

Effective 2-way Communication

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Few things are more frustrating than being unable to understand what others are saying. In a work environment, failing to comprehend important messages can result in severe consequences. Safety and productivity depend on workers' ability to collaborate, problem-solve, and react quickly to emergency situations. Obstacles including loud background noise, PPE such as respiratory and hearing protection, and isolated work locations can create special challenges to achieving effective 2-way communication.

Noise remains one of the most prevalent hazards in industry today. And noise creates challenges in the workplace well beyond its most basic threat to hearing health. Growing evidence suggests there may be a link between noise, hearing loss, and risk of occupational injury. And as demands on worker productivity become more complex, the need for efficient and effective communication is essential. Comprehending speech in the presence of loud background noise can be challenging at best, and at times nearly impossible. Here we review some of the basic principles affecting workers' ability to communicate and offer solutions for improving safety and productivity in your workplace.

Key factors affecting speech communication

- **Speech-to-noise ratio (SNR).** The most basic determining factor of speech detection (realizing someone is speaking) and speech intelligibility (understanding what is said) is the loudness of the speech compared to the background noise. The level of a speech signal must be significantly higher than the background noise for the message to be understood.
- **Poor speech quality.** If a talker is wearing a respirator or other head/face PPE, speech may be altered/garbled from the start. And shouting to be heard is not a solution. There is a physiologic limit to how loud and how long talkers can raise their voice. Shouted speech often sounds distorted, too.
- **Environmental obstacles.** When speaker and listener are separated by distance or other obstacles such as machinery, visual cues such as lip-reading and hand signals/gestures are missed. Under best circumstances, a spoken, even shouted message cannot be heard at 3 to 5 feet in high noise. Even if workers have the benefit of a 2-way radio, phone, or public announcement system, cranking up the volume to be heard over background noise results in distortion of the speech signal and adds to employee noise exposure.
- **Inner ear distortion.** Next, let's consider the ear itself. Simply making sounds louder doesn't render those sounds easier to understand. Sensory cells and nerve fibers in the inner ear work most effectively at low to moderate sound levels. At high sound levels, signals within the inner ear become distorted, and auditory function is diminished. Just as music can lose its quality if played through a stereo speaker at full volume, speech can become distorted when entering the ear at very high levels.
- **Hearing loss.** As if there weren't enough challenges to listening in noise, now add one of the most common problems experienced by adults: hearing loss. According to the National Institutes of Health, approximately 15 percent of American adults report some degree of hearing loss. There are many different types of hearing loss that can affect listeners in varying ways. Some people have

trouble hearing even in quiet situations. Others get by fine in quiet, but experience significant difficulty distinguishing sounds, particularly speech, in the presence of competing background noise. A listener with hearing impairment is likely to say making sounds louder doesn't necessarily make them clearer or easier to understand and they have difficulty in crowds, restaurants, even in face to face speaking situations.

- **Hearing protector complications.** Finally, one more PPE obstacle for listeners in noisy environments: hearing protectors affect speech intelligibility, particularly for people with hearing impairment. Hearing protectors block out high pitched sounds (consonant speech sounds like s, f, th, sh, etc.) that are critical for speech discrimination, reducing the speech to mumbling or gibberish. For a worker with high frequency hearing loss (very common), wearing hearing protectors can exacerbate the high frequency deficit, and in turn, further impair speech intelligibility

Options for improving communication

If companies are concerned that noise may be interfering with 2-way communication for their workers, then a complete Communication Survey is warranted. Where possible, engineering noise controls should be considered as a first line of defense to reduce noise at its source. Other solutions to consider:

- **Group communication systems.** With new technologies emerging, there are now many options for group communication available. Companies can choose a wide range of technologies, from cell phones or simple short-range 2-way radios to complex multi-user systems capable of connecting many workers across wide areas.
- **Personal communication devices.** These specialty devices typically consist of a personal hearing protector (earplug or earmuff) that attenuates (blocks) the background noise in combination with a communication interface. Devices may be designed for one-way or two-way communication. Typically, a small speaker is imbedded in the earplug or earmuff to deliver the communication signal directly to the ear. For 2-way communication, microphone quality is important and personal preference can be a deciding factor: boom-style, bone-conduction, and CavCom's [Talk Through Your Ears®](#) in-ear mic technology are options. With any personal device, there are many factors to consider, including performance, comfort, and compatibility with other personal protective equipment. When it comes to communication effectiveness, there are three important features to consider:

Binaural (both ear) listening provides a significant advantage over monaural (one ear) listening. The human auditory system is clearly designed to work with input from both ears. The brain processes and compares signals from each ear for localization, understanding speech, and separating speech from background noise. As a result, signals such as radio transmissions do not need to be as loud if a listener is using both ears. The practical result of this phenomenon is that comfortable, and most importantly, SAFER volume settings are typically possible when using binaural systems compared to an earset with a monaural listening configuration.

Output-limiting promotes safer listening levels. Whether a worker has normal hearing or hearing loss, it is important that signals delivered to the ear do not add to a noise hazard on the job. When purchasing a communication headset for any employee, make sure the device has an electronic feature to limit outputs to safe levels. Again, a binaural listening also helps most users choose a lower, safer, listening level than would be possible with a monaural system.

Adequate seal of hearing protector ensures best results. Delivering audio communications directly to the ears at a safe but sufficient level can be strongly dependent on a suitable seal of the hearing protector. If the hearing protector is not sealed properly, then background noise leaks

in and competes with the speech signal. Not only may the user be inadequately protected from background noise, but worse yet, may try to compensate by increasing the volume control on the communication device resulting in added noise exposure. Remember that the key to high-quality communication is an optimal speech-to-noise ratio. When a proper hearing protector seal is achieved, excessive background noise will not be competing with the desired speech signal.

- **High-fidelity filtered hearing protectors.** Consider providing a new technology that is generally referred to as uniform (or "flat") attenuation filtered hearing protectors. Uniform attenuation means the hearing protector or communication earset is specially designed to reduce sounds evenly across a broad frequency range. Combined with a moderate amount of noise reduction, this type of hearing protector preserves the frequency balance of sound. **The result is that reduced sounds have roughly the same quality as the original sounds, only quieter.** To learn more, check out this helpful previous article from our [SoundBytes](#) newsletter



- **Individual review.** Because job requirements vary and workers' hearing abilities differ, consider building job-specific protocols for hearing-critical jobs and individualized plans for any hearing-impaired workers. For more information on accommodations and safety considerations and preparedness for those with hearing loss, see this helpful previous article from our [SoundBytes](#) newsletter.

To sum up, extreme noise and other obstacles can impair 2-way communication in your workplace. But with planning and ingenuity, employers can protect workers' hearing while promoting intelligible communications in a challenging environment.

If you would like to learn more about hearing loss and listening in noise, more resources are just a click away.

Communication Survey: How are loud noise or other challenges such as use of respirators affecting 2-way communications in your workplace? Request a free copy of our Communication Survey. This simple tool will help you identify problem areas that may be compromising safety and productivity.

Downtime impact calculator: Ever wished you could place a price tag on how down-time in your operation affects your bottom line? The impact can be surprising and quickly demonstrates your return on investment for communication system upgrades. Request a free calculator.

High-fidelity hearing protection: Read more and listen to an audio demonstration of CavCom's selection of high-fidelity filters to enhance speech communication in noisy situations.

Video/Audio Demonstration - Communicating in High Noise: View CavCom's quick demonstration videos for ideas on how to improve communication in your workplace.

Contact [CavCom](#) for more information about improving your company's productivity, safety, and communication capabilities.



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