An introduction to OR-OSHA's rule for controlling noise in the workplace

HEARING CONSERVATION PROGRAM

INSTRUCTOR GUIDE

OR-OSHA 217
0104

DEPARTMENT OF CONSUMER & BUSINESS SERVICES

Presented by
The Public Education Section
Oregon Occupational
Safety and Health Division
(OR-OSHA)

OREGON OSHA

OR-OSHA Mission Statement

To advance and improve workplace safety and health for all workers in Oregon.

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Oregon OSHA offers a variety of safety and health services to employers and employees:

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Offers no-cost, confidential on-site safety, health, and ergonomic assistance to Oregon employers for help in recognizing and correcting safety and health problems in their workplaces.

Our consultants can also introduce you to the Safety & Health Achievement Recognition Program (SHARP) and Oregon's Voluntary Protection Program (VPP).

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Welcome

Welcome to the Hearing Conservation workshop. This workshop is designed to include you in the learning experience. The more you contribute, the more you will get out of this training, so please don't hold back...participate and have fun!

Purpose

OR-OSHA requires that an employer monitor noise in a workplace and that appropriate hearing protection be furnished to the employee when required under the rule.

The purpose of this workshop is to give you the basic knowledge needed to understand why hearing conservation is an important part of the safety and health equation.

Objectives:

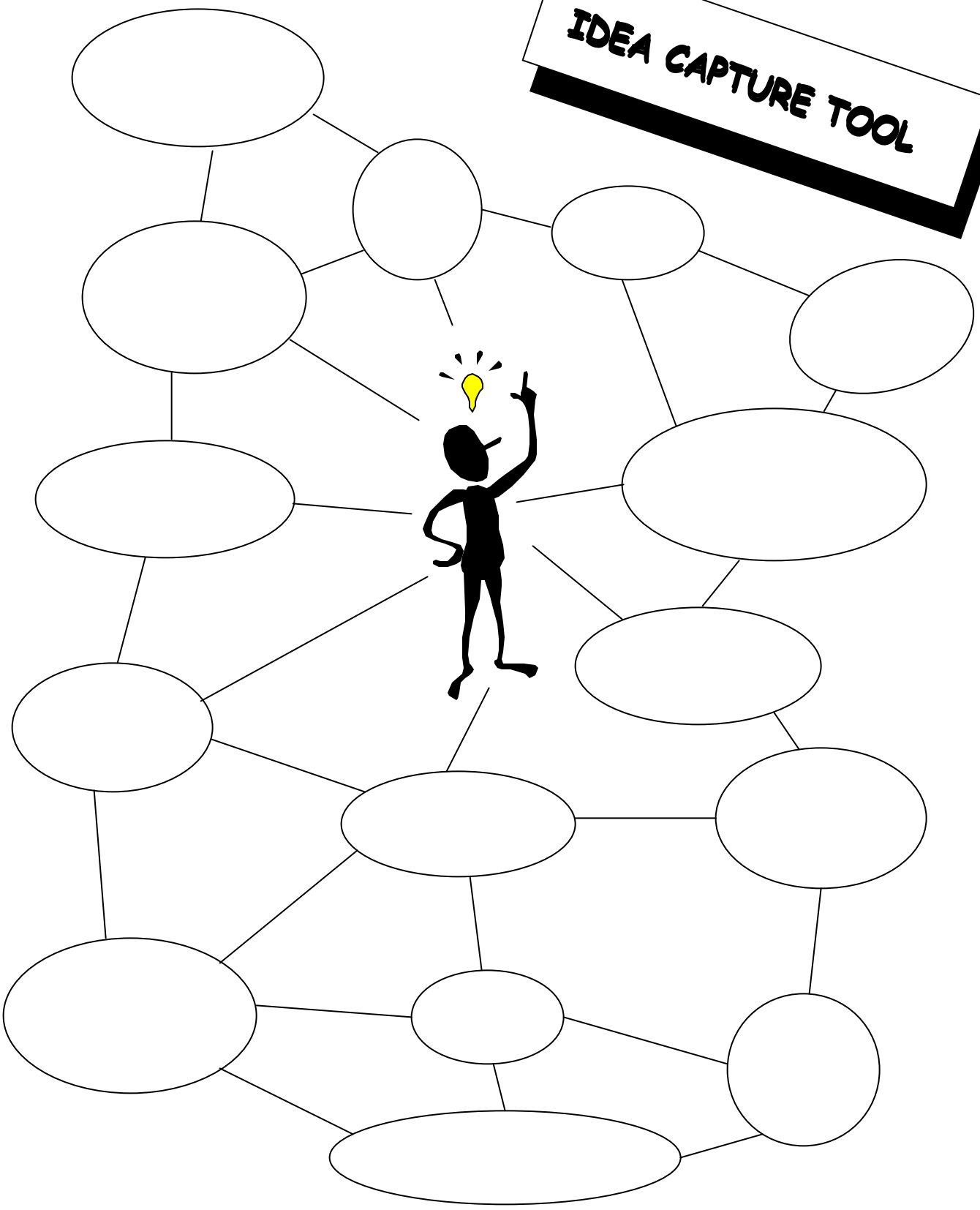
By the end of this presentation, participants should be able to…

1. Explain how sound is created
2. Describe how the ear receives and interprets sound
3. Name two ways sound is measured
4. Describe at least two indicators of excessive noise in a workplace
5. Name the part of the ear damaged by excessive noise and the medical test used to document that damage

6 Identify five key elements of a hearing conservation program

Please Note: This material or any other material used to inform employers of compliance requirements of Oregon OSHA standards through simplification of the regulations should not considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA.

IDEA CAPTURE TOOL



Part One: A Sound Review

- So, What's the Problem?
- How is Sound Created?
- How do We Hear Sound?
- Measuring the Sound We Hear
- How Much is Too Much?

So, What's the Problem?

In a word, ***NOISE***...too much of it! As our world has become more mechanized, the problem of noise pollution also has increased. Noise bombards us around the clock, at work, home and play.

What is Noise?

The terms ***Noise*** and ***Sound*** often are used interchangeably. One person's music can be another's racket. So let's see if we can agree on a working definition for today's discussion:

Sound can be ___wanted___, or___unwanted___.

In terms of occupational health, *noise* can be defined as any sound that is intense enough to...

___damage___ hearing.

Noise is a BIG Problem!

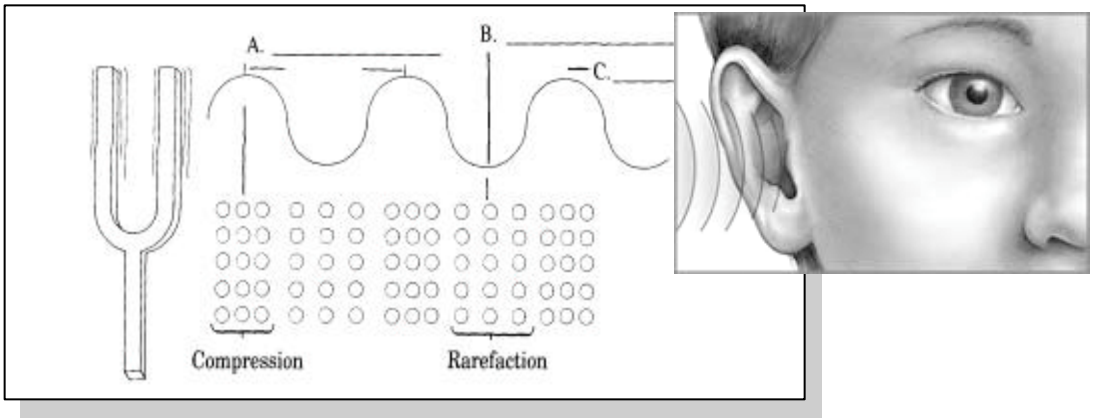
Noise, or unwanted sound, is one of the most pervasive occupational health problems. Occupational hearing loss is the **number one cause** of nonfatal health problems in the U.S. Over 28 million people are affected with partial or total hearing loss.

It's a sneaky villain, too. Each over-exposure to noise sources such as heavy equipment, air compressors, powder-actuated fasteners, radial saws, etc., can damage some of the thousands of delicate nerve cells in your ears. Although the cells will try to repair themselves, repeated damage will eventually destroy them.

This destruction is so gradual it usually goes unnoticed, but the hearing loss is permanent.

How is Sound Created?

A vibrating body pushes on _____molecules_____ , creating a series of pressure waves that radiate out from the source of the vibration.



A sound wave is a series of these compressions and rarefactions traveling through a substance. The individual molecules do not travel; rather, they vibrate rhythmically back and forth.

KEY POINT

Any Vibrating Object + Any Transmitting Medium = Sound Wave

How Do We Hear Sound?

It's as simple as 1, 2, 3...

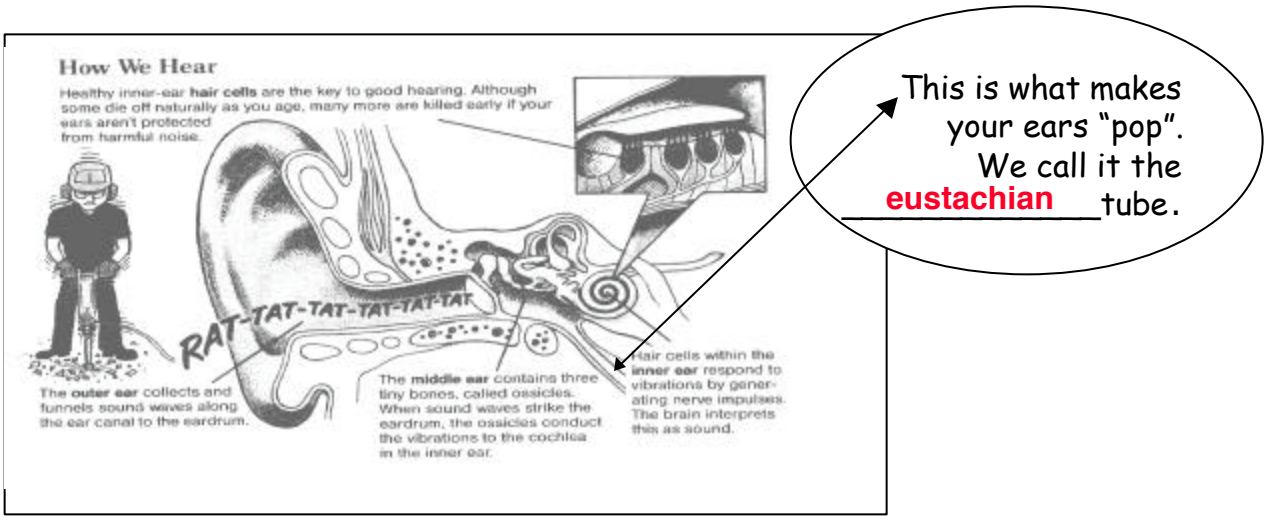
1) Your ***outer ear*** collects sound waves and channels them down the ear canal to a thin, tight piece of skin called the:

Tympanic membrane (ear drum)

2) The eardrum vibrates in response to these pressure waves and pushes on the small bones of your **middle ear.** These bones act like a set of levers, transferring their mechanical motion to a fluid-filled structure in the ***inner ear,*** called the:

cochlea.

3) In the cochlea, cells with tiny sensing hairs transform the fluid movement into electrical signals. These signals travel along the auditory nerve to your brain. Once in the brain, the nerve signals are decoded and processed into what we recognize as sound.



Now, for a few extra details about…

The Cochlea - It's the main organ of hearing, found in the fluid-filled inner ear. It's a snail-shaped tube that's very complex. It contains the **Organ of Conti**, a ribbon-like structure that contains sensory cells with hairs projecting from them.

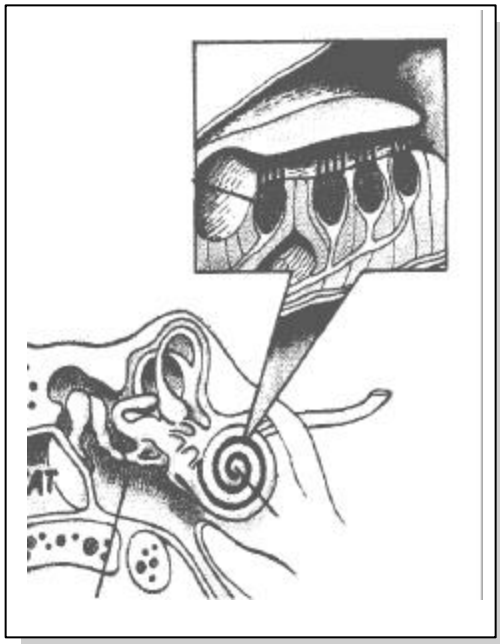
When the stirrup vibrates and bangs against the oval window, the fluid in the cochlea vibrates, and the organ of Conti shakes.

There are over **40,000** hair cells in the organ of Conti, and each of these cells has 50-100 hairs sticking out of it. The hair cells' movement stimulates the nerve cells, which in turn sends electrical impulses to the brain.

PICTURE THIS:

You take a shortcut across a luxuriant green lawn with tall, healthy blades of grass reaching proudly toward the sky. Where you have walked, the blades are trampled, bent over, bruised and damaged. You can see the outline of each of your steps in the thick carpet of grass.

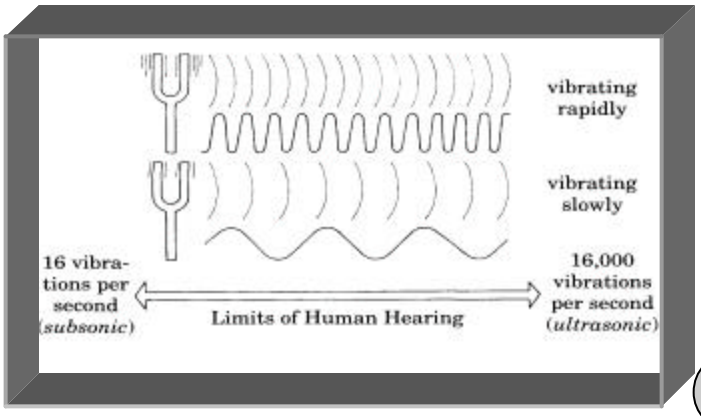
Tomorrow, you decide to take the same shortcut. As you look, there is no sign you passed this way yesterday. This time, however, some of your co-workers see you and decide to do the same thing. Soon, many people begin taking this route, not just once a day but throughout the day as well. Before long, bicyclists are using the path. Eventually, the blades of grass have no time to repair themselves between uses. Gradually, some of the blades break off, and then more as time progresses. Eventually, where once there was a beautiful lawn, there now is a dirt trail with only a blade or two of grass here and there..



How is Sound Measured?

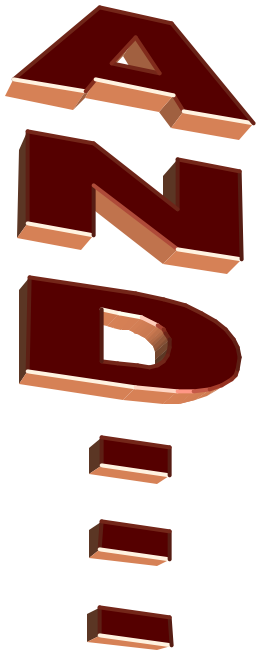
Once it's been created, a sound has **two** fundamental characteristics:

1) **Frequency (pitch)**



A vibrating object pushes waves of air molecules away from itself each time it moves, which in most cases is many times or **cycles** every second. You might say it pushes the air **frequently**. Since some objects vibrate more frequently than others we tend to classify them according to their...

Frequency!



2) **Loudness**

hint, hint...

hint, hint...

Measuring Sound… Three Ways / Two Tools

We measure sound in three different ways:

(1) Frequency, or pitch, is measured as sound vibrations per second or ___cycles_____.

(2) Intensity, or loudness, is measured in ___deciBels___.

(3) Duration, or how long the exposure lasts, is measured in good old familiar ___Hours and minutes___

How Do You Know How Much Noise you're Exposed To?

There are ***two measuring devices*** used to test amounts of sound in any given situation:

1. Sound Level Meter

- Provides a snapshot
- Provides immediate results
- Measures the noise levels in the immediate area
- Measures loudness in decibels

2. Dosimeter

- Worn by the individual during the day
- Measures the sound near the entrance to the ear
- Measures the amount of noise encountered continuously as the individual goes about the day's work

Measuring Sound (continued)...

Measurement Scales The OSHA Rule uses language that says…"equal or exceed…85 decibels ***measured on the A scale*** (slow response)". So what's that all about?

Various measurement scales treat intensity and frequency differently according to the purpose they are intended to serve. There are three scales it helps to know about:

(1) dBC or linear scale
(2) Octave band,or narrow band scale
(3) dBA scale

The C scale takes the energy from all frequencies in the sound and treats it all equally.

The octave band reports only the energy from a single frequency.

The A scale treats each frequency differently, imposing a very high reference level on some low frequencies and a very low reference level on others. As a result, low frequencies are not given as much weight in a dBA measure.

We use the dBA scale because it most closely mimics the scale of human hearing and because damage is more likely to occur in the higher frequency ranges.

"Slow Response": This is a damper on the meter needle so that readings are averaged out when the sound levels are uneven.

How much is Too Much?

Once sound levels are determined, the figures must be adjusted to arrive at a ***Time-Weighted Average (TWA)**** exposure.

The amount of sound you receive each day depends on three factors:

1. ____Loudness____ measured in dBA's;
2. **Length (duration)** of exposure;
3. ____Distribution____ of exposure (the range of noise levels and frequencies);

Prolonged exposure to sound levels greater than

___85___decibels

will result in hearing loss.

You don't "get used to" noise...

Noise does not have to be uncomfortably loud to be damaging.

You may even think your ears are "used to" the noise, but what has probably happened is that hearing loss has already begun.

* **Time-weighted average (TWA)** sound level defined:
That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

Taking Action for Hearing Health

Why It's important To Act NOW...

Because every day you are exposed to noise, whether it's work-related or a part of your home and recreational environment, some damage is done to your ear's hair cells. It may be gradual, ***painless***, and invisible, but.....

the damage is very real, it is ***progressive***, and it is ***permanent***.

Remember the 4 P's!

Damage to Your Hearing is:

- painless
- progressive
- permanent
- preventible

Bonus Points for the fifth P..... personal

Action Steps You Can Take Now

- Wear hearing protection for hobbies, sports, hunting, etc.
- Voluntarily wear hearing protection at work.
- Learn proper nose-blowing technique.
- Seek medical attention if a cold becomes chronic.
- Control Walkman levels.

Part Two: Controlling Workplace Noise

- *Five components of a hearing conservation program*
- *What you should know about exposure monitoring*
- *What you should know about audiometric testing*
- *Using engineering controls*
- *Using administrative controls*
- *Using Hearing Protection Devices (HPD'S)*
- *What you should know about education and training*
- *Recordkeeping*

Five components of a Hearing Conservation Program

(1) Monitor noise levels
(2) Perform audiometric testing
(3) Select appropriate Hearing Protection Devices (HPD's)
(4) Educate and train affected employees
(5) Do the Recordkeeping

Let's talk specifics…

Requirement for Establishing a Hearing Conservation Program:

1. Monitor noise levels

Whenever an employer determines that workers are exposed to average noise levels of **85 dB or greater** during an **8 hour workday.** This numerical value is referred to as the: **Action level**.

Monitoring :

Monitoring isn't necessarily *required* under the OSHA rule; only when exposures are at or above _____..

So how can an employer decide whether or not a problem may exist?

QUICK TEST:

Do you have to shout to talk to someone 2-3 feet away?

Other indicators that noise levels could be excessive and that monitoring probably should occur:

- Employee complaints about the loudness of the noise;
- Indications that some employees are losing their hearing;
- Noisy conditions that make normal conversation difficult.

1. Monitoring (continued)

Your monitoring goals should be:

- To identify employees who should be included in the hearing conservation program;
- To enable the proper selection of hearing protection.

Requirements for monitoring include the following:

- Representative personal sampling may be necessary if there is high worker mobility or significant variations in the sound level throughout the work shift.
- Repeat monitoring must be performed whenever there is a change that increases exposure levels.
- Employees exposed at or above action levels must be notified of monitoring results.
- Affected employees or their representatives may observe the monitoring process.

Three Types of Noise that Monitoring must Address:

1.

2.

3.

2. Test Employee Hearing

In Oregon, audiometric testing may be performed by any of these three individuals:

1. Physician
2. Audiologist
3. A technician certified by the Council on Accreditation in Occupational Hearing Conservation.

For audiometric testing to be most effective, an employee should have a pre-employment or pre-placement audiogram to act as a baseline to which future audiograms will be compared.

The OSHA rule requires that this baseline audiogram be administered within 6 months of an employee's first exposure at or above the action level.

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise.

T/F It's okay to use hearing protectors at the work site to achieve the 14 hours requirement, provided they give a sufficient level of protection.

2. Testing (continued):

Once the baseline audiogram is done, a new audiogram is required at least how often? annually

...for every employee who meets what requirement?

Exposed at or above the Action level (85dB)

In comparing the baseline with annual audiogram results, the technician is looking for any evidence of a.....

Standard Threshold Shift

Standard Threshold Shift

STS is defined as a change in the hearing threshold relative to the baseline audiogram of an average of 10dB or more at 2,000, 3,000 and 4,000 Hz.

If the reviewer finds an STS exists, the employee must be informed in writing within what time period? 21 days .

Managing Noise Exposure: Three Methods...

A. Engineering Controls

a) Generally preferred as a first choice. However, these are a challenge in that there are seldom ready-to-order solutions. They must be tailored to the situation.

b) In many instances it is difficult to achieve even 10dB of noise reduction in a retrofit noise control application.

c) Many such controls require maintenance and periodic adjustment or replacement to remain effective.

d) Works best when coupled with carefully selected **H**earing **P**rotection **D**evices **(HPD's)** and adequate emphasis on training, motivation, supervision and enforcement.

B. Administrative Controls

a) Job Rotation

b) Selective operation of equipment only when needed in the production process

c) Ensuring employees maintain the equipment in good running order

C. Personal Protective Equipment (HPD's)

3. Selecting appropriate Hearing Protection Devices (HPD's)

Employers are required to provide hearing protectors to all employees who meet what requirement? **Exposed at or above action level** *

Hearing Protector Attenuation *

An employer must evaluate a selected hearing protection device for its ability to **attenuate** or reduce the amount of noise that actually reaches the eardrum. The employee must be provided with whatever combination of protection is required to achieve the following levels:

a) Attenuation to an exposure level of **90dB** or less over an 8-hour TWA.

b) For employees with an STS, exposure must be attenuated to an 8-hour TWA of **85dB** or less.

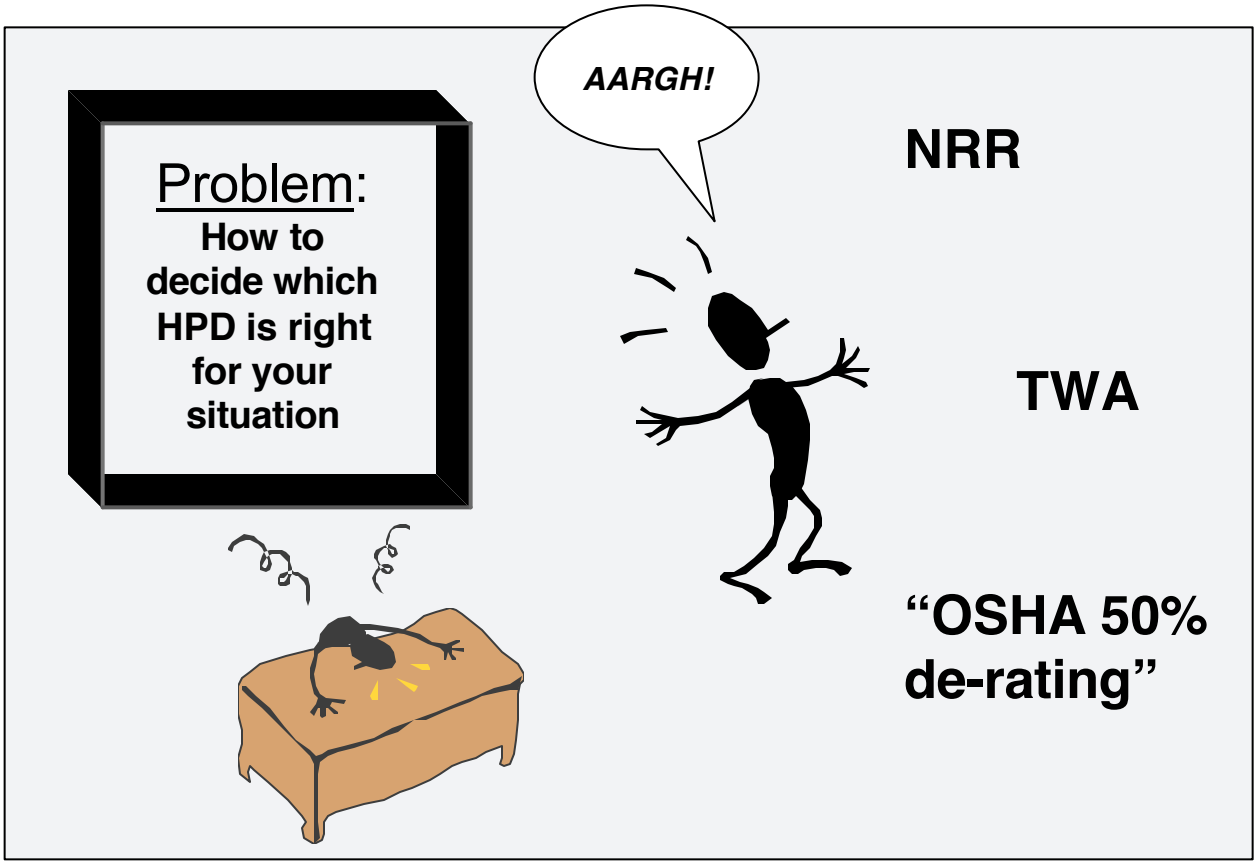
Key Point: Remember that the ear is the only organ that has **no defense mechanism.** It's basically a straight shot from outside the ear to the eardrum and into the middle and inner ear. Whereas your eyelid can blink and protect the eye, your ear has to sit there and take the full force of a sound wave. That's why **you** are so essential to your ears' health!

* For additional information, refer to Appendix B, page G-33 of the Code.

Determining the adequacy of HPD attenuation

First, some points to consider:

- It's estimated that 97% of industries have TWA's below 100dB. Therefore, if one selects an HPD with 10dB of ***actual*** noise attenuation, the odds of being in compliance are 90%+.
- The average **Noise Reduction Rating (NRR)** for HPD's sold in North America today is over 22dB.
- It's vital that the employer consider factors such as comfort, compatibility, wearability, and employee satisfaction, in addition to the selected HPD's advertised level of protection.



Determining the adequacy of HPD attenuation continued)...

Target:
Your goal is to reduce the effective exposure of a worker to a value equal to or less than the OSHA standard of

90dBA

Piece of cake!! Let's walk through it.

STEP ONE: Determine how many decibels you are over the limit in your workplace.

Example: ***YourWorkplaceValue*** **= 105dB,**
so for this example…… ***105dB minus 90dB*** **= *15* dB**

STEP TWO: Determine whether your workplace decibel measurements are made using the A scale (dB***A***) or the C scale (dB***C***) **= A (or C) scale**

Some thoughts on selection of "correct" HPD

- A wide variety of plugs, caps and muffs are available to choose from.
- All come with an ***NRR*** rating, what the manufacturer says is this product's

  "Noise Reduction Rating". Don't you believe it!
- In general, you want to select an option with a higher NRR rating but more importantly, one which the employee will ***use.*** If a selected HPD is uncomfortable or difficult to use, an employee will be less likely to use it.

Determining the adequacy of HPD attenuation continued)...

Target: 90dBA

Piece of cake!! Honest! Stay with me here...

STEP THREE: Let's calculate how high an NRR rating we will need.

For our example: Let's select an HPD that has an **NRR rating of 21 dB**.

Choose one of the two options below:

Option A: Use this option if the scale used in Step Two is in dB***A*** ***:***

- Subtract 7 from the selected HPD's NRR rating:
  = [21 minus 7 = 14]
- Divide that number by **2**:**..... = [14 / 2 = 7]**
- Subtract this value from the number of decibels you are over limit (calculated on the previous page **(= 15dB in our example):**

15dB - 7 = 8dB.....this still exceeds the OSHA Standard.

Obviously we will have to select an HPD with a higher NRR rating and recalculate, using this same procedure until we drop below the maximum allowable exposure.

Option B: Use this option if the scale used in Step Two was Db**C.**

- If ***YourWorkplaceValue*** is measured in units of dB**C,** follow the same steps outlined in Option A, except do not subtract the 7 in step one.

Determining the adequacy of HPD attenuation concluded)...

Told you so!

Now, one more thing and we're done...

Well then, What about using plugs and muffs together?

Simple!.

- **Add 5dB** to the value of the higher-rated HPD, but only after following the steps on the previous page.
- Example: Let's say $\mathbf{NRR_{plug} = 30}$ and $\mathbf{NRR_{muff} = 21}$.

[(30 - 7)/2] + 5dB = **17 dB of effective protection**

Eureka! **By combining two forms of HPD's, we now fall within the parameters of the OSHA standard.**

4. Education and training

1. A training program is mandatory for all employees exposed at or above the action level of _____ .

2. Training must be repeated at least _____ each year and must be updated to be consistent with changes in protective equipment and work processes.

Topics required to be a part of the training program

a) Effects of noise on hearing .

b) Purpose of hearing protectors .

c) Advantages/disadvantages and attenuation of various types .

d) Instructions on selection, fitting, use and care .

e) Purpose of audiometric testing and an explanation of test procedures .

5. Recordkeeping

All audiometric test records obtained during the course of an employee's employment must also be retained. The employer must maintain accurate records of all employee noise exposure measurements for...

_____two_____years.

OSHA 300 Log Recordkeeping Issues

OSHA Issues Final Rule for Recording Occupational Hearing Loss

For those professionals working in occupational health and safety settings, one of the most complicated responsibilities has traditionally been the reporting of work-related injuries and illnesses as required by OSHA.

On July 1, 2002, OSHA published its final rule for recording occupational hearing loss on the Form 300 Log of Work-Related Injuries and Illnesses (OAR 437-001-0700); effective date January 1, 2003. Additional clarifications were released on December 17, 2002.

Forms: OSHA has also updated its recordkeeping forms (now OSHA Form 300, 301 and 300A). ***Beginning January 1, 2004***, employers will be required to record hearing loss cases in a separate column. In 2003, employers should record cases of occupational hearing loss as an "injury" (single event acoustic trauma) or "other illness" (long term noise exposure), as appropriate. Although state-run OSHA plans were allowed to continue utilizing more stringent enforcement criteria during 2002, all are required to adopt the final federal rule for hearing loss recordability, effective January 1, 2003.

Applicable industries: Under Oregon OSHA rules, all industries are included.

OSHA 300 Log Recordkeeping Issues

Summary of the Final Rule continued...

- ***Basic recording criterion:*** Employers must record work-related "Standard Threshold Shift", or STS (an average change of 10 dB at 2000, 3000, and 4000 Hz in either ear, compared to baseline; age-adjustments allowed) **provided that** the employee's average hearing level at the same frequencies in the same ear is 25 dB hearing loss (HL) or greater (an average hearing level of 25 dB or more, regardless of employee's age, i.e., no age adjustment allowed).

- **Baseline/reference audiogram:** To determine whether a STS has occurred, the employer must compare the current hearing test results to the employee's baseline audiogram. The baseline audiogram is the employee's original audiogram or revised audiogram as defined under OSHA's noise standard OAR 437-002-1910.95.

- **Reconfirmation of STS:** If the annual audiogram shows a STS, a hearing retest may be performed within 30 days. If the retest does not confirm the STS, then the case need not be recorded. However, if the retest confirms the STS, then the STS if work-related, must be recorded within 7 calendar days of retest. If a retest is not performed, then the case (again, if work-related) must be recorded within 37 days of test.

OSHA 300 Log Recordkeeping Issues

Summary of the Final Rule (concluded)…

- **Results of subsequent testing:** If later testing performed as part of the hearing conservation program indicates that the STS is not persistent, then the employer may erase or line-out the recorded entry.

- **Determination of work-relatedness:** Work-relatedness must be determined according to specifications of 437-001-0700(6) of Oregon's general recordkeeping rule. If an event/exposure in the workplace caused or contributed to the shift in hearing or "significantly aggravated" a previously existing hearing loss, then the STS is recordable.

FAQ: Recording criteria for cases involving occupational hearing loss

Basic requirement:

If an employee's hearing test (audiogram) reveals that the employee has experienced a work-related Standard Threshold Shift (STS) in hearing in one or both ears, and the employee's total hearing level is 25 decibels(dB) or more above audiometric zero (averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS, you must record the case on the OSHA 300 Log.

What is a Standard Threshold Shift?

A Standard Threshold Shift, or STS, is defined as a change in hearing threshold, relative to the baseline audiogram for that employee, of an average of 10 decibels (dB) or more at 2000, 3000, and 4000 hertz (Hz) in one or both ears.

How do I evaluate the current audiogram to determine whether an employee has an STS and a 25-dB hearing level?

STS

If the employee has never previously experienced a recordable hearing loss, you must compare the employee's current audiogram with that employee's baseline audiogram. If the employee has previously experienced a recordable hearing loss, you must compare the employee's current audiogram with the employee's revised baseline audiogram (the audiogram reflecting the employee's previous recordable hearing loss case).

25-dB loss

Audiometric test results reflect the employee's overall hearing ability in comparison to audiometric zero. Therefore, using the employee's current audiogram, you must use the average hearing level at 2000, 3000, and 4000 Hz to determine whether or not the employee's total hearing level is 25 dB or more.

FAQ: Recording criteria for cases involving occupational hearing loss (continued)...

May I adjust the current audiogram to reflect the effects of aging on hearing?

No and Yes.

No, you cannot use age correction for determining whether an employee has reached the 25dB threshold above audiometric zero. You cannot age-correct an audiogram for determining a Standard Threshold Shift (STS) for purposes of OAR 437-002-1910.95, "Occupational Noise Exposure".

And Yes, ***for recordkeeping purposes.*** When determining whether you must record an STS on the OSHA 300 Log, you can allow for the contribution of aging by adjusting the current audiogram (see Appendix A to 437-001-0700, Age-Related Hearing Loss).

Do I have to record the hearing loss if I am going to retest the employee's hearing?

No, if you retest the employee's hearing within 30 days of the first test, and the retest does not confirm the recordable STS, you are not required to record the hearing loss case on the OSHA 300 Log. If the retest confirms the recordable STS, you must record the hearing loss illness within seven (7) calendar days of the retest. If subsequent audiometric testing performed under the testing requirements of the noise standard (OAR 437-002-1910.95) indicates that an STS is not persistent, you may erase or line-out the recorded entry.

Are there any special rules for determining whether a hearing loss case is work-related?

No. If an event or exposure in the work environment either caused or contributed to the hearing loss, or significantly aggravated a pre-existing hearing loss, you must consider the case to be work related.

FAQ: Recording criteria for cases involving occupational hearing loss (concluded)…

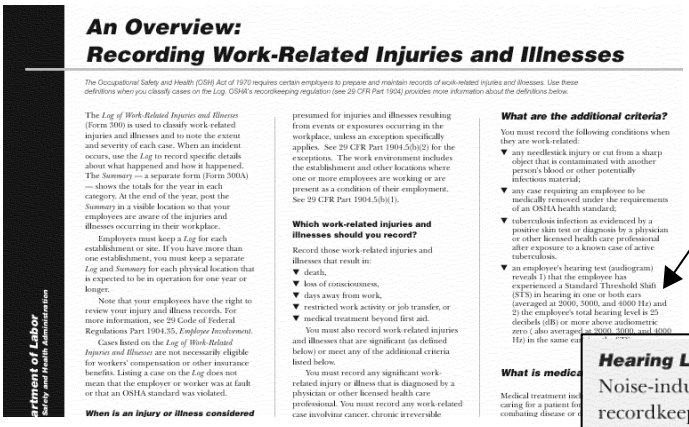
If a physician or other licensed health care professional determines the hearing loss is not work-related, do I still need to record the case?

If a physician or other licensed health care professional determines that the hearing loss is not work-related or has not been significantly aggravated by occupational noise exposure, you are not required to consider the case work-related or to record the case on the OSHA 300 Log.

How do I complete the 300 Log for a hearing loss case?

When you enter a recordable hearing loss case on the OSHA 300 Log, you must check the 300 Log column for hearing loss. (**Note: effective beginning January 1, 2004.)**

300 Log Recordkeeping Format



An Overview:
Recording Work-Related Injuries and Illnesses

The Occupational Safety and Health (OSH) Act of 1970 requires certain employers to prepare and maintain records of work-related injuries and illnesses. Use these definitions when you classify cases on the Log. OSHA's recordkeeping regulation (see 29 CFR Part 1904) provides more information about the definitions below.

The *Log of Work-Related Injuries and Illnesses* (Form 300) is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened. The *Summary* — a separate form (Form 300A) — shows the totals for the year in each category. At the end of the year, post the *Summary* in a visible location so that your employees are aware of the injuries and illnesses occurring in their workplace.

Employers must keep a *Log* for each establishment or site. If you have more than one establishment, you must keep a separate *Log* and *Summary* for each physical location that is expected to be in operation for one year or longer.

Note that your employees have the right to review your injury and illness records. For more information, see 29 Code of Federal Regulations Part 1904.35, *Employee Involvement*.

Cases listed on the *Log of Work-Related Injuries and Illnesses* are not necessarily eligible for workers' compensation or other insurance benefits. Listing a case on the *Log* does not mean that the employer or worker was at fault or that an OSHA standard was violated.

When is an injury or illness considered

presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. See 29 CFR Part 1904.5(b)(2) for the exceptions. The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment. See 29 CFR Part 1904.5(b)(1).

Which work-related injuries and illnesses should you record?

Record those work-related injuries and illnesses that result in:

- death,
- loss of consciousness,
- days away from work,
- restricted work activity or job transfer, or
- medical treatment beyond first aid.

You must also record work-related injuries and illnesses that are significant (as defined below) or meet any of the additional criteria listed below.

You must record any significant work-related injury or illness that is diagnosed by a physician or other licensed health care professional. You must record any work-related case involving cancer, chronic irreversible

What are the additional criteria?

You must record the following conditions when they are work-related:

- any needlestick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material;
- any case requiring an employee to be medically removed under the requirements of an OSHA health standard;
- tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.
- an employee's hearing test (audiogram) reveals 1) that the employee has experienced a Standard Threshold Shift (STS) in hearing in one or both ears (averaged at 2000, 3000, and 4000 Hz) and 2) the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 Hz) in the same ear(s).

What is medica

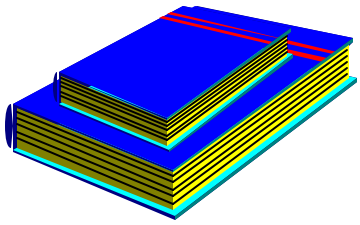
Medical treatment inc
caring for a patient fo
combating disease or

▼ an employee's hearing test (audiogram) reveals 1) that the employee has experienced a Standard Threshold Shift (STS) in hearing in one or both ears (averaged at 2000, 3000, and 4000 Hz) and 2) the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS.

Hearing Loss

Noise-induced hearing loss is defined for recordkeeping purposes as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in either ear at 2000, 3000 and 4000 hertz and the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 hertz) in the same ear(s).

Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
Away from work (K)	On job transfer or restriction (L)	(M) Injury (1)	Skin disorders (2)	Respiratory conditions (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
12 days	15 days	☑	☐	☐	☐	☐	☐
____ days	30 days	☐	☐	☐	☑	☐	☐
7 days	30 days	☑	☐	☐		☐	☐
3 days	« Move » « Select Area »	☑	☐	☐		☐	☐
____ days	____ days	☑	☐	☐		☐	☐



Appendices

A. How Decibels Work

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D. Building Quiet

E. Working Quiet - 1

F. Working Quiet - 2

G. OR-OSHA Occupational Noise Exposure Code
OAR 437, Division 2 (29CFR 1910)

Appendix A

How Decibels work

IMAGINE, by imperial decree, that everyone on planet Earth is now required to express length in units of inches only. All other units of length have been abolished. No big deal in everyday applications; even the diameter of something as small as the period at the end of this sentence could be expressed easily as 0.01 inches. But what about the length of the playing surface of a football field (3,600 inches), a 20-mile trip to Grandma's house (1,267,000 inches), or a trip around the world (1,584,000,000 inches)? Pretty cumbersome, right? And we've not even started the computations for our Earth-to-Mars round trip yet!

One of the primary purposes of the decibel scale is to make the usable range of sound pressures more manageable. The pressure variations in a sound wave are measured in terms of a unit borrowed from meteorology called the ***microbar.*** A microbar is one-millionth of the normal atmospheric pressure.

The range of sound pressures to which the human ear may be exposed is enormous. For example, the weakest sound that can be heard by a person with very good hearing is about
0.0002 microbars at 1,000 cycles per second, while the noise near a jet engine may be **ten million times this level**, or 2,000 microbars.

To make their work easier, scientists frequently create different scales of measure. Let's use our "inches-only" example to illustrate. If we were, in fact, confined to using inches as our sole unit of length, we could try to make the numbers more manageable by using logarithms. Logarithms essentially compress or squeeze a wide range of numbers into a smaller scale. Every tenfold change in our physical units results in an increase or decrease on the log scale of just one unit.

Appendix A

How Decibels work (continued)…

Let's see what happens when we compress our length scale by applying the logarithm to the set of lengths in the example above. We'll arbitrarily refer to this new scale of length based on the logarithm of length in inches as the ***'login scale'***…

- The 'period' with a diameter of .01 inches now equals**: -2.0 logins**

(log_{10} of 0.01);

- The football field now equals: **+ 3.5 logins;** and…
- The trip around the world now equals: **+ 9.2 logins .**

Wow! The logarithm function has really squeezed things together. The period at the end of this sentence has a diameter of – 2.0 logins, and a trip around the world is just 11.2 logins greater, at + 9.2 logins. Now, if we were fairly certain that the diameter of this period was close to the smallest object we'd ever be interested in measuring, we could eliminate all negative numbers by taking the logarithm of ratios in which the denominator of the ratio is always 0.01 inches. This is just a way to make the zero point of the scale correspond to the smallest measurement that is likely to be made. In this new login scale, all values calculated previously simply increase by 2.0. Thus, our login values for this example range from **0.0** logins (the 'period', at $\log_{10}$ of 0.01/0.01) to the trip around the world at **11.2** logins.

Perhaps we've gotten a little carried away and compressed our system of length measurement too much. We could ***un***compress it by multiplying the logins by some factor of our choosing, say, by 10 (call these decilogins), or 100 (centilogins) or 1000 (millilogins). Let's select a factor of 10, so that now, in decilogs, our range of lengths would span from 0.0 decilogins to 112 decilogins for our trip around the world. Cool, huh?

Appendix A

How Decibels work (concluded)…

So, what does this have to do with noise and decibels and stuff?

Remember on page 10, we learned that the range of sound pressures to which the ears are exposed is in the millions?

In order to express this wide range of pressure in small, convenient numbers, a unit called the ***bel*** was created, so named in honor of Alexander Graham Bell. The bel can be defined as the logarithm of the ratio of two sound pressures. However, it reduced the numbers too much, so that the ***decibel*** **(ten times the bel)**, came into common use.

In acoustics, the decibel is most often used for expressing the sound-pressure level with respect to a reference sound pressure. For airborne sound, this reference sound pressure is generally ***0.0002 microbar, which is also called zero decibels*** or, the starting point on the scale of noise levels.

So now you know more than most of the kids on the block about decibels. We simply use logarithms to compress an unmanageable range of sound pressures into a more reasonable scale of numbers that is then expanded slightly through multiplication by a factor of 10.

Just one more point and we're done…The logarithm function was not chosen arbitrarily to perform this compression of the sound pressure scale. It was chosen both for its mathematical compression capabilities and because a similar type of compression is believed to be performed by the auditory system when presented with sounds covering a wide range of sound pressures.

Got it? Good! You pass! Now for extra credit, here's a….
Pop Quiz….

The correct spelling of our word for the day is: (a) Decibel (b) decibel… or
(c) deciBel (C is correct)

A measurement of zero decibels means an absence of sound.
True or… False! Zero deciBels simply means the sound (pressure) is equal to the reference level.

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