The Modern Evolution of Hearing Conservation Regulations

By Theresa Y. Schulz, PhD

It is interesting to study the noise standards that have been promulgated in the US over the last decade or so. These regulations are likely to have long-lasting impact. The Occupational Safety and Health Administration (OSHA) Hearing Conservation Amendment (March 1983) continues to have influence not only in the workplace but in the debate over new regulations. Both the Mine Safety and Health Administration (MSHA) and Federal Railroad Administration (FRA) regulatory preamble documents state the desire to be consistent with OSHA. An examination of Table 1, which compares the major components of the three regulations and the 1998 NIOSH "best practices" criteria, depicts the extent to which that intent is met.

There has been some regulatory activity in the last decade which may give some hope for evolution and updating based on the wealth of science that has occurred during the last quarter of a century since the OSHA regulation was enacted. However there has also been some "back-sliding" toward more lenient standards. The MSHA noise standard made regulatory progress in September 2000 by emphasizing engineering and administrative controls, followed by personal protective equipment, in the hierarchy of noise intervention. MSHA's requirement for technician certification (today only available from CAOHC) strengthened the training requirements for audiometric testing in hearing conservation programs and MSHA also added the requirement of dual hearing protection at 105 dB TWA.

There were many subtle differences between OSHA and MSHA based on comments and a desire to clarify some of the vague aspects of the OSHA noise standard, and meet the needs of the regulated mining industry. One example pertains to the ceiling for exposures. OSHA says, "no exposures >115 dBA," which is interpreted to mean no *unprotected* exposures above that level, giving credit for the assumed effectiveness of hearing conservation programs, hearing protection devices and administrative and engineering controls. MSHA specified that a "P" code[1] violation be issued for any protected or unprotected exposures >115 dBA.

The Federal Railroad Administration (FRA) noise standard for railroad operating employees, which went The Modern Evolution of Hearing Conservation Regulationsinto effect February 26, 2007, was expressly based on the OSHA standard but also uses MSHA for comparison. The preamble states that the FRA defers to OSHA as the "primary regulator of noise in the workplace," but also acknowledges the need for some departure from the OSHA regulation (FRA Preamble II.B). As an example, FRA requires testing at 8000 Hz "because it will allow employers to identify hearing loss sooner." The FRA rejected MSHA's hierarchy of noise controls in favor of requiring specific engineering interventions and focusing on appropriate hearing protection which would still allow communication and audibility, and identification of excessive noise through employee-filed "excessive noise reports."[2] Where OSHA has no specific mandate requiring employees to take advantage of the employer-paid audiogram, it has been traditionally a condition of employment and is generally accepted that OSHA-covered workers require an annual audiogram. MSHA addressed this issue in its preamble; however, they made no significant change. MSHA employers are required to *offer* annual audiograms but MSHA stopped short of requiring employees to comply with annual audiometric testing. The MSHA preamble does allow that mine operators can also make audiometric monitoring a condition of employment. FRA requires employees to

complete audiometric testing and hearing conservation training only every three years, but requires that training be *offered* at least once a year.

The FRA loosened some OSHA requirements as well:

- Audiometric retest can occur within 90 days of the periodic test vs. OSHA's 30 day requirement;
- Employees must be notified within 30 days about changes in their hearing vs. OSHA's 21 days;
- Exposures up to 120 dB(A) are allowed for up to 5 seconds, citing the safety issue of needing horn blasts to warn the public of oncoming trains.

The FRA states that audiologists or physicians are responsible for the audiometric testing in a hearing conservation programs and qualifies that the physician must have "experience and expertise in hearing and hearing loss."

There appears to be a general reluctance to deviate too far from the OSHA regulation however. As an example, FRA wrote to OSHA asking of any plans to move from a 5-dB to a 3-dB exchange rate. OSHA replied that there were no such plans and FRA has stayed with 5 dB despite recommendations from experts in the field to the contrary.

Discussion

One would hope that employers would want to use "best practices" rather than being minimally compliant but the realities of the workplace reveal the unfortunate focus on minimal compliance. The preamble documents for these regulations are rich with information. One would also hope that with the evolution of hearing conservation regulations each would "build" on its predecessors. In some aspects that has occurred but in others, the new regulations "tear down" the gains made by previous regulations. Table 1 is set up with the regulations in chronological order and the NIOSH Criteria Document to the right. See if you think there is "progress" or "regress" as you move from left to right.

Theresa Y. Schulz, PhD is a Team Leader at the NIOSH Pittsburgh Research Laboratory, Hearing Loss Prevention Branch, the President of the National Hearing Conservation Association (NHCA) and a former Chair of CAOHC. She can be contacted at TSchulz@cdc.gov.

1 A "P" Code is an administrative device to document (in an MSHA database) when overexposure conditions remain despite the implementation of all feasible engineering and administrative controls to reduce the miner's noise exposure to or below the Permissible Exposure Limit (PEL). The term "P" Code derives from the requirement to wear protective equipment (e.g. HPDs).

2 The term ''Excessive Noise Report,'' refers to a report filed by a locomotive cab occupant that indicates that the locomotive is producing an unusual level of noise such that the noise significantly interferes with normal cab communications or that the noise raises a concern with respect to hearing conservation. The employee is required to report such excessive noise and the training requirements include how and when to make an excessive noise report. The railroad is required to respond to each report.

ISSUE	29 CFR 1910.95 OSHA. Occupational Noise Exposure; Hearing Conservation Amendment; Final Rule, effective 8 March 1983	30 CFR Part 62 MSHA, Published on 13 September 1999, effective 13 September 2000	49 CFR 227 and 229, FRA Final Rule on Occupational Noise Exposures for Railroad Operating Employees, effective 26 February, 2007	Pub. No. 98-126. NIOSH Criteria Document. The Document is a recommendation, " Best Practice Guide, and not a compliance document
Exposure Limit	PEL=90 dBA TWA	Similar to OSHA, except integration range explicit in regulation (62.101), and is for all sounds from 90 to *at least* 140 dBA	Same as OSHA	Recommended Exposure Limit (REL) = 85 dBA TWA. REL is exceeded when TWA ≥ 85 dBA, integrating all sounds from 80 - 140 dBA
Action Level	85 dBA TWA	Similar to OSHA, except integration is for all sounds 80 to *at least* 130 dBA	Same as OSHA	Does not have Action level, but REL is 85 dBA TWA for HL prevention, noise controls and HPDs
Exchange Rate	5 dB	Same as OSHA	Same as OSHA	3 dB
Impulse/Impact	Should *not* exceed 140 dB peak SPL; to be integrated with measurements of all other noises	Integrate with measurements of all other noise	Same as OSHA	To be integrated with measurement of all other noise, but *not to exceed* 140 dBA
Ceiling	No exposures > 115 dBA, interpreted as no *unprotected* exposures, give credit for HCP, HPDs and engineering controls	No exposures > 115 dBA, no adjustment for use of hearing protection. "P" code issued where the miner is still over-exposed even though feasible engineering and administrative controls are in place	No exposures >115 dBA, except continuous >115 dBA and ≤ 120 dBA are permissible, provided total daily exposure ≤ 5 seconds	No protected or unprotected exposure to continuous, varying, intermittent or impulse noise > 140 dBA
Monitoring noise exposure	Once to determine risk, HCP inclusion, then as conditions change resulting in more potential exposure	Mine operator must establish system to evaluate each miner's exposure sufficiently to determine continuing compliance with rule	Same as OSHA; Measurement artifacts may be removed	Every 2 years if any exposure ≥ 85 dBA TWA
Noise control	Feasible engineering controls required where TWA > 90 dBA, compliance policy (OSHA can change/revoke any time) permits proven HCP in lieu of engineering where TWA < 100 dBA	Feasible engineering and administrative controls required for TWA > 90 dBA; even if controls do not reduce exposure to PEL, they are required if feasible (i.e.≥ 3-dBA reduction). Administrative controls must be provided to miner in writing and posted	FRA describes the specific actions that railroads and manufacturers must take when designing, building, and maintaining locomotives (instead of engineering controls); "noise operational controls" (administrative controls); hearing protection (same); "FRA has no hierarchy of noise controls"	Feasible controls to 85 dBA TWA
Administrative controls/Noise operational controls	Feasible administrative controls required where TWA > 90 dBA	Administrative controls must be provided to miner in writing and posted	FRA does not require the use of noise operational controls but makes them optional.	Administrative controls must not expose more workers to noise
HPDs	Optional for ≥ 85 dBA TWA, mandatory for > 90 dBA TWA, ≥ 85 dBA TWA for workers with STS	Same as OSHA , but amount of protection *not specified.* Dual protection (muff plus plug) required at exposures >105 dBA TWA	Same as OSHA, but shall consider an employee's ability to understand and respond to communications and audible warnings	Mandatory for ≥ 85 dBA TWA. Must protect to 85. Dual protection recommended at exposures > 100 dBA TWA

Table 1: Comparison of Noise Exposure Regulations

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HPD Variety	Offer variety, at least 1 type plug and 1 type muff	Choices must include 2 plugs and 2 muffs.	Variety of suitable HPD with a range of attenuation levels	Offer variety
HPD Attenuation	Protect to 90 dBA or to 85 dBA after STS. 50% derating when comparing relative effectiveness of HPDs and engineering controls	No method included in standard. Compliance guide will follow with suggested procedures.	Always use NRR with 7-dB correction and dBA, and either derate by type (muffs 20%, formable plugs 40%, other plugs 60%), or use ANSI S12.6 Method B data, or make objective measures.	Protect to 85 dBA TWA; derate muffs 25%, slow-recovery plugs 50%; other plugs 70%
Background noise levels for audiometry	40 dB @ 500 and 1000, 47 dB @ 2000, 57 dB @ 4000 and 62 dB @ 8000 Hz	According to scientifically validated procedures	Same as OSHA for supra-aural earphones; for insert earphones: 50 dB @ 500, 47 dB @ 1000, 49 dB @ 2000, 50 dB @ 4000 and 56 dB @ 8000 Hz	Per ANSI S3.1-1999 or latest revision; 19-dB more stringent than OSHA at 500 Hz and 13 to 25 dB more stringent at other frequencies
Audiometry	Required test frequencies: 500, 1000, 2000, 3000, 4000 and 6000 Hz	Same as OSHA	Required test frequencies: 500, 1000, 2000, 3000, 4000 , 6000 and 8000 Hz	Same as OSHA, but recommends 8000 Hz as option
Use of Insert Earphones	de minimis violation unless testing completed with both types of headphones per 1993 "OSHA Standard Interpretation"	Same as OSHA	Allowed under Appendix E provisions; Requires double testing if transitioning from supra-aural (See OSHA 1993 Standard Interpretation)	Not indicated
Audiometry - Baseline	Audiometry required annually for workers exposed to ≥ 85 dBA TWA. Baseline within 6 months of exposure, 12 months if use mobile testing, with HPD use in the interim. QUIET PERIOD prior to baseline is 14 hours with HPD use acceptable as alternative	Annual audiometry (same as OSHA), but choice of whether or not to take audiogram is at the miner's discretion. Quiet period same as OSHA	Audiometry required every 3 years for workers exposed to ≥ 85 dBA TWA. Baseline within 6 months of exposure, 12 months if use mobile testing, with HPD use in the interim. QUIET PERIOD prior to baseline is 14 hours with HPD use acceptable as alternative; Professional Supervisor to determine validity of existing baselines	Required for all workers exposed ≥ 85 dBA TWA. Baseline test pre-placement or within 30 days of exposure
Audiometry - Periodic	Annually, if exposed to ≥ 85 dBA	Same as OSHA	Audiometry must be offered annually, required at least once every 1095 days (3 years)	Required for all workers exposed ≥ 85 dBA TWA. Best practice is to test workers exposed > 100 dBA TWA twice per year
Audiometry - Other	May obtain a follow-up audiogram retest within 30 days and substitute for annual audiogram for STS re-tests	May obtain follow-up audiogram retest within 30 days and substitute for annual audiogram for STS re-tests	May obtain a follow-up audiogram retest within 90 days and substitute for annual audiogram for STS re-tests	If STS, must provide confirmation audiogram within 30 days
Audiogram review/supervisor; Professional Supervisor	Licensed or certified audiologist, otolaryngologist, or other physician	Licensed or certified audiologist or physician	Audiologist, otolaryngologist, or other physician who has experience and expertise in hearing and hearing loss	Audiologist or physician
STS (Standard Threshold Shift)	≥ 10-dB average shift from baseline testing hearing levels at 2000, 3000 and 4000 in either ear	Same as OSHA	Same as OSHA	Significant threshold shift (NIOSH) is a hearing loss that is ≥ 15-dB worse than baseline at any test frequency, in either ear, confirmed with follow-up test for same ear or frequency

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STS Follow-up Criteria	Notify worker within 21 days (unless not work-related). Fit or re-fit HPDs and select higher attenuation if necessary, refer for further testing if problem due to HPDs, inform employee of need for exam if a problem unrelated to HPD use is suspected	Within 30 days of receiving evidence or confirmation of STS, unless not work-related, must retrain the miner and provide an HPD or different HPD. Review effectiveness of any engineering or administrative controls to correct deficiencies	Notify worker within 30 days (unless not work-related). Fit or re-fit HPDs and select higher attenuation if necessary, refer for further testing if problem due to HPDs, inform employee of need for exam if a problem unrelated to HPD use is suspected	Notify worker within 30 days. Must take action such as explain effects of noise, re-instruct and re-fit with HPDs, provide additional training in hearing loss prevention, or reassign to quieter area
OHC Qualification	Responsible to audiologist, otolarnyngologist or physician. Certified through CAOHC, or demonstrates competence. If microprocessor used, certification not required	Must be under direction of supervisor. Must be certified by CAOHC or equivalent certification organization	Responsible to Professional Supervisor. CAOHC certification or equivalent certification or has demonstrated competence.	Must be under direction of audiologist or physician. Must be certified by CAOHC or equivalent certification organization
Employee Notification	Not specified, unless STS is detected, then follow STS criteria	Audiograms must be reviewed within 30 days and feedback provided in writing to each miner within 10 days thereafter	Required for noise monitoring results (all monitored employees), ID of STS	Not specified unless STS is detected, then follow NIOSH STS follow-up
Baseline Revision	Annual audiogram substituted for baseline, when STS is *persistent* , or thresholds show significant improvement	Annual audiogram substituted for baseline when STS is permanent, or thresholds show significant improvement	Determined by Professional Supervisor. Method: NHCA Guidelines are Appendix C	Annual audiogram substituted for baseline when the confirming audiogram validates an STS
Presbycusis or Age-correction	Is allowed	Is allowed	Is allowed	Not allowed
Work-Relatedness	CFR 1904.10 "physician or other licensed healthcare professional"	Same as OSHA	Physician or audiologist determines work-relatedness	Not indicated
Recordable or Reportable Hearing Loss	CFR 1904.10-Work related STS (≥ 10-dB shift at 2000, 3000 and 4000 Hz, in either ear), if shift plus baseline threshold levels total ≥ 25 dB above audiometric zero. Age adjustment allowed for STS, but not to determine if average levels ≥ 25 dB	≥ 25-dB avg shift from baseline, or revised baseline at 2000, 3000, and 4000 Hz in either ear	Same as OSHA	Not indicated
Recordkeeping and Retention	Two years for noise surveys, duration of employment for audiograms, with requirement to transfer records to successor if business closes	Employee noise exposure notices and training records for duration of enrollment in HCP + 6 months. Audiograms for duration of employment + 6 mos with requirement to transfer records to successor mine operator	Same as OSHA; training records for 3 years; electronic records allowed	Noise surveys for 30 years, audiograms for duration of employment + 30 years, calibration records for 5 years, and record transfer per 29 CFR 1910.20 (h)

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Training and Education	Annual for all employees exposed ≥ 85 dB TWA; include effects of noise, HPDs, purpose and explanation of audiometry	Same as OSHA, except must begin within 30 days of enrollment in HCP and include description of mine operator and miner's responsibilities for maintaining noise controls	Training must be offered annually, required at least once every 1095 days (3 years); includes same topics as OSHA plus: explanation of noise operational controls, noise range and appropriate HPDs, noise monitoring information, access to records, criteria for excessive noise report and how to file such reports	Same as OSHA, but must also include psychological effects of noise and roles/responsibilities of both employers and workers in program
Program evaluation	Continuing, effective HCP	Not indicated	Same as OSHA	Required annually by comparing rates of STS for exposed and non-exposed workers
Postings	Hearing Conservation amendment will be posted in workplace	No requirement for posting, but when *admin controls* are utilized the procedures must be posted	Post understandable noise monitoring results at crew origination point for a least 30 days.	Signs must be posted at entrance to areas with TWAs routinely ≥ 85 dBA
Requirements for new locomotives	Not applicable	Not applicable	New locomotives required to meet static testing requirements	Not discussed
Maintenance requirements for existing locomotives	Not applicable	Not applicable	Protection of sound-insulating properties in existing locomotives, repair of certain noise sources as identified by crews	Not discussed