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UPDATE

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The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

Chair's Message

by Peter Weber, MD MBA FACS, Representative of the American Academy of Otolaryngology Head and Neck Surgery

Hi! It is with some sadness that I realize this will be my last message to you in the "Chair's Message" portion of the UPDATE. I have had the fortunate opportunity to serve as the chair of CAOHC for two years. I will be turning this position over to Theresa Schulz, PhD CCC-A, at the completion of our Fall Council meeting. She is presently Vice-Chair and one of two representatives of the Military Audiology Association on the Council. Theresa has served on the Council for the past four years and has been involved in hearing conservation issues for most of her career.

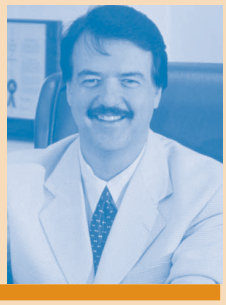
As I reflect upon my two years as Chair, I am pleased with the results of the several projects that were instituted as a result of our long range planning, namely, a hearing conservation course taught by CAOHC Council members to Occupational and Environmental Physicians at their annual meeting, and the development of a similar course for the American Association of Occupational Nurses at their annual meeting. These are two endeavors we will continue to perform since we feel that this is much-needed education for these two groups. We have also started to prepare a standardized examination for all new OHC candidates in order that we can improve the uniformity in training by course directors. We have also developed an instructional videotape describing the anatomy, physiology, and diseases of the ear which can be used by CDs in teaching their CAOHC courses or by OHCs and program supervisors in teaching their patients about the ear.

Recently we introduced a new brochure for OHCs and their employers titled "The Stamp of Approval for Occupational Hearing Conservation" describing the importance and benefits of becoming CAOHC certified. And finally, many of you have probably noted and benefited from our redesigned and enhanced web site that is more user friendly and includes a number of new online registration forms.

It has been a very busy two years and I know that through Theresa's guidance, CAOHC will grow and maintain its leadership in hearing conservation.

I'll continue to serve on the Council as Past Chair and remain one of two representatives for the American Academy of Otolaryngology. I look forward to serving you and CAOHC throughout the remainder of my term.

Issues Relating to Speech Communications in Noise



By J. G. Casali, PhD CPE and G. S. Robinson, PhD
From: Auditory Systems Laboratory
Grado Department of Industrial and Systems Engineering
Virginia Tech

Introduction

Workers in noisy environments must often communicate either face-to-face or over an intercom or public address system. Unfortunately, noise, hearing protection devices (HPDs), and/or elevated auditory thresholds can make understanding speech difficult, if not impossible. Although nonintuitive, it is a fact that in some circumstances, HPDs can improve the ability of an individual of normal hearing to understand speech compared to unprotected conditions. However, this effect depends greatly on the attenuation characteristics of the HPD, the hearing threshold of the wearer, and the level and spectrum of the noise. Even under ideal conditions, speech will be less

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Published by the Council for Accreditation in Occupational Hearing Conservation, a not-for-profit organization dedicated to the establishment and maintenance of training standards for those who safeguard hearing in the workplace.

Articles should be submitted, with a black and white photograph of the author. The UPDATE *is available to individuals not certified by CAOHC at an annual subscription rate of $20. Payment must accompany request:*

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CAOHC Approved OHC Courses

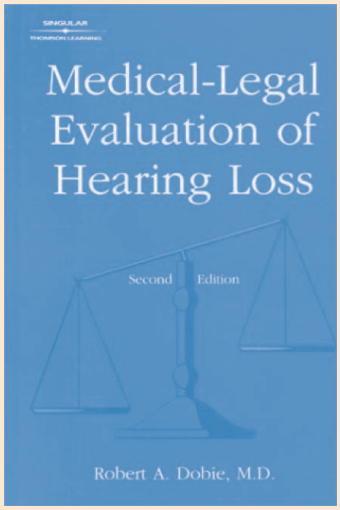
When you are registering for a recertification course (or if your fellow staff member is registering for the first time at a certification course), please confirm with the registrar that "this is a CAOHC approved" course. Only certified Course Directors, who have received a course approval certificate from the CAOHC Executive office, can conduct an occupational hearing conservation course that leads to CAOHC certification. Course Directors must display this certificate of approval in view of their students. If you don't see it, please ask your Course Director.

If you are uncertain whether the course you are planning to attend is certified by CAOHC, please contact Chris Whiting at the CAOHC office at 414/276-5338 or e-mail info@CAOHC.org

Book Review

Medical-Legal Evaluation of Hearing Loss (2nd edition)

Authored By: Robert A. Dobie, MD
Reviewed By: Robert A. Goldenberg, MD
A Representative of the American Academy of Otolaryngology – Head and Neck Surgery



Dr. Dobie has provided a wonderfully comprehensive and current revision of his excellent book first published in 1993. Every chapter has been revised and updated, some errors corrected, and some omissions from the first edition have been addressed.

The book discusses acoustics, anatomy and physiology of the ear, hearing tests, otological evaluation, audiological evaluation of exaggerated hearing loss, estimation of hearing impairment or handicap, age-related hearing loss, noise-induced hearing loss and acoustical trauma, other otologic disorders, and hearing conservation. The remaining chapters describe legal remedies for hearing loss, reporting methods, and the expert witness.

There are several significant revisions from the first edition. ANSI S3.44 includes a new database (Annex C) for estimating the effects of age related hearing loss; research suggests that the highly screened database A is inappropriate for purposes of medical – legal analysis. Examples in the book reflect that point of view. Legal changes (including recent Supreme Court decisions involving the Americans with Disabilities Act), and new federal regulations are summarized. New research into the amount of attenuation expected from hearing protection devices is presented, along with the advantages and disadvantages of using dosimeters to measure noise exposure.

The appendices at the end of the chapters provide invaluable information. Appendix A lists typical sound levels for various types of equipment or exposures. Appendix B discusses workers compensation plans in the US and Canada. Appendix C provides a glossary of abbreviations commonly used in this field, but often not understood.

This book will be an excellent resource for otologists and otolaryngologists who are called upon to provide expert opinions in the medical – legal assessment of hearing loss, but may be ill prepared to do so. The book will also be of use to audiologists, occupational hearing conservationists, occupational physicians, attorneys, industrial hygienists, engineers, safety experts, insurance and risk management professionals, and government agency personnel who are involved in claims for hearing loss.

Dr. Dobie, through his thoughtful insight and extensive knowledge of the medical-legal evaluation process for hearing loss, has added immeasurably to this field.

Editor's Note: Dr. Robert Dobie is currently employed at the Division of Extramural Research at the National Institutes of Health in Bethesda, MD and served on the CAOHC Council from 1990 to 2000. This book may be ordered at www.amazon.com ISBN#0769300529.

OHC Corner

STS: Back to the Basics

By Gayle S. Rink, RN, MS, COHN-S
Representative of the American Association of Occupational Health Nurses

Within just the past two days I received calls from two different employers pursuant to one of their employees being identified as having a Standard Threshold Shift (STS) on a recent audiogram. In both scenarios, the caller fortunately realized that some follow-up was warranted based on two concerns – (1) the employee's well-being and (2) regulatory compliance. However, both callers were unsure as to the appropriate next steps. I shared with them my "easy recall" method of remembering those all-important post-STS next steps - the 3 R's. In doing so, I thought perhaps there might be other Occupational Hearing Conservationists (OHCs) who, like myself, would find this approach useful. Thus, the impetus for this article.

I'd like to begin by reviewing the most basic 3 R's:

Retesting, Refitting, and Retraining.

Later in the article I will add several more "R's" that also contribute significantly to an effective hearing conservation program. One of the most critical characteristics of those responsible for a hearing conservation program is the understanding that the hearing testing portion of the program is neither a "stand-alone" nor "end result" exercise. *Aggregate* audiometric data provide a barometer for evaluating the overall effectiveness of your hearing conservation program. On the other hand, when an STS occurs within an *individual's* audiometric data, it provides a sentinel event that declares the need for a series of activities aimed at protecting and promoting that particular employee's hearing, productivity, and qualify of life – the occupational hearing conservationist's true mission.

Retesting:

Both OSHA [1910.95 (g)(7)(ii)] and MSHA [62.172 (b)(2)] allow for (but do NOT routinely mandate) a retest within 30 days of the identification of an STS on an employee's annual audiogram and also commonly state that the retest results may be considered as the annual audiogram. In many cases, the STS is not confirmed via the retest. This is particularly common when the STS detected in the original audiogram is causally associated with medical etiology. Taking advantage of retesting to rule out a permanent shift in hearing is of benefit in avoiding both unnecessary concern on the part of the employee about the hearing loss being permanent, and needless resource allocation on the part of the employer when the loss is falsely presumed to be due to work-related noise exposure. When a retest does not confirm the STS, it is still good practice for the OHC to follow through per the "Refitting" and "Retraining" sections below. A *temporary* shift in hearing (when not associated with medical etiology) often serves as a predictive indicator of noise sensitivity in an employee and, therefore, can alert the OHC to the particular benefit of providing preventive counseling for the employee demonstrating the temporary shift.

Refitting:

The second "R" refers to the refitting of the employee's HPD - hearing protection device. This would obviously pertain to an employee who has already been wearing hearing protection. This "R" is a post-STS mandate of both OSHA and MSHA and both agencies also stipulate that employees *not* previously using HPDs must now (i.e., post-STS) be provided with appropriate protection. Prior to actually contacting the employee about the refitting, it is often useful to observe the employee using his/her hearing protection on the job. During the observation, the occupational hearing conservationist may identify ways in which the employee is not using his/her HPDs in the most protective manner and, therefore, be better able to counsel the employee about particular practices to be avoided that reduce the HPD's effectiveness. If HPDs with greater attenuation are indicated and appropriate from a job safety perspective, both OSHA and MSHA require their provision; however, in most instances inadequate protection can be directly traced to incorrect and/or inconsistent HPD utilization.

Retraining:

When it comes to an STS having been detected and the need for retraining, both OSHA and MSHA again share a common, clear-cut position – it's required! OSHA specifies the training must focus on the use and care of HPDs, while MSHA requires that all seven components specified in its "Training" paragraph [62.180] be included in the instruction. Certainly, if you - the OHC – determine that the employee (1) does not understand the mechanism and/or characteristics of noise-induced hearing loss, or (2) does not appreciate its impact on his/her productivity and quality of life, it would be important to thoroughly communicate that information in the hopes of motivating the employee to be a more active participant in the work of protecting his/her hearing. I often discuss what I refer to as the "price" of not protecting hearing when I speak to an employee specifically about noise-induced hearing loss being: insidious, irreversible, cumulative, excessive, preventable, regrettable, and costly – both from a monetary perspective (if their productivity is negatively impacted) and from a quality of life perspective (since interpersonal relationships are often negatively affected).

In terms of purely motivational potential, I have found these down-to-earth, real life-impacting issues (as opposed to technical points about the physics of noise or noise attenuation) to be the most effective incentives of long-term behavioral changes on the part of the employee. The employee, like the employer, must realize that the testing component of the hearing conservation program (albeit very important) is NOT in and of itself protective

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STS: Back to Basics *continued from page 3*

– just informational. I try hard to get the employee to also realize that while it is the mission (and hopefully passion) of the OHC and the employer to protect the employee's hearing, ONLY the employee himself or herself can realize that goal through the effective and consistent use of hearing protection (i.e., with ALL noise exposure experiences – both on AND off the job).

Beyond the Basic 3:
As if to conveniently support my easy recall approach, other essentials of post-STS follow-up also seem to fall in place by similarly beginning with the letter "R". These include **Reporting, Referring, Reduction/Reassignment, Recording,** and **Reviewing**. **Reporting** reminds me of the current regulatory need per some state OSHA programs (North Carolina, South Carolina, Tennessee, Michigan, California) to report a 10-dB shift (i.e., an STS) on OSHA's current 200 (or soon to be 300) log. The other states (under federal OSHA) currently require OSHA log reporting of 25-dB shifts. **Reporting** also reminds me of both OSHA's and MSHA's mandates to notify the worker within a prescribed number of days of the STS's detection that a shift in hearing has been documented – *unless* the professional reviewer has determined the STS is not work-related. For OSHA, it's 21 days; for MSHA, it's 10 days. **Referring** for an audiological or otological exam must (per OSHA) occur post-STS if more testing is needed or if the use of HPDs may be a contributing factor to medical pathology of the ear. MSHA similarly requires such exams if an invalid audiogram interferes with obtaining definitive test results. In addition to OSHA and MSHA requirements, the *Otological Referral Criteria for Occupational Hearing Conservation Programs* of the American Academy of Otolaryngology-Head and Neck Surgery provide useful clinical guidelines for referrals that pertain to both baseline and periodic audiograms.[1]

If all **Reduction** efforts (engineering controls) to minimize the noise exposure of the employee with an STS have been exhausted, **Reassignment** to (or rotating the employee in and out of) a work area or job with less noise exposure (an administrative control measure) may constitute an appropriate consideration. Reassignment is a particularly relevant consideration when: (1) an employee has demonstrated repeated shifts, (2) reassignment to a new work area would not significantly impact the employee's job performance, (3) providing HPDs with greater attenuation is not an alternative due to concerns about the employee's ability to hear safety warnings or signals, (4) an employee appears to be uniquely sensitive to noise, and/or (5) reassignment to alternative job (if available) is an acceptable solution to the employee. I reserve the term **Recording** to remind me to document (in the employee's health record) all the post-STS follow-up measures that have been performed – in order to demonstrate regulatory compliance or to provide workers compensation litigation support - if those needs arise.

Finally, **Reviewing** not only refers to MSHA's post-STS requirement [62.174 (c)] to "Review the effectiveness of any engineering and administrative controls to identify and correct any [program] deficiencies", but also reinforces the need to continually review or audit your program's group audiometric data to identify areas in which your hearing conservation program can be enhanced. For example, in an on-going effort to achieve a maximally effective program, scrutinize your data's current rate of PTS (permanent threshold shift) by: (1) comparing the rate to industry standards (ref: draft ANSI Standard S12.13, or AIHA *Noise Manual*[2], (2) comparing the rate to the standard of excellence established in your own hearing conservation policy, (3) comparing the current rate to those in previous years, (4) comparing rates plant to plant, department to department, shift to shift, job to job, work area to work area. The supervising professional's (audiologist's or physician's) role in reviewing all other than normal audiograms is also a very important source of insight into factors contributing to program effectiveness as well as the hearing health of individual employees.

Yes, it is certainly "Back to the Basics: The 3 R's …and then some!" when it comes to the many post-STS follow-up activities of the Occupational Hearing Conservationist. Hopefully, remembering the "R's" will at least save other OHCs (as it does for me) some time by not having to research a list of appropriate activities each time an STS is identified. However, "research" starts with "R" too. Now isn't that convenient!

NOTE: All regulatory references pertain to federal (rather than state) OSHA and MSHA policies unless otherwise indicated.

The 3 R's. . . and then some!

Retesting

Refitting

Retraining

Reporting

Referring

Reduction/Reassignment

Recording

Reviewing

[1] Suter, Alice H. *Hearing Conservation Manual* (3rd ed.) Council for Accreditation in Occupational Hearing Conservation: Milwaukee, WI, 1993. p. 70.

[2] E.H. Berger, L. H. Royster, J. D. Royster, D. P. Driscoll, M. Layne (Eds.). *The Noise Manual* (5th ed.) American Industrial Hygiene Association: Fairfax, VA, 2000. Chapters 12 and 17.

Developing and Implementing an Engineered Noise Control Solution

By Beth A. Cooper, PE INCE. Bd. Cert.
Representative for the Institute of Noise Control Engineering

Part 3 in a series on engineering approaches to reducing noise exposure

The implementation of engineered noise control solutions is a responsibility that is shared by the entire hearing conservation team. The OHC is often the focal point of this effort, bringing the other members of the team together with the affected employees and their management to work with a noise control professional who will develop the detailed technical solution.

In the first article in this series, "Considering an Engineered Noise Control Solution," (Winter 2000/2001 issue of UPDATE), we discussed the role of the OHC in the identification and solution of noise exposure problems. Several checklists were provided to guide the OHC through the process of assessing noise exposure problems prior to involving a noise control professional. The second article, "Selecting an Engineered Noise Control Approach: Controlling Noise at the Source, Path or Receiver," (Summer 2001 issue of UPDATE) described the three basic approaches to controlling noise exposure and provided some typical examples.

This third and final installment will acquaint you with two basic noise control principles: *transmission loss* and *sound absorption.* Some suggestions for do-it-yourself solutions will be discussed, and, finally, resources will be provided to help you identify and engage a noise control professional for projects that require specialized skills.

Noise Control Principles and Materials: transmission loss and sound absorption

There are two basic principles that may be employed, either separately or together, to effect reduction in noise exposure: *transmission loss* and *sound absorption*. A general understanding of these principles, the differences between them, and the applicability of each to specific classes of problems is helpful in developing solutions to noise exposure problems and in understanding the recommendations of a noise control professional. It will also assist the OHC in facilitating discussions among employees, management, and the hearing conservation team as possible solutions are proposed. Misunderstandings regarding the concepts of transmission loss and sound absorption are undoubtedly the cause of many failed or less-than-successful engineered noise control attempts.

The most fundamental principle related to noise control materials is that of *transmission loss*, which may be thought of as "stopping" an unwanted sound from traveling between one space and another. Hazardous noise that exists in a plant area is "stopped" or prevented from entering a plant office or break room by the transmission loss properties of the room's structure. Likewise, noise generated by a machine housed in a sound-attenuating enclosure is "stopped" from entering the adjacent area by the transmission loss properties of the enclosure. As you might expect intuitively, transmission loss is typically provided by massive and continuous materials that completely enclose either the noise source or the receiver, depending on whether the objective of the solution (as discussed in the first article in this series) is to contain the noise inside a machine housing or to protect employees inside a quiet room. In general, as the frequency of the unwanted sound decreases, it takes more mass to "stop" the transmission of noise. Lead, loaded vinyl, concrete block, and drywall are examples of materials used for their transmission loss properties. Materials are rated for their performance using a metric called Sound Transmission Class or STC, expressed in units of decibels. An STC curve is a graph of transmission loss as a function of frequency, where each curve is named for its value at 500 Hz.

Sound absorption is the principle that complements transmission loss in most noise control constructions. Although sound that is contained within an enclosure is "stopped" from entering an adjacent space by the enclosure walls, if the inside surfaces of the enclosure are reflective, sound will reverberate inside the enclosure. This increases the sound level inside the enclosure such that its transmission loss properties may no longer be sufficient. For this reason, the interior surfaces of machinery enclosures are usually lined with absorptive material. These materials absorb incident sound and prevent it from reflecting back into the space but do not stop the absorbed sound from passing through into the adjacent space. Fiberglass, acoustical foam and standard architectural treatments like draperies and fabric office partitions are examples of absorptive materials. In the case of a "quiet" room or office where the unwanted sound is located in the adjacent space (outside the "quiet" room), absorptive material on the inside surfaces of the room is helpful, as in general building construction, for achieving a comfortable working environment with favorable conditions for speech communication. Materials that provide acoustical absorption are rated using an absorption coefficient, which may be interpreted as the percentage of incident energy that is absorbed by the material. Absorption coefficients are listed as dimensionless values of the parameter alpha (α) between 0 and 1 (sometimes slightly higher than 1 due to an artifact of the testing procedure).

Most noise control constructions will employ a combination of transmission loss and absorptive materials. Often, specialized materials or devices are also part of machine or personnel enclosures. For instance, pre-fabricated (acoustically-rated) wall and ceiling panels, doors, windows, ventilation or exhaust silencers and acoustically treated (wrapped) ventilation/exhaust ductwork are typical features of both employee and machine enclosures. Although an enclosure that is constructed for noise control purposes may not look much different than a typical office or room, the design and construction is quite specialized. It is important that construction personnel pay very close attention to the integrity of the structure during the construction process

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Noise Control Solutions *continued from page 5*

so that there are no weak spots, cracks or gaps that allow sound to inadvertently be transmitted between the enclosure and the adjacent space(s). Penetrations for electrical, ventilation and plumbing access should be minimized and properly sealed, and the structure should be vibration-isolated from the adjacent space to prevent noise from being transmitted through the floor or other structural members.

"Do-it-Yourself" Noise Control for the OHC

As an OHC, you are the first line of defense in protecting the acoustical integrity of the noise control enclosures that currently exist in your work environment. For instance, as you respond to employee inquiries about noise exposure, perform noise monitoring and begin to consider and prioritize noise exposure problems, you may be able to identify some problems that may be easily solved by your own personnel using the principles discussed here. Among these opportunities are the following, which may be implemented using materials available at a local hardware store:

- Caulk or re-cement cracks, gaps and leaks in walls, ceilings and floors where noise enters or leaves the space. A good rule of thumb is to look for places where light is visible coming from the opposite side of the wall or where an airflow path is evident. These are likely paths for sound transmission as well.
- Install acoustical seals to close gaps under doors.
- Install perimeter seals around doors.
- Replace abraded door seals.
- Replace lightweight doors in an otherwise intact structure with solid-core or acoustically rated doors.

Resources for Professional Noise Control Engineering Assistance

For the large majority of noise exposure problems for which an engineered solution is desired, the services of a noise control professional are appropriate and recommended. The following organizations are resources you may want to consider when shopping for professional assistance:

Institute of Noise Control Engineering (one of CAOHC's Component Professional Organizations - individual members may become Board Certified by passing an eight-hour exam). Members who are Board Certified and those who provide consulting services are listed on the INCE website: http://ince.org.

National Council of Acoustical Consultants (a trade organization of member firms - these are advertised by their specialties and geographic locations). A directory of firms is published for the use of potential customers on the NCAC website: http://www.ncac.com.

As an OHC, you are a key member of the hearing conservation team. Although you may not *develop* engineered solutions to noise exposure problems, you will no doubt be called on at some point to identify problems, suggest possible solutions, evaluate technical recommendations and possibly even prioritize projects. Your familiarity with the benefits, procedures, approaches and materials involved in engineered noise controls will be invaluable to the members of your team, and it will certainly make the experience more enjoyable. Most importantly, it will help ensure a properly designed solution that is well thought out and therefore effective, practical, maintainable and cost-effective for the employees whose noise exposure it is intended to reduce.

OHC RECERTIFICATION FEE REVISED

Due to increasing costs, the Council voted at their recent meeting in Baltimore to change the recertification fee for OHCs to $50.00. The five-year certification period will remain effective. Recertifying OHCs will receive a certificate and wallet ID card upon receipt of their recertification application, and issues of the UPDATE newsletter throughout the five-year period of their certification. OHCs also receive a 6-month notification card when it is time to recertify. Address changes are made at no charge.

The change to fees will be effective for any course completed on or after January 1, 2002.

COURSE DIRECTOR CERTIFICATION & RECERTIFICATION FEES REVISED

The CAOHC Council voted at their recent meeting in Baltimore to revise the certification and recertification application fees for Course Directors. These new fees, which have not been increased for almost a decade, will help offset increasing costs. These fees are effective January 1, 2002.

An applicant to be a "new" Course Director will now incur a $150.00 application fee and the recertification application fee for currently certified Course Directors will be $100.00. The certification or recertification period for Course Directors will remain at five years.

Example of a specially designed, well-sealed acoustical enclosure.

Going Down Under: A Mining Industry Experience

By Melette Meloy, MS CCC-A
Audiologist and CAOHC Course Director
Sound Solutions
Dallas, GA

Illustration Provided Courtesy E-A-R

I still remember my first conversation with him. "I have a lot of experience with OSHA," I said. He chuckled and replied, "MSHA is not exactly the same thing as OSHA."

"He" is a Safety and Training Manager of a large underground coal mining operation for a company that was to become my debut into hearing conservation for the mining industry, prompted, of course, by MSHA's September, 2000 hearing conservation regulation. I went to him offering CAOHC training, consulting, audiometric exams, and expert witness skills. I was full of confidence, experience, references, and myself. He taught me every bit as much as I taught him. He taught me in so many ways that indeed the mining industry is very different from general manufacturing. I hope in sharing a few of my lessons, that those of you who provide services to, or teach CAOHC courses for the mining industry, will gain some insight to help you on the way.

Lesson #1: MSHA and OSHA are very different entities. Both are indeed federal agencies charged with safety and health compliance. However, MSHA and OSHA have different regulations, policies, procedures, field inspectors, and directors. Anyone working with mining operations should understand completely what the prevailing agency/office is and how they operate. It is also significant to note that even within MSHA there are two divisions, coal and metal/non-metal. There are also differences between surface and underground mining within MSHA. Existing regulations impact each type of operation differently

Another significant difference, of course, is enforcement. It is run from different offices with different requirements for inspections. I found there to be much less of an appeals process with MSHA. Unlike OSHA where there is a chance for penalty reduction in the appeal hearing, most MSHA citations stand as issued. An MSHA reportable illness (the equivalent of an OSHA recordable) cannot be easily "retracted" as in the lining-out procedure on the OSHA log. I remember when I taught the CAOHC class for the above mentioned company and began the section on federal regulations, one safety-supervisor attendee said, "No offense, Ma'am, but my mine was inspected eighty-seven times last month." EIGHTY SEVEN times in a month!!! For sure, I had never before witnessed that in general manufacturing.

These differences between the two entities even extend to the noise regulation itself. MSHA's noise standard includes more stringent guidelines than OSHA's concerning noise controls, timelines for employee notification, and confidentiality of employee records, to mention a few. Recent UPDATE articles that address these differences include: Banach (2000) "Mine Safety and Health Administration Announces New Health Standard," 11(1), p. 2-3, and Berger (2000). "Comparison of U.S. Hearing Conservation Regulations and Recommendations," 11(2), p. 1 and 6-7.

You may obtain additional information regarding MSHA and OSHA, including field updates and interpretations, at www.msha.gov and www.osha.gov.

Lesson #2: Credibility is a must. I was told on my second visit, if I wanted to teach miners, I needed to go underground and witness their operation. A lot of negative misconceptions follow the mining industry and many miners and mine operators are more trusting of someone who is willing to go down under and see what they do first hand, especially if that someone is going to be teaching them how to do something as important as complying with an MSHA regulation. After I spent a day 2200 feet underground, rode a man-bus for 45 minutes, experienced and listened to mine operations exceeding 95 and 100 dBA, wore hearing protectors in total darkness, and talked one-on-one with miners who often do not see daylight for six days running, I understood their point entirely. And it was extremely beneficial to me when I entered the classroom with them.

Lesson #3: Watch out for Workers' Compensation Cases. Many mining operations have not done audiometric testing for anywhere from ten to twenty-five years, often operating without any documentation of pre-existing (baseline) hearing loss. The mines with which I consulted worried the current testing would heighten awareness among employees and call attention to the lack of prior hearing conservation, leading to more claims. And, in fact, before I even returned the test results to the mine, they already had received notice of three hearing loss claims. Within three months they had seventeen cases and it is still rising. A month ago I was invited to the mine for an informal "visit" with their attorney, workers' compensation administrator, safety and training manager, mine-site safety managers, vice-president, and employee liaison. For two hours they asked me every question known to hearing conservation. Most of the things I said in my CAOHC class, specialized MSHA regulation training, preparatory meetings, and reports all came back to haunt me. Every word of the "Employee Notification Letter of Hearing Test Results" was scrutinized and questioned. Interpretations of confidentiality from the MSHA regulation were hashed and re-hashed. And I was limited in suggestions to help them defend themselves since the lack of a Hearing Conservation Program may very well have contributed to employee's hearing loss. The lesson was very clear: Be very knowledgeable about what is coming out of your mouth in a training class and be able to defend it.

I can say without reservation that after sixteen years of service in the hearing conservation business, I found the mining industry to be a new challenge, filled with unknowns, dark alleys, resistance, regulations, frustrations, and trial-and-error. But I also found it filled with diligent and hard-working people possessing a genuine desire to protect the health of their workers. It was interesting, exciting, and challenging. But most of all it was humbling to find that no matter how much you know, you never know it all. And this experience confirms that you actually can teach this old dog new tricks.

CLASSIFIED ADVERTISING/JOB PLACEMENT

Need to sell your used sound booth, or has upgrading your audiometer left you with the old one to sell? Or, are you being relocated to a new city and need a job in hearing conservation? Space is now available in this newsletter for your classified ad or job search. Your ad will be placed in an upcoming issue of the UPDATE. We will accept text only (no logos or graphics). Maximum of 50 words. Fee is $1.00 per word – payment in advance and accepted as Mastercard, Visa, check or money order.

Deadline for submitting classified ads is:		
	January 4, 2002	(Spring 2002 issue)
	May 4, 2002	(Summer 2002 issue)
	September 4, 2002	(Fall 2002 issue)

You may send your ad copy via e-mail to: info@caohc.org

Mail to: CAOHC, Attention: Barbara Lechner, 611 E. Wells Street, Milwaukee, WI 53202

NEW CAOHC BROCHURE - "THE STAMP OF APPROVAL"

A new brochure titled "The Stamp of Approval for Occupational Hearing Conservation" was recently introduced and is being distributed to CAOHC Course Directors for their certification and recertification course attendees. We hope you'll like the more colorful design – but most important is the new message stressing the importance of being certified by CAOHC as an Occupational Hearing Conservationist (COHC). The brochure is meant to help your employer learn about CAOHC certification, too. So, pass it along! Ask your Course Director for a copy or contact Chris Whiting at the CAOHC office: phone 414/276-5338 or e-mail: **info@caohc.org** and we'll send you a copy at no charge.

WORKSHOP SCHEDULED FOR DALLAS 2002

The Spring 2002 Course Director Workshop will be held in Dallas, Texas on Wednesday, February 20, 2002 at the Westin Park Central Hotel in conjunction with the National Hearing Conservation Association's 27th Annual Conference. If you are interested in becoming a Course Director and meet the qualifications described in the Course Director Certification and Recertification Requirements brochure and have your application approved by the Screening Committee, you must then complete a one-day Course Director workshop.

You may contact Barbara Lechner at the CAOHC office at 414/276-5338 for more information, or access the CAOHC web page at **http://www.caohc.org/howtobecertified.html**

Course Directors presently certified who wish to recertify via the workshop method may also attend. The web page for recertification is **http://www.caohc.org/howtoberecertified.html**

Application forms can be forwarded on-line. Remember to mail or fax any required back-up documentation to the CAOHC office.

The Fall 2002 Course Director Workshop will be held in Milwaukee, Wisconsin. The date and location to be determined. More information about this workshop will be available in the next issue of the UPDATE

Employment Opportunity

MEDIVAN, INC. in the Milwaukee, WI area is seeking a CAOHC Certified Technician for its mobile clinic. A clean driver's license, ability to travel overnight and additional training required. Good salary & Fantastic Fringe Benefit Package. Call 414/483-8267 for appointment.

COUNCIL TO MEET

The CAOHC Council will hold their semi-annual meeting prior to the Spring Course Director Workshop on Tuesday, February 19, 2001 in Dallas, Texas at the Westin Park Central Hotel. The Council is comprised of two representatives from each of the Component Professional Organizations assisting CAOHC in meeting its mission (see outside back cover for these representatives and their organizations). The Council meets twice a year to review the status of committee projects, discuss tactics for carrying out future tasks, and to review the fiscal activities of CAOHC.

The next Council meeting will be held in the fall of 2002 in Milwaukee, Wisconsin.

CORRECTION TO 25 MOST ACTIVE COURSE DIRECTORS 2000

Course Director, Pamela J. Gordon, MS CCC-A of Gordon Hearing Conservation, Inc of Danvers, MA was inadvertently left off the 25 most active Course Director list for 2000. Congratulations to Ms.Gordon for her efforts on behalf of hearing conservation.

Issues Relating to Speech Communications in Noise

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audible in noise than in quiet. Understanding the problem is the first step toward a solution. The discussions which follow deal exclusively with normal-hearing individuals. The problem is more complex for individuals suffering from a hearing loss, and solutions may require individual consultation with an audiologist.

Masking

Masking is defined as the increase in the threshold of audibility of one sound (i.e., speech) caused by the presence of another sound (background noise). Masking reduces the intelligibility of speech by preventing the listener from hearing critical acoustic components of the speech signal. The degree to which noise will mask speech depends on the physical characteristics of the noise and speech (levels, spectra, temporal pattern, etc.), the attenuation characteristics of the HPD (if used), and the manner in which sound is processed by the inner ear and brain. Obviously, not all of these factors can be controlled, but it is important to learn how they are related in order to understand how a change in one or more of these factors affects the audibility and intelligibility of speech.

Speech-to-Noise Ratio (S/N), Vocal Effort and the Speech Band

The signed (+/-) difference between the speech level and the background noise level is referred to as the speech-to-noise ratio (S/N) in dB. A positive value of S/N indicates that the speech level is higher than the noise level. The speech level is usually the long-term average level measured in dB. In general, the greater the background noise level relative to the speech level, the more difficult it will be to hear and understand speech. Conversely, if the noise is reduced (e.g., through engineering controls) or the speech level is increased (e.g., through the use of amplification), the speech will be better understood. However, excessive amplification can distort speech. Furthermore, at high sound pressure levels, the cochlea overloads and cannot accurately transduce the acoustic energy reaching it, resulting in the phenomenon known as *cochlear distortion*. This is why it is best to make noise reduction a high priority. Doing so not only helps preserve the workers' hearing, but also improves the audibility of signals, making the workplace safer.

At noise levels between 35 and 110 dB, a S/N of +12 dB is usually adequate to achieve nearly 100% intelligibility (Sanders and McCormick, 1993); however, it is impossible for any individual to sustain the vocal efforts required in the higher noise levels without electronic amplification (i.e., a public address system). Intelligibility decreases as the S/N decreases, reaching 70-75 % at a S/N of 5 dB, 45-50 % at a S/N of 0 dB and 25-30 % at a S/N of -5 dB (Acton, 1970). In low to moderate noise levels, people naturally increase their vocal effort to overcome background noise and communicate with others, as a result of the "Lombard reflex" (Lane and Tranel, 1971). Mean speech levels for male and female speakers in quiet are shown in Table 1. Although extreme efforts can produce levels greater than 90 dB, such levels cannot be maintained for long periods. Since a relatively high positive S/N is necessary for reliable speech communications in the presence of background noise, it should be obvious that in high noise levels (greater than about 75-80 dB), unaided speech cannot be relied upon except for short durations over short distances.

Table 1 Mean speech levels for male and female speakers in quiet at one meter (adapted from Kryter, 1985).

	Speech Level, dB	
Vocal Effort	**Males**	**Females**
Casual	52	50
Normal	58	55
Raised	65	63
Loud	76	71
Shout	89	82

The speech bandwidth extends from 200 to 8000 Hz; however, the region between 600 and 4000 Hz is most critical to intelligibility. Fundamental speech sounds also differ in the vocal effort with which they are produced; consonants are produced with much less intensity than are vowels. Since consonants are far more critical to intelligibility than are vowels, any circumstance that compromises consonant recognition (e.g., noise-induced hearing loss) can have an adverse effect on speech intelligibility, more than if only the vowel sounds are affected.

Message Content, Context, and Structure

Only about 50% of the words spoken in conversational speech are intelligible when presented in isolation from other words. Context supplies invaluable clues to the listener as to what words to expect and to the subject of the conversation. Other factors which affect sentence intelligibility include their syntactic (how words and other sentence elements combine to form grammatically correct sentences) and prosodic (how individuals naturally group words when speaking sentences) structure. In general, intelligibility is higher for complete sentences than for isolated words and higher for whole words than for single letters. This is the reason that the military and police use phonetic alphabets (alpha, bravo, charlie, etc.) instead of individual letter names when communicating information such as call signs or license numbers. Finally, intelligibility is also maximized when the vocabulary of possible words/phrases is restricted and well known to the listener (Miller, Heise, and Lighten, 1951).

Facial Cueing

Speech intelligibility in noise is aided by face-to-face contact between the speaker and listener. At low speech-to-noise ratios, the ability of the listener to view or "read" the lips of the speaker can have a tremendous positive effect on the intelligibility of the speech signal. At low S/N ratios, (e.g., -10 dB; Erber, 1969), intelligibility increases from less than 20% to up to almost 80% simply by allowing the listener to see the speaker's lips. The benefit decreases as S/N increases, becoming negligible at positive S/N.

Acoustic Environment

The acoustic environment (barriers, reverberation, etc.) can also have a detrimental effect on speech intelligibility. Obviously, as the distance between the listener and the speech source (person or loudspeaker) increases, the ability to understand the speech is

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adversely affected if the S/N is not increased to compensate. Similarly, barriers in the source-receiver path create shadow zones in which the S/N is insufficient for adequate intelligibility. Finally, each one-second increase in reverberation time (echo) will result in a loss of approximately 5% in intelligibility (Sanders and McCormick, 1993).

HPD Effects

The effects of HPD use on speech communication and intelligibility are quite complex. In addition to the factors already discussed, speech intelligibility also depends upon whether the speaker, listener, or both wear an HPD.

In general, if the speech level is adequate, HPDs will have no detrimental effect (compared to the unprotected condition) on speech communication in noise levels above about 80 dBA. In fact, in background noise levels greater than about 85 dBA, HPDs can actually improve the wearer's ability to hear and understand speech by reducing cochlear distortion. In background noise levels below about 80 dBA; however, HPD use can reduce intelligibility (Casali and Horylev, 1987). In high noise levels, HPDs generally cause the speaker to decrease his/her voice level since occlusion of the ear causes the perception of the speaker's own voice to be louder relative to the noise, due to the HPD's attenuation of the ambient noise coupled with its enhancement of the bone-conducted transmission of the speaker's own voice. Thus, communication may be particularly difficult when both speaker and listener are wearing HPDs. In quiet, the speaker perceives his/her own voice as being softer than normal due to the attenuation of airborne feedback of his/her own voice, resulting in an increased vocal effort.

Recommendations for Speech Communications Design

Verbal communication will always be problematic as long as excessive noise levels are prevalent. Based on the preceding discussion, however, it is possible to make some recommendations that can help reduce the severity of the problem.

- Whenever possible, decrease the distance between speaker and listener and encourage the use of hand and facial cues, as ancillary aids.
- Encourage employees to speak more forcefully to overcome the tendency to lower the voice while wearing HPDs. However, discourage prolonged increased vocal efforts because it may irritate the vocal tract.
- Encourage feedback from employees regarding workplace speech intelligibility. Such information can identify problems before an accident occurs.
- Select HPDs that are appropriate for the noise environment and do not "overprotect," and stress the positive effects that proper use of HPDs can have on the audibility of speech. Excessive HPD attenuation may reduce the consonant level to one of inaudibility.
- Improve message content by encouraging and implementing consistent sentence construction for standard messages.
- Avoid the verbalization of single letters, and use whole words (phonetic alphabet) or complete sentences whenever possible.

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CAOHC Responds to OSHA Call for Comment!

- In July, 2001, OSHA proposed a 1-year delay in implementing the criteria for recording work-related hearing loss (66 FR 5916, January 19, 2001), and called for comments that were to be postmarked by September 4, 2001.
- CAOHC joined the Coalition to Protect Workers' Hearing in responding to OSHA. The response included answering OSHA's questions, and strongly encouraged OSHA not to delay implementation or to change the final rule, originally slated to go into effect January 1, 2002.
- OSHA's questions and a summary of the Coalition's response follows:
  1. What is the appropriate criterion for recording cases of occupational hearing loss?
     - ➢ It is an age-corrected OSHA standard threshold shift (STS),
     - ➢ which is confirmed as persistent,
     - ➢ and which is determined to be work-related.
  2. What is the variability of audiometric test equipment?
     - ➢ Audiometer calibration errors occur infrequently.
     - ➢ Its influence is reduced by choosing a frequency-averaged shift (such as OSHA STS), and by optional retesting,
     - ➢ is minimized through careful procedural controls such as daily use of a bioacoustic simulator,
     - ➢ and is minimized through proper professional supervision of the audiometric testing program
  3. What is the appropriate benchmark, baseline audiogram or audiometric zero?
     - ➢ The appropriate benchmark is the employee's own baseline audiogram.
  4. Should subsequent losses be treated as new cases?
     - ➢ Subsequent STS after baseline revision is an additional injury and should be recorded.

To access the Coalition's full response, visit the CAOHC web site at www.caohc.org and click on the banner at the top of the page. For a full copy of the current revised regulation visit the OSHA Web site:

http://www.osha-slc.gov/recordkeeping/index.html

UPCOMING OHC CERTIFICATION AND RECERTIFICATION COURSES* 2001 & 2002

*The listed dates indicate day one of the scheduled classes; certification courses are 20 hours in length; recertification classes are 8 hours.

Current as of September 25, 2001: (for a more complete list of courses access www.caohc.org); for the most current list of courses contact the CAOHC office at 414/276-5338.

Begin Date	City	State	Course Director	Phone
10/18/2001	Ft.Lauderdale	FL	Elmore, John	800/357-5759
10/18/2001	Greensboro	NC	Cook, George	336/931-0178
10/18/2001	Waterville	ME	Giroux, Anne	207/872-0320
10/22/2001	Bethesda	MD	Cook, Lynn	Navy
10/22/2001	Jacksonville	FL	Cavalli, Lt.Gina	Navy
10/22/2001	Landstuhl	Germany	Fleener, Rhonda	Army
10/23/2001	Irvine	CA	McCall, Kirsten	425/254-3833
10/23/2001	Seoul	Korea	Leccese, Melissa	Army
10/24/2001	Amherst	NY	Nelson, David Todd	716/874-3375
10/24/2001	Fresno	CA	Deppensmith, Kathryn	713/468-3201
10/24/2001	Irvine	CA	McCall, Kirsten	425/254-3833
10/24/2001	San Juan	PR	Hogan, Donald	787/728-3535
10/25/2001	Honolulu	HI	Sekine, Dennis	Navy
10/25/2001	Walnut Creek	CA	Fankhauser, Charles	707/746-6334
10/29/2001	Waterville	ME	Giroux, Anne	207/872-0320
10/31/2001	Birmingham	AL	Meloy, Melette	678/363-9897
11/1/2001	Detroit	MI	Elmore, John	800/357-5759
11/1/2001	Pontiac	IL	Sidak, Julie	815/844-3892
11/5/2001	Great Lakes	IL	Alexander, Alicia	Navy
11/5/2001	Houston	TX	Meloy, Melette	678/363-9897
11/5/2001	Okiwana	JAPAN	Breshike, Kevin	Navy
11/6/2001	Atlanta	GA	Moore, Gregg	770/933-9236
11/6/2001	Charleston	WV	Harris, Gary	304/766-6555
11/6/2001	Indianapolis	IN	Jerome, Jim	317/841-1065
11/6/2001	N.Kansas City	MO	Ratliff-Hober, Linda	816/221-1401
11/6/2001	St.Louis	MO	Bellamy, McKenna	314/968-4710
11/7/2001	Baltimore	MD	Doyle, Mary	410/955-4088
11/7/2001	Birmingham	AL	Holmes, Georgia	205/934-7178
11/7/2001	Cleveland	OH	Snyderwine, Carol	216/491-6104
11/7/2001	Durham	NC	Stewart, Andy	919/544-7500
11/7/2001	Greenville	SC	Carroll, Tara	864/331-1400
11/7/2001	Houston	TX	Rhodes, Robert	713/869-6664
11/7/2001	Pittsburgh	PA	Swisher, Timothy	412/367-8690
11/13/2001	Clearfield	UT	Juarez, Omar	801/296/8259
11/13/2001	Durham	NC	Stewart, Andy	919/544-7500
11/14/2001	Dallas	TX	Harris, Dean	970/586-0702
11/14/2001	Portland	OR	Fairchild, Michael	503/259-2685
11/15/2001	Pittsburgh	PA	Angelelli, Roger	412/831-0430
11/27/2001	Chapel Hill	NC	Bloyer, Cindy	816/471-3900
11/30/2001	Chicago	IL	Elmore, John	800/357-5759
12/3/2001	Portland	OR	Atack, Rodney	503/614-8465
12/4/2001	Bellevue	WA	McDaniel, Mary	206/706-7352
12/4/2001	Marlboro	MA	Gordon, Pamela	508/481-5819
12/4/2001	New Orleans	LA	Seidemann, Michael	504/443-5670
12/4/2001	Philadelphia	PA	Chiarello, Joseph	610/667-1711
12/4/2001	Seoul	Korea	Leccese, Melissa	Army
12/5/2001	Atlanta	GA	Wolfe, William	770/475-2055
12/5/2001	Birmingham	AL	Holmes, Georgia	205/934-7178
12/5/2001	Chicago/Woodfield	IL	Thunder, Thomas	847/359-1068
12/5/2001	Cincinnati	OH	Swisher, Timothy	412/367-8690
12/5/2001	Durham	NC	Stewart, Andy	919/544-7500
12/5/2001	Greensboro	NC	Cook, George	336/992-0034
12/5/2001	Houston	TX	Elmore, John	800/357-5759
12/5/2001	Knoxville	TN	Meloy, Melette	678/363-9897
12/5/2001	Salinas	CA	McCall, Kirsten	425/254-3833
12/5/2001	San Antonio	TX	Deppensmith, Kathryn	713/869-6664
12/5/2001	W.Palm Beach	FL	Greenberg, Herbert	561/968-3536
12/7/2001	Brooks AFB	TX	Agres, Karen Mjr	Air Force
12/10/2001	New Brunswick	NJ	Kelly, Ellen	732/238-1664
12/11/2001	Kansas City	MO	Bloyer, Cindy	816/471-3900
12/12/2001	Greensboro	NC	Moore, Gregg	770/933-9236 NR
12/12/2001	San Antonio	TX	Elmore, John	800/357-5759
12/17/2001	New Brunswick	NJ	Kelly, Ellen	732/238-1664
1/7/2002	Normal	IL	Pollock, Gail	309/266-9949
1/15/2002	Philadelphia	PA	Robertson, James	215/922/1126
2/5/2002	Seoul	Korea	Leccese, Melissa	US Army
3/11/2002	Ft. Sam Houston	TX	Byrne, Cclyde	210/295-4427
3/18/2002	Portland	OR	Dolan, Thomas	503/725-3264
4/2/2002	Seoul	Korea	Leccese, Melissa	US Army
5/15/2002	Normal	IL	Pollock, Gail	309/266-9949
6/4/2002	Seoul	Korea	Leccese, Melissa	US Army
6/10/2002	Portland	OR	Dolan, Thomas	503/725-3264
7/15/2002	Ft. Sam Houston	TX	Byrne, Cclyde	210/295-4427
8/6/2002	Seoul	Korea	Leccese, Melissa	US Army

For your convenience, you may now update your mailing name, address, company name, phone number, fax number, etc. via CAOHC's website address at www.caohc.org. Click on the button titled "ADDRESS UPDATE". Your mailing changes will be forwarded directly to our office e-mail system. For those of you without internet access, please see page 2 for CAOHC's address, phone, or fax number when forwarding address changes to the CAOHC office.

CAOHC Council Members and Their Represented Organizations

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