye in Washington terms. Work continues on the new label and evaluation approach. While nothing is final until it is final, expect the new label to reflect a range of protection instead of a single number Noise Reduction Rating (NRR). The approach described by the EPA so far also will permit the evaluation of electronic hearing protectors (like the active cancellation devices that knock down low frequency sound using "anti-noise") as well as devices designed to change the amount of noise they block based on how loud the noise gets – "non-linear" hearing protectors, like some of those designed for shooters and weapons fire.

OSHA pursued a bit of a false start in the noise arena by publishing a notice that they planned to change the way noise rules would be enforced. Based on interpretations of the law from the early 1980's, OSHA has not emphasized noise control – the reduction of workplace noise – unless very specific circumstances were met. While there has always been a requirement to implement feasible engineering controls for noise, a matrix was developed that very tightly defined "feasible" such that most employers found it easier and less expensive to provide hearing conservation programs instead of noise control. Last fall, OSHA indicated that they intended to change the

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A Primer on Engineering Noise Controls

Noel W. Hart, Kimberly Riegel, and Robert D. Bruce, CSTI acoustics

Introduction

If quiet equipment cannot be purchased, engineering noise controls should be implemented, especially for people with time-weighted average (TWA) exposures greater than 90 dBA. Engineering noise controls are much more effective than either administrative controls or personal hearing protection for several reasons: They are always active and in place, have the same quieting effect for visiting contractors as for regular workers, and require less effort from management to ensure the treatments are working properly.

Engineering based noise control carries a higher up-front cost than hearing protection, but the benefits often far outweigh the costs. Safety improves, because all forms of communication, verbal and electronic, improve in quieter environments. Studies have even shown that worker morale and productivity improve with quieter workplaces (Driscoll & Royster, 2000). With all of the financial and ethical benefits offered by engineering noise controls, it is a wonder why so many companies still rely primarily on hearing protection.

Different types of engineering controls exist, each with strengths and drawbacks. A professional noise control engineer can assist companies in selecting and designing the optimum treatment for any particular application. Enclosures are probably the oldest form of noise control, very useful when implemented correctly.

Figure 1. Noise enclosure

Enclosures

Enclosures can range in size from whole buildings to small, rigid skins wrapped around noisy pumps. There are full or partial enclosures. Figure 1 shows a full enclosure for a propane powered generator. Enclosures work by inserting a solid mass between the equipment and the outside. It is important to ensure the enclosure has a high enough transmission loss (TL) to meet the desired noise criteria. TL values are measured in dB. As simple as this concept is, much work must be put into properly designing an enclosure to ensure sound attenuation is within the desired range, ease of access for maintenance addressed, and proper cooling and ventilation implemented. The most common problems when designing enclosures are:

- Insufficient transmission loss of materials
- Numerous untreated or unintended openings (e.g. improperly sealed)
- Structural connections between machinery and enclosure ignored, allowing noise from structural vibration to become a problem
- Conversely, it is also possible to place people inside the enclosure, leaving the noisy machinery unenclosed; such is the case with control rooms. This approach does not offer all the same benefits, and instead acts more like hearing protection than an engineering noise control. Enclosure performance can be improved by lining the interior with sound absorptive material.

Absorption

Sound absorbing materials absorb rather than reflect sound. Sound energy increases in confined spaces due to a large number of repeating reflections. The length of time it takes for the sound energy in the room to cease after the source has stopped is known as reverberation time (Harris, 1998). If some or all of these reflections are absorbed, the sound level inside the room will decrease, and this is why all noise enclosures should have internal sound absorption.

Most sound absorptive materials are porous, such as sheets of mineral wool, fiberglass batting, ceiling tiles, or porous foam materials, but hard surface absorbers such as the micro perforated panels first described by Daa-You Maa (1975) are slowly entering the market . Absorption is quantified by a material's absorption coefficient (α), a number between 0 and 1. Materials with α values equal to 1 are totally absorptive, and materials with values equal to 0 are totally reflective. Due to imperfections in testing methods, it is possible to obtain measured α values greater than 1.

Barrier Walls

A barrier wall works by occluding line of site between the source and receiver. They are extremely common in highway noise control and along borders of industrial facilities. Figure 2 shows a barrier wall of a compressor station. Barrier walls work extremely well for high frequencies above about 500 Hz, but due to the nature of low frequency sound and its wavelength, become very poor controls for frequencies below 500 Hz. A barrier is effective because it lengthens the path from source to receiver, causing the sound to travel over the barrier. The closer the barrier is to the source or the receiver, the more effective it will be. A barrier is least effective when placed equidistant from source and receiver.

Figure 2. Noise barrier wall

When designing a barrier wall, it is important to consider its construction materials. Whatever the barrier is constructed of must have ample mass to ensure the TL of the wall does not limit its noise control potential. Care must be taken to eliminate overhanging structures or vegetation from offering reflection points around or over the wall. Any holes or passages through the wall will reduce its effectiveness and

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Fitness for Duty

Jennifer Tufts, Ph.D., CCC-A

The virtuoso violinist and the firefighter spend their working days very differently – but each must be able to hear in order to do his or her job well. In the case of the virtuoso violinist, an inability to hear could mean the end of a career. In the case of the firefighter, an inability to hear could mean the difference between life and death. But how good does hearing need to be in these and other hearing-critical occupations, such as law enforcement and piloting? The answer is surprisingly elusive.

Auditory fitness for duty (AFFD) refers to the possession of hearing abilities sufficient for safe and effective job performance. AFFD is evaluated as a condition of employment in occupations that are physically hazardous or that involve the safety of others (e.g., the firefighter or the pilot, but not the violinist). AFFD standards for the U.S. military are established by the Department of Defense (Department of Defense, 2005). For federal civilian jobs, the Office of Personnel Management establishes AFFD standards (LaCroix, 1996a). State agencies, and even private companies, may adopt federal AFFD protocols or establish their own standards. Most guidelines require AFFD evaluations to be conducted by a supervised audiometric technician, an occupational hearing conservationist certified by the Council for Accreditation of Occupational Hearing Conservationists, or a licensed and/or certified audiologist.

Assessing AFFD usually involves, at the very least, obtaining pure-tone air conduction thresholds at 500, 1000, and 2000 Hz. Pass/fail cut-off values at these frequencies generally fall between 20 and 35 dB HL. Testing at some combination of 3000, 4000, and/or 6000 Hz is usually required as well. The pass/fail cut-off values at these frequencies tend to be somewhat higher. Protocols vary as to whether pass/fail criteria are identical for each ear, or whether a certain degree of asymmetry between ears is acceptable.

As an example, the audiometric requirements for enlistment into the U.S. Armed Forces are the following: thresholds in either ear no greater than 35 dB HL at 500, 1000, and 2000 Hz, with the average of these frequencies in each ear no greater than 30 dB HL; and thresholds at 3000 and 4000 Hz no greater than 45 and 55 dB HL, respectively, in either ear (Department of Defense, 2005). Individuals with bilateral mild-to-moderate hearing loss are not excluded from enlistment. In fact, almost all AFFD protocols allow some degree of hearing loss (i.e., thresholds $\geq$20 dB HL). This is partly an historical throwback: audiometric pass/fail criteria were originally based on medico-legal definitions of handicapping hearing loss, not on fitness-for-duty concerns (MacLean, 1995). However, perfectly normal hearing is not necessary to perform most hearing-critical jobs; thus, it makes sense that AFFD protocols do not require it.

The question still remains as to what level of hearing acuity is necessary to perform hearing-critical jobs. We are unlikely to arrive at a wholly satisfactory answer based on pure-tone audiometry alone. Most hearing-critical jobs require spatial awareness of sounds and speech at suprathreshold levels, often in background noise (Laroche et al, 2008). Pure-tone audiometry, on the other hand, measures monaural, peripheral auditory function in quiet. Thus, the ability to perform hearing-critical job tasks cannot be truly assessed with the audiogram alone (Marshall and Carpenter, 1988; Goldberg, 2001; Jones and Hughes, 2001). Indeed, the audiogram often under-predicts the functional performance of individuals with hearing loss (Soli, 2003).

In addition to the audiogram, some AFFD protocols include speech-in-quiet or speech-in-noise tests. These so-called *functional* exams purportedly relate more closely to real-world function than does the audiogram. Functional testing is typically conducted if individuals do not meet pure-tone threshold criteria. For example, enlisted U.S. Army soldiers who do not meet certain audiometric criteria (e.g., due to a progressive hearing loss) are required to take the Speech Recognition in Noise Test (SPRINT; Cord et al., 1992). The SPRINT presents 200 monosyllabic words diotically under headphones at 50 dB HL in six-talker babble at a signal-to-noise ratio of +9 dB. A percent correct score is calculated. This score, plus the soldier's length of service, are taken into account when determining whether or not changes in the soldier's assignment should be made.

Although functional exams may offer greater face validity compared with the audiogram, demonstrating the relationship between job performance and functional test results is no less difficult. Functional tests are usually conducted in a clinical or other artificial environment under conditions that bear little resemblance to actual job conditions. The ability to detect non-speech signals in noise is not evaluated, nor is the ability to integrate information usefully across the two ears for localization and environmental awareness, even though these abilities may be important on the job. To further complicate the situation, experience, skill, and familiarity with typical communications and warning signals on the job may allow an employee to compensate successfully for hearing loss (Dobie, 2001; Goldberg, 2001; Jones and Hughes, 2001). Such non-auditory influences on hearing-critical job performance cannot be evaluated with current functional tests.

One approach to avoid these pitfalls is to use tests that mimic hearing-critical situations in specific work environments (MacLean, 2001). The use of real-world simulations has high face validity and may be indicated for jobs involving life-threatening situations (e.g., combat or firefighting). Real-world simulations have the advantage of taking into account non-auditory factors, such as the availability of visual cues that influence task performance. On the other hand, the development and administration of such tests is costly and time-consuming.

In the last several years, the legality of AFFD test protocols based on pure-tone audiometry has been tested in court (e.g., Laroche, 1994; Laroche et al, 2003; Seyfarth Shaw LLP, 2006; Ceniceros, 2008). The outcomes of these cases demonstrate the tendency of the legal system to support AFFD standards that more clearly relate to job requirements. Given society's movement toward greater fairness and accountability, current pure-tone-audiometry-based protocols may eventually be supplemented or replaced with defensible protocols that offer a truer assessment of auditory fitness of duty.

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NHCA Tech

Renee S. Bessette

In February, over 275 hearing loss professionals from around the world gathered in Mesa, Arizona for the 36th annual National Hearing Conservation Association conference. Titled "Innovations & Technology," workshops, platform presentations, and posters focused on emerging technologies and new efficiencies in preventing noise-induced hearing loss at work and at home.

The mission of the NHCA is to prevent hearing loss due to noise and other environmental factors in all sectors of society. NHCA's membership includes audiologists, researchers, industrial hygienists, physicians and occupational health nurses, educators, professional service organizations, safety professionals, engineers, audio professionals, students, and others who have dedicated their work to the advancement of hearing loss prevention.

The conference started with a full day of hands-on workshops, including:

- "The Basics," which brings in speakers from many disciplines within hearing conservation to educate attendees on different aspects on hearing conservation programs and training;
- "Preservation of Hearing in the U.S. Army," an overview of a new approach to protecting soldier hearing;
- Professional Service Provider session; and
- Earplug fit testing day long workshop that allowed attendees to experience all available systems on the market.

On Friday, the conference proceedings kicked off with a series of platform presentations on "30 Years of OSHA" and the implementation of the Occupational Noise Standard in the United States. Presenters represented a broad range of perspectives, including Nancy Hauter from OSHA; Christine Dixon-Ernest from Alcoa, explaining the company's own global hearing conservation practices; Tim Rink from HTI reviewing trends and new findings in audiometric test data; Robert Anderson of Anderson & Associates speaking about the implementation of noise controls in industry; and Scott Schneider from the *Laborers*' Health and Safety Fund of North America (LHSFNA).

Afternoon proceedings included breakout sessions tackling the topics of Epidemiology and Education, including new training techniques; Workplace and Impulse Noise; and HPDs and Noise Risk Monitoring, which focused heavily on new technologies such as in-ear dosimetry to prevent NIHL.

Friday also included the presentation of the NIOSH / NHCA Safe-in-Sound Excellence in Hearing Loss Prevention Award, presented for best practices and innovations in hearing loss prevention. Shaw Industries, a flooring manufacturer, was presented with the Excellence in Hearing Loss Prevention in Manufacturing Award for implementation of noise controls at its facilities and earplug fit testing in hearing conservation training program. CPT Leanne Cleveland and the Fort Carson Army Hearing Program received the Innovation in Hearing Loss Prevention in the Service Sector award for its innovations to implement the far-reaching programmatic changes outlined in Army Hearing Program. (http://militaryaudiology.org/site/wp-content/images/st_4_02_501.pdf).

On Saturday, morning proceedings turned to the topic of otoacoustic emissions (OAE) and new approaches towards measuring the health of outer hair cells. While OAEs are not currently used in hearing conservation programs, the protocols being developed show promise in early detection of noise-induced hearing loss.

During the afternoon luncheon, Peter Rabinowitz, MD, MPH, Associate Professor of Medicine and Director of Clinical Services at the Yale University Occupational and Environmental Medicine Program, was named the 2011 "Outstanding Hearing Conservationist" in recognition of his career work in hearing loss prevention. Dr. Rabinowitz's recent research includes a partnership with Alcoa to analyze its database of audiograms and implement programs that identify risk factors for hearing loss early.

In addition, NIOSH's Hearing Loss Prevention Team received the 2011 "Media Award" for its contributions to the NIOSH Science Blog that have raised national awareness about hearing loss prevention at work and at home.

Additional presentations on Saturday reflected the implementation of earplug fit testing programs in industry; and research on the use of MP3 players and personal listening devices on hearing health.

In the exhibit hall, representatives from manufacturers of hearing protectors, audiometric test equipment, noise measurement and controls demonstrated their latest products. Staff from NIOSH, ASHA and CAOHC shared new resources and tools to educate people on hearing loss prevention at work and at home. During the opening cocktail reception on Thursday night and throughout break hours, attendees networked with one another and viewed the 19 posters that presented research ranging from firearms noise, NIHL in agriculture, military hearing protectors, and hearing loss among factory workers.

Renee S. Bessette, COHC, is the global brand manager for Howard Leight/Honeywell Safety Products, a global leader in Hearing Conservation solutions. She is responsible for global brand management and marketing communications for the Howard Leight brand. Renee holds a BA in journalism from the University of Rhode Island; she received CAOHC certification in 2005; and is a Certified Occupational Hearing Conservationist (COHC). Renee is also the director of public relations and marketing for the National Hearing Conservation Association (NHCA). She previously held the commercial member delegate position on NHCA's executive council.

News from CAOHC Component Organizations

Military Audiology Association (MAA)

COL Vickie Tuten

The Military Audiology Association (MAA) and the Association of Veteran Affairs Audiologists (AVAA) met for their 3rd annual combined conference, the Joint Defense Veteran Audiology Conference (JDVAC). The location for this year's conference was San Diego, an area rich in military history. Attendance for JDVAC was in excess of 280 participants from across Department of Defense (DoD) and the Veteran Affairs (VA). Collaboration and seamless transition of hearing health care has prompted the move to join forces and to meet and share knowledge and information of interest to both DoD and VA audiologists. The conference offers opportunity to obtain continuing education credits and attend lectures and presentations of interest to audiologists in both organizations. It is also an excellent opportunity for professional and social networking with two organizations that share some common vision and goals.

JDVAC has one day devoted to respective Break Out sessions where the VA and each Service meet to have presentations and updates on issues relative to each organization. The joint and concurrent sessions take place over the next several days. The theme for this year's conference was…Charting a Course to Provide the "Best for the Best." Distinguished speakers included Dr. James Jerger, Dr. Todd Ricketts, Dr. Sherri Smith, CAPT Ben Balough, and LtCol Mark Packer. Dr. Richard Pimentel, a nationally renowned expert of the Americans with Disabilities Act (ADA) provided an inspirational presentation on "Hearing Healthcare: A Soldier's Perspective." Other presentations throughout the conference included presentations on best practices from a number of speakers across DoD and the VA.

In conjunction with JDVAC, MAA hosted a CAOHC Course Director Workshop for Certification and Recertification of DoD Course Directors which included 67 participants who all successfully completed the course requirements.

Feedback for the joint conference continues to be very positive, and the next JDVAC will be held next year in New Orleans following the NHCA Conference.

The **Armed Forces Public Health Conference** (AFPHC) was held from 17-25 March 2011 at the Hampton Roads Convention Center in Hampton, Virginia. It is was the first joint conference organized by the Army and Navy Public Health Commands. The conference offers a number of workshops which often include certification and re-certifications for many different specialties. The core conference offers tracks in Environmental Health, Industrial Hygiene, Preventive Medicine, Occupational Medicine, Behavioral Health, and Deployment Health. The conference is a great multi-disciplinary conference which offers subjects of interest to anyone involved in taking care of our Service Members and civilian employees as well as an excellent opportunity for networking. During the conference, the Navy offered a re-certification workshop for Occupational Hearing Conservationists. MAJ Andy Merkley provided a presentation on CAOHC Professional Supervisor training. COL Vickie Tuten provided an update on the Army Hearing Program and the results of the recent GAO Audit done on DoD Hearing Programs. CAPT Ben Balough, a Navy Oto-neurologist provided a presentation on Pharmalogical solutions for Noise Induced Hearing Loss. Several Navy audiologists and industrial hygienists presented on topics dealing with areas of interest to those working in hearing programs. All of the above were well attended with rooms often filled to capacity.

The next Annual AFPHC will be held in San Diego, CA 8-15 June 2012.

COL Vickie Tuten is one of CAOHC's representatives from the Military Audiology Association.

International Occupational Hygiene Association

Chandran Achutan, PhD

The 2010 International Occupational Hygiene Association (IOHA) International Scientific Conference held in Rome, Italy from September 28th to October 2nd, 2010 included a total of seven platform presentations primarily related to noise exposure and hearing loss. Topics included low frequency noise exposures in the oil and gas industry (Iran), noise reduction strategies in for existing port facilities in Russia and Italy, and the use of active noise control inside the cabins of agricultural trucks and earth moving machines in Italy. The U.S. National Institute for Occupational Safety and Health and the National Hearing Conservation Association discussed the creation of the Safe-in-Sound Excellence in Hearing Loss Prevention Award (www.safeinsound.US/)to recognize organizations that have documented measurable achievements and shared leading edge information on hearing health practices in the U.S.

Ten posters primarily addressed issues of noise exposure and hearing loss at the IOHA Conference. Posters included a study on ototoxic effects of industrial solvents from Canada, use of otoacoustic emissions to prevent hearing loss among musicians and singers in Italy, and noise exposure assessment studies among bus drivers (Iran) and refrigerator manufacturers (Turkey). A presentation on protection against noise among workers in printing, textile, wood, and plastic manufacturing in Estonia found that a flexible risk assessment of occupational noise exposure is appropriate and applicable in these selected industries.

Submitted by Chandran Achutan, PhD is one of the representitives for the American Industrial Hygiene Association (AIHA)

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should be accounted for in the design process. Because a barrier wall only reduces sound on the opposite side of the wall, often times quieting the source will provide noise control with a higher degree of confidence.

Silencers and Lagging

Piping and other flow-induced noise sources can be quieted by the addition of a silencer or a lagging treatment. Both treatments are measured in terms of their insertion loss (IL) in dB. A silencer is a device or section that is installed inline and reduces the noise output at every point downstream. Silencers can be used to quiet internal combustion engines, HVAC systems, natural gas compressors and even pneumatic tools with little to no impact on performance.

Two types of silencers exist, reactive and dissipative. Dissipative silencers work by adding sound absorptive material to the interior of the pipe or duct. The absorption works as described earlier to reduce the sound buildup. Reactive silencers work on principles of pressure differentials to cancel out some of the noise.

Pneumatic tool silencers are available in several forms to quiet machinery. Air exhaust silencers can be installed on tools with loud exhaust air, such as jack hammers. Dissipative silencers or quieter, alternative gun tips with multiple flow rates can be installed in line for blown air guns to significantly reduce their noise (Driscoll & Royster, 2000).

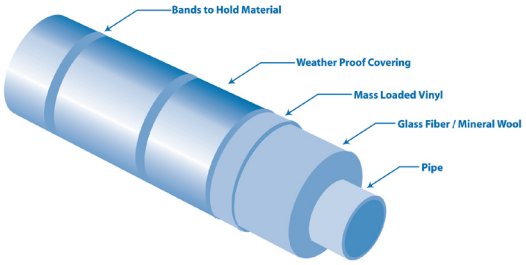

Figure 3. Acoustical pipe lagging

Lagging treatments surround ducts and pipes to form a rudimentary enclosure. Consisting of an absorptive inner layer and heavy outer layer called a mass layer, high noise reduction can be achieved due to a combination of decoupling and transmission loss effects. Figure 3 shows a typical acoustic lagging treatment. Lagging treatments can inadvertently increase the noise if done improperly without a resilient enough absorption layer to decouple the pipe from the hard mass layer. Because lagging treatments are often already specified for thermal reasons, minor modifications can ensure they also have acoustic benefits as well.

Process Modifications

Many machines become much louder with only a slight increase in speed. For these cases it may often be more convenient in the long run to operate the machine for longer periods at lower speeds. Doing so will not only reduce the noise exposures of nearby employees, but it may also extend the life of the machine.

Punch machines can create extremely loud, impulsive sounds. The noise can be quieted by simply adjusting the distance of the stock material from the punch, or by adjusting the angle of incidence so the punch is exerting a greater force over a smaller area for an extended period of time. This time increase is usually on the order of a few milliseconds.

Vibration Isolation and Damping

Structural and machine vibrations can radiate into the air, causing airborne noise. Two approaches can combat this problem, vibration isolation and damping.

Vibration isolators reduce the energy transmitted from equipment to its attached structure. They are tipically made of springs, rubber, or sometimes a combination of both. They come in numerous sizes, deflections and maximum loads. It is very important to specify the correct parameters for vibration isolators, or vibration may not be reduced and may even be amplified.

Lightweight panels vibrate with large displacements, creating equally large amounts of noise. Damping treatments can be applied to these panels to reduce displacement and the radiated noise (Bies & Hansen, 2009). Damping treatments commonly consist of trowelled or sprayed on mastic, mass loaded vinyl, or asphalt. They can be applied mechanically, with adhesives or screws, or sprayed. Some damping devices can even be welded into place.

Conclusions

A wide variety of engineering noise controls exist, many with specific purposes. All of them have the ability to reduce the overall noise level inside and around industrial facilities, making the work environment not only safer but also more productive and enjoyable. Engineering noise controls serve as a permanent fix to noise issues and one that provides potentially safer, cheaper, and more productive work environments.

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A Consultant for CSTI acoustics in Houston, Noel Hart specializes in industrial noise control modeling, testing and hearing conservation, as well as architectural and litigation acoustics. He holds a Master's degree from Rensselaer Polytechnic Institute, concentrating in acoustics

OSHA Policies on Noise Control… – continued from page 1

and that they needed to examine other alternatives. They would, however, review all comments that arrived by March 21st and some time after that hold a stakeholders meeting. The date of the meeting has not yet been determined.

Although the deadline of March 21st is past, OSHA officials have stated that the docket would continue to remain open and that interested parties could still send in comments. It would be particularly helpful to OSHA to learn about how some companies have used noise control in efficient and inexpensive ways. Comments on these issues may be sent to the OSHA Docket Office, Docket no. OSHA 2010-0032, U.S. Dept. Labor, 200 Constitution Ave. NW, Washington DC 20210.

Further information:

OSHA's Federal Register notice: 10-19-10 https://www.osha.gov

OSHA's Federal Register notice: 1-19-11 https://www.osha.gov

Alice H. Suter, Ph.D.

Alice Suter has worked in the area of noise effects and hearing conservation for more than 30 years and is the editor and author of the CAOHC Hearing Conservation Manual 4th edition. She has an M.S. in education of the deaf and a Ph.D. in audiology. She has been influential in noise criteria development, regulation, and public policy, first at the U.S. EPA's Office of Noise Abatement and later at OSHA. At the EPA she participated in the development of criteria for noise effects, including the psychological, extra-auditory physiological, performance, and communication effects, in addition to the effects of noise on hearing. As Senior Scientist and Manager of the Noise Standard at OSHA, she was principal author of the hearing conservation amendment to the noise standard.

She may be contacted at ahsuter@comcast.net *or 503-206-7770.*

Chairs Message… – continued from page 2

compliance definition of "feasible" to - well, feasible. As Webster would put it, feasible meant "capable of being done". This raised the specter of a new compliance emphasis on controls, and raised the ire of many industrial employers. OSHA has since backed away from their proposal, but plans to continue to look at ways to reduce hearing loss in American workers.

But Some Things Never Change

Hearing loss continues to accrue. According to the Bureau of Labor Statistics, 21,700 new cases of work related permanent, irreversible hearing loss were recorded in 2009 – on top of the 22,000 the year before and the 23,000 the year before. Since OSHA started keeping track of hearing loss separately on their Form 300 in 2004 workers have suffered over 143,000 cases ofunnecessary, preventable hearing loss. We understand noise and we understand testing hearing; maybe we all need to do a better job of understanding how to prevent hearing loss in the first place.

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Lee D. Hager • CAOHC Chair

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Jennifer Tufts is assistant professor in the Department of Communication Sciences at the University of Connecticut. Previously, she completed postdoctoral clinical and research training at Walter Reed Army Medical Center in Washington DC. Her current research areas include hearing loss prevention and auditory fitness for duty in diverse populations.

UPCOMING OCCUPATIONAL HEARING CONSERVATIONIST (OHC) COURSES 2011

Below is a listing of all OHC certification and re-certification courses from May 16 – August 25, 2011. Please note that new courses are added daily, for the most up-to-date information please check the OHC Course Listing section of the CAOHC website, www.caohc.org.

Start Date	End Date	State	City	FULL_NAME	Phone
5/16/2011	5/18/2011	GA	Atlanta	Herbert J. Greenberg, PhD CCC-A	678-352-0312
*5/17/2011	5/17/2011	GA	Atlanta	Herbert J. Greenberg, PhD CCC-A	678-352-0312
5/17/2011	5/19/2011	MI	Detroit	Thomas Simpson	313-516-7786
*5/18/2011	5/18/2011	MI	Detroit	Thomas Simpson	313-516-7786
5/16/2011	5/18/2011	ME	Waterville	Anne Louise P. Giroux, AuD CCC-A	207-872-0320
5/17/2011	5/19/2011	DC	Washington	Diane M. Brewer, MA CCC-A	202-994-7167
*5/18/2011	5/18/2011	DC	Washington	Diane M. Brewer, MA CCC-A	202-994-7167
*5/19/2011	5/19/2011	DE	Dover	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
5/18/2011	5/20/2011	DE	Dover	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
5/18/2011	5/20/2011	OR	Portland	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
*5/18/2011	5/18/2011	OR	Portland	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
5/18/2011	5/20/2011	TX	Houston	Johnny L. Sanders, MA CCC-A	800-869-6783
*5/19/2011	5/19/2011	TX	Houston	Johnny L. Sanders, MA CCC-A	800-869-6783
5/18/2011	5/20/2011	WI	Green Bay	Paul F. Kurland, MA	920-499-6366
*5/19/2011	5/19/2011	WI	Green Bay	Paul F. Kurland, MA	920-499-6366
*5/19/2011	5/19/2011	WV	Charleston	Michele Alexander, MS CCC-A	336-834-8775
5/18/2011	5/20/2011	WV	Charleston	Michele Alexander, MS CCC-A	336-834-8775
*5/20/2011	5/20/2011	IA	Waterloo	Christine Pernetti, MA CCC-A	319-369-7569
5/19/2011	5/21/2011	IA	Waterloo	Christine Pernetti, MA CCC-A	319-369-7569
5/19/2011	5/21/2011	SC	Charleston	Stuart L. Cohen, MAud	843-830-6533
*5/20/2011	5/20/2011	SC	Charleston	Stuart L. Cohen, MAud	843-830-6533
5/24/2011	5/26/2011	WA	Seattle	Mary M. McDaniel, AuD CCC-A CPS/A	206-706-7352
*5/23/2011	5/23/2011	WA	Seattle	Mary M. McDaniel, AuD CCC-A CPS/A	206-706-7352
*5/24/2011	5/24/2011	FL	Mulberry	John H. Elmore, AuD MBA CCC-A	800-357-5759
5/25/2011	5/27/2011	FL	Orlando	John H. Elmore, AuD MBA CCC-A	800-357-5759
*5/26/2011	5/26/2011	FL	Orlando	John H. Elmore, AuD MBA CCC-A	800-357-5759
*5/26/2011	5/26/2011	CA	Vacaville	Charles E. Fankhauser, PhD	707-746-6334
5/25/2011	5/27/2011	CA	Vacaville	Charles E. Fankhauser, PhD	707-746-6334
6/6/2011	6/8/2011	ME	Waterville	Anne Louise P. Giroux, AuD CCC-A	207-872-0320
6/7/2011	6/9/2011	MO	North Kansas City	Linda Kay Ratliff-Hober, MS CCC-A	816-221-3230 x120
*6/8/2011	6/8/2011	MO	North Kansas City	Linda Kay Ratliff-Hober, MS CCC-A	816-221-3230 X120
6/7/2011	6/9/2011	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
*6/8/2011	6/8/2011	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
6/8/2011	6/10/2011	MD	Baltimore	Lynn E. Cook, AuD FAAA	800-869-6783
*6/9/2011	6/9/2011	MD	Baltimore	Lynn E. Cook, AuD FAAA	800-869-6783
6/8/2011	6/10/2011	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
6/8/2011	6/10/2011	NM	Albuquerque	John H. Elmore, AuD MBA CCC-A	800-357-5759
*6/9/2011	6/9/2011	NM	Albuquerque	John H. Elmore, AuD MBA CCC-A	800-357-5759
6/8/2011	6/10/2011	OH	Columbus	James J. Jerome, MA CCC-A	317-841-9829
*6/9/2011	6/9/2011	OH	Columbus	James J. Jerome, MA CCC-A	317-841-9829
6/8/2011	6/10/2011	PA	Harrisburg	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
*6/9/2011	6/9/2011	PA	Harrisburg	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
6/8/2011	6/10/2011	SC	Columbia	Melette L. Meloy, MS CCC-A	678-363-9897
*6/9/2011	6/9/2011	SC	Columbia	Melette L. Meloy, MS CCC-A	678-363-9897
6/9/2011	6/11/2011	PA	Pittsburgh	Roger M. Angelelli, PhD	412-831-0430
*6/10/2011	6/10/2011	PA	Pittsburgh	Roger M. Angelelli, PhD	412-831-0430
6/13/2011	6/15/2011	FL	W Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
6/13/2011	6/15/2011	OR	Portland	Thomas Dolan	503-725-3264
*6/14/2011	6/14/2011	OR	Portland	Thomas Dolan	503-725-3264

**indicates a one-day recertification course*

UPCOMING OCCUPATIONAL HEARING CONSERVATIONIST (OHC) COURSES 2011, continued

*6/14/2011	6/14/2011	FL	W Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
6/14/2011	6/16/2011	MA	Auburn	Steven R. Fournier, AuD CPS/A	508-832-8484
6/15/2011	6/17/2011	AR	Little Rock	Michele Alexander, MS CCC-A	336-834-8775
*6/16/2011	6/16/2011	AR	Little Rock	Michele Alexander, MS CCC-A	336-834-8775
6/15/2011	6/17/2011	MO	St. Louis	Thomas L. Hutchison, MA, MHA	800-869-6783
*6/16/2011	6/16/2011	MO	St Louis	Thomas L. Hutchison, MA, MHA	800-869-6783
6/20/2011	6/22/2011	WA	Spokane	Mary M. McDaniel, AuD CCC-A CPS/A	206-706-7352
*6/23/2011	6/23/2011	WA	Spokane	Mary M. McDaniel, AuD CCC-A CPS/A	206-706-7352
6/22/2011	6/24/2011	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
*6/21/2011	6/21/2011	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
6/22/2011	6/24/2011	AR	Little Rock	Thomas L. Hutchison, MA, MHA	800-869-6783
*6/23/2011	6/23/2011	AR	Little Rock	Thomas L. Hutchison, MA, MHA	800-869-6783
6/22/2011	6/24/2011	NV	Las Vegas	John H. Elmore, AuD MBA CCC-A	800-357-5759
*6/23/2011	6/23/2011	NV	Las Vegas	John H. Elmore, AuD MBA CCC-A	800-357-5759
*7/7/2011	7/7/2011	NY	Albany	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
7/6/2011	7/8/2011	NY	Albany	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
7/6/2011	7/8/2011	TX	Dallas/Ft Worth	John H. Elmore, AuD MBA CCC-A	800-357-5759
7/6/2011	7/8/2011	WI	Madison	James J. Jerome, MA CCC-A	317-841-9829
*7/7/2011	7/7/2011	WI	Madison	James J. Jerome, MA CCC-A	317-841-9829
*7/7/2011	7/7/2011	TX	Dallas/Ft Worth	John H. Elmore, AuD MBA CCC-A	800-357-5759
*7/8/2011	7/8/2011	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
7/11/2011	7/13/2011	GA	Atlanta	Herbert J. Greenberg, PhD CCC-A	678-352-0312
*7/12/2011	7/12/2011	GA	Atlanta	Herbert J. Greenberg, PhD CCC-A	678-352-0312
7/11/2011	7/13/2011	IA	Davenport	James J. Jerome, MA CCC-A	317-841-9829
*7/12/2011	7/12/2011	IA	Davenport	James J. Jerome, MA CCC-A	317-841-9829
*7/14/2011	7/14/2011	AR	Little Rock	Jane Prince, PhD	870-972-1166
7/13/2011	7/15/2011	AR	Little Rock	Jane Prince, PhD	870-972-1166
7/13/2011	7/15/2011	GA	Atlanta	Michele Alexander, MS CCC-A	336-834-8775
*7/14/2011	7/14/2011	GA	Atlanta	Michele Alexander, MS CCC-A	336-834-8775
7/13/2011	7/15/2011	WA	Seattle	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
*7/14/2011	7/14/2011	WA	Seattle	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
7/18/2011	7/20/2011	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
*7/19/2011	7/19/2011	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
7/18/2011	7/20/2011	OR	Portland	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
*7/18/2011	7/18/2011	OR	Portland	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
7/20/2011	7/22/2011	TX	Houston	Richard W. Danielson, PhD CPS/A	800-869-6783
*7/21/2011	7/21/2011	TX	Houston	Richard W. Danielson, PhD CPS/A	800-869-6783
7/20/2011	7/22/2011	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759
*7/21/2011	7/21/2011	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759
7/20/2011	7/22/2011	WA	Seattle	Amy R. Stewart, MA CCC-A CPS/A	206-764-3330
*7/21/2011	7/21/2011	WA	Seattle	Amy R. Stewart, MA CCC-A CPS/A	206-764-3330
7/21/2011	7/23/2011	PA	Kittanning	Douglas N. Callen, PhD	724-543-7068
*7/22/2011	7/22/2011	PA	Kittanning	Douglas N. Callen, PhD	724-543-7068
*7/26/2011	7/26/2011	VA	Norfolk	George R. Cook, Jr., AuD CCC-A	276-637-6595
7/25/2011	7/27/2011	VA	Norfolk	George R. Cook, Jr., AuD CCC-A	276-637-6595
7/26/2011	7/28/2011	MO	North Kansas City	Linda Kay Ratliff-Hober, MS CCC-A	816-221-3230 X120
*7/27/2011	7/27/2011	MO	North Kansas City	Linda Kay Ratliff-Hober, MS CCC-A	816-221-3230 X120
7/27/2011	7/29/2011	GA	Atlanta	Melette L. Meloy, MS CCC-A	678-363-9897
*7/28/2011	7/28/2011	GA	Atlanta	Melette L. Meloy, MS CCC-A	678-363-9897
7/27/2011	7/29/2011	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
7/27/2011	7/29/2011	NV	Las Vegas	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
*7/28/2011	7/28/2011	NV	Las Veglas	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
8/3/2011	8/5/2011	AL	Birmingham	Georgia W. Holmes, AuD CCC-A	205-934-7178
*8/4/2011	8/4/2011	AL	Birmingham	Georgia W. Holmes, AuD CCC-A	205-934-7178
8/3/2011	8/5/2011	FL	Tampa	Thomas L. Hutchison, MA, MHA	800-869-6783
*8/4/2011	8/4/2011	FL	Tampa	Thomas L. Hutchison, MA, MHA	800-869-6783
8/3/2011	8/5/2011	KY	Louisville	James J. Jerome, MA CCC-A	317-841-9829

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UPCOMING OCCUPATIONAL HEARING CONSERVATIONIST (OHC) COURSES 2011, continued

*8/4/2011	8/4/2011	KY	Louisville	James J. Jerome, MA CCC-A	317-841-9829
8/3/2011	8/5/2011	OH	Dayton	Chris M. Pavlakos, PhD	937-436-1161
*8/5/2011	8/5/2011	OH	Dayton	Chris M. Pavlakos, PhD	937-436-1161
8/8/2011	8/10/2011	FL	W Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
*8/9/2011	8/9/2011	FL	W Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
8/10/2011	8/12/2011	FL	Jacksonville	Nancy N. Green, AuD FAAA FADA	904-880-1710
*8/11/2011	8/11/2011	FL	Jacksonville	Nancy N. Green, AuD FAAA FADA	904-880-1710
8/10/2011	8/12/2011	MI	Detroit	Lynn E. Cook, AuD FAAA	800-869-6783
*8/11/2011	8/11/2011	OH	Cincinnati	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
8/10/2011	8/12/2011	OH	Cincinnati	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
*8/11/2011	8/11/2011	MI	Detroit	Lynn E. Cook, AuD FAAA	800-869-6783
*8/18/2011	8/18/2011	LA	New Orleans	Michele Alexander, MS CCC-A	336-834-8775
8/17/2011	8/19/2011	LA	New Orleans	Michele Alexander, MS CCC-A	336-834-8775
8/17/2011	8/19/2011	MI	Detroit	John H. Elmore, AuD MBA CCC-A	800-357-5759
*8/18/2011	8/18/2011	MI	Detroit	John H. Elmore, AuD MBA CCC-A	800-357-5759
8/17/2011	8/19/2011	OK	Oklahoma City	Thomas L. Hutchison, MA, MHA	800-869-6783
*8/18/2011	8/18/2011	OK	Oklahoma City	Thomas L. Hutchison, MA, MHA	800-869-6783
8/24/2011	8/26/2011	CO	Loveland	Laurie Wells, AuD, FAAA CPS/A	970-593-6339
*8/26/2011	8/26/2011	CO	Loveland	Theresa H. Small, AuD	970-593-6339
8/24/2011	8/26/2011	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
8/24/2011	8/26/2011	NM	Albuquerque	Lynn E. Cook, AuD FAAA	800-869-6783
*8/25/2011	8/25/2011	NM	Albuquereque	Lynn E. Cook, AuD FAAA	800-869-6783
8/24/2011	8/26/2011	PA	Pittsburgh	Timothy A. Swisher, MA CCC-A FAAA	412-367-8690
*8/25/2011	8/25/2011	PA	Pittsburgh	Timothy A. Swisher, MA CCC-A FAAA	412-367-6890

**indicates a one-day recertification course*

Upcoming 2011

Upcoming **Professional Supervisor** Workshop

Thursday, May 13, 2011
Hotel Metro
Milwaukee, WI

Thursday, November 3, 2011
Hyatt Regency
Bonita Springs, FL

To register go to http://www.caohc.org/ps_workshop/

Registration now open see CAOHC website **www.caohc.org** for further details.

CAOHC-0411-053 *Spring 2011*

Look for CAOHC on the INTERNET
www.caohc.org

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