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# Team communications for construction and utilities



***Keeping your crew  
safe, effective, and  
productive***



Sonetics Corporation of Portland, Oregon designs, manufactures, and supports proven communication solutions for work teams in construction, public works, aviation, firefighting, marine, construction, and industrial operations. Twice named by *Inc.* magazine as one of America's 500 fastest-growing private companies, Sonetics, together with its Firecom and Flightcom divisions, helps more than 500,000 customers in 90 countries hear and be heard under challenging circumstances.

## Team communications for construction and utilities: Keeping your crew safe, effective, and productive

A Sonetics Corporation White Paper

**T**eam communication is absolutely essential for creating a safe, productive, and effective workplace. This is especially true in construction, utility, and industrial environments, where members of work crews often struggle to hear and be heard over excessive background noise. In these situations, a missed warning or misunderstood instruction can have serious or even fatal consequences.

High-noise environments present a seemingly intractable problem: how to protect workers from noise-induced hearing loss while still enabling them to hear each other during the performance of shared tasks. Traditional methods of hearing protection, such as earplugs and earmuffs, may guard against hearing loss, but make it even more difficult for crew members to communicate with each other. Radios and walkie-talkies enable direct communication within and among work teams, but do nothing to protect hearing, and also require a free hand to operate. Other methods of communication, such as hand signals, require line-of-sight visibility and can be

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APEX 230 hard hat-compatible wireless headset



APEX 235 wireless headset

misinterpreted. As a result, worksite communication is often unreliable, haphazard, and ambiguous.

Recent advances in technology have made self-contained wireless headsets the best practice for ensuring clear communication in high-noise environments. Although the features and quality of systems vary greatly from one manufacturer to another, most headsets are designed to fit completely over the ear for hearing protection and are outfitted with a boom microphone and ear speakers to allow voice transmission and reception through a mobile base station using a wireless signal.

These systems are rapidly becoming the most practical solution for enabling work crews to hear what they need to hear while protecting them from extraneous and dangerous noise. *Configurable* wireless systems extend this functionality by enabling supervisors to control who can broadcast over any associated portable or mobile radios, greatly reducing the amount of irrelevant cross talk or “chatter” that can occur with non-configurable systems. Up to 60 users can communicate in an efficient and orderly fashion on a configurable wireless system, making it an ideal solution for even the largest work teams.

### **The consequences of poor communication**

The professional literature in occupational safety is replete with examples of how poor communication adversely affects workplaces in general [1] and construction-related workplaces specifically [2], [3]. Lack of communication during shared tasks has been cited as the proximate cause of, or at least a

Of the 12 human factor errors commonly cited in the literature, “lack of communication” is the **number one** mistake that causes accidents.

major contributing factor in, fatal accidents involving forklifts [4], mining [5], [6], offshore drilling [7], [8], railway operations [9], public utilities [10], nuclear power plants [11], ferries [12], and marine safety [13] [14]. Despite a tremendous diversity of circumstances and environments, all of these incidents share one painful and inescapable truth: tragedy could have been avoided *if* the work crews and supervisors had been able to communicate clearly with each other.

Safety specialist Gordon Dupont has devoted an entire career to investigating and documenting the root causes of accidents in the workplace. [15] His famed “Dirty Dozen” list of human factor errors have been adopted as a model for occupational safety and health in industries ranging from aircraft maintenance to medicine. In the safety context, “human factor errors” are mistakes in judgment and perception that, while unintentional, lead to accidents and injuries. Of the 12 human factor errors that Dupont cites, “lack of communication” is the number one mistake that causes accidents<sup>†</sup>. [16]

Interruptions in communication can cause orders to be misinterpreted, improperly carried out, or completely missed. Simply put, if crew members do not — or cannot — exchange information, the stage is set for an accident to occur. One frequently quoted statistic is that 70 percent to 80 percent of all aircraft accidents are due to human error; not, as some might suppose, faulty equipment or other variables. [17]

<sup>†</sup>The other factors on Dupont’s list are: complacency; lack of knowledge; distraction; lack of teamwork; fatigue; lack of resources; pressure; lack of assertiveness; stress; lack of awareness; and norms.

Approximately 30 million American workers are exposed to hazardous levels of noise on the job, particularly in construction, utilities, mining, agriculture, transportation, and the military.

### **Effects of background noise**

Background noise is a major problem on most worksites because it not only interferes with clear communication, it also poses the threat of tinnitus and noise-induced hearing loss. Moreover, sustained or intermittent exposure to excessive noise also can cause stress-related problems, including high blood pressure, headaches, muscle tension and declining job performance.

Tinnitus is the medical term for the perception of sound in one or both ears when no external sound is present. Although it is often referred to as “ringing in the ears,” it can also sound like roaring, clicking, hissing, or buzzing. The etiology of tinnitus varies, but is most commonly caused by exposure to excessive noise which, over time, destroys tiny hair cells, known as cilia, in the inner ear. Once damaged, cilia cannot be renewed or replaced. According to the American Tinnitus Association, tinnitus drastically reduces quality of life for 250 million people worldwide. [18]

Tinnitus itself is not a disease, but it is frequently a precursor to noise-induced hearing loss (NIHL). The National Institute for Occupational Safety and Health estimates that approximately 30 million American workers are exposed to hazardous levels of noise on the job. Industries with particularly high numbers of exposed workers include: agriculture, mining, construction, manufacturing, utilities, transportation, and the military. [19] According to a recent study by the Better Hearing Institute, people with untreated hearing loss lose as much as \$30,000 in income annually – or approximately \$176 billion overall. The resulting costs of

Occupational hearing loss costs the American economy \$26 billion each year in unrealized federal taxes.

occupational hearing loss to the U.S. economy are estimated to be as high as \$26 billion in unrealized federal taxes. [20] There is no cure for NIHL or tinnitus, although both are considered to be 100 percent preventable. [21]

While excessive noise is clearly a problem, the precise definition of “excessive” depends on a number of factors, including:

- The loudness of the noise measured in decibels (dB);
- The duration of each employee’s exposure to the noise;
- Whether employees move between work areas with different noise levels (decibel levels);
- Whether noise is generated from a single source or multiple sources. [22]

NIHL can be caused by a single exposure to an intense “impulse” sound, such as an explosion, or by continuous exposure to loud sounds over an extended period of time, such as noise generated in a factory or on a construction site.

Sound is measured in decibels on a scale ranging from 0 (near total silence) to 194 (the loudest theoretically possible sound). The decibel scale is logarithmic: a 10dB sound is 10 times more powerful than silence, a 20dB sound is 100 times more powerful than silence, and a 30dB sound is 1000 times more powerful than silence. For purposes of comparison, a ticking watch emits sounds of 20dB; a normal conversation, 60-70dB; a motorcycle or passing truck, 100dB; an ambulance, 125dB; and a jet engine during takeoff, 150dB. The average human threshold of pain is

**Employers beware**

Hearing loss claims are common in industrial environments. The use of personal protection equipment, coupled with a consistently monitored and applied hearing loss prevention program helps to limit these expensive claims. If you are an employer, your period of liability for a worker’s hearing loss could be longer than you think. In a recent case, an employee who worked in a sawmill for over 30 years experienced hearing loss over the course of his employment, but did not consult a doctor until after he retired. The Washington Supreme Court ruled that the calculation of his permanent partial disability claim should be based on the much more generous schedule that was in place as of the last day he was exposed to hazardous occupational noise (i.e., the last day of work).

*Harry v. Buse Timber & Sales, Inc.*, 166 Wn.2d 1, 201 P3d 1011 (2009).

typically around 110dB; sounds above 150dB can rupture the eardrum. [23]

OSHA regulations require hearing protection when the time-weighted average noise exposure over an eight-hour period equals or exceeds 85 decibels.† [24] “Time-weighted average” takes into account the fact that the louder the noise, the shorter the exposure time before hearing protection is needed. As shown in Table 1, as the decibel level increases, the allowable exposure time without mandated hearing protection decreases. As shown by the column of corresponding sounds, these standards are routinely exceeded in construction and utility environments; hence, the need for hearing protection.

While there is no cure for NIHL, the National Institute on Deafness and Other Communication Disorders recommends these steps for preventing its onset:

- Know which noises can cause damage (those at or above 85 decibels)

Sound level (dB)	Approximate corresponding sounds	Hours/day
90	Metal milling/fabricating machine, backhoe, excavator, dump truck	8
92	Forklift, wood chipper, table saw, front end loader	6
95	Newspaper press, concrete mixer, grain dryer, farming combine	4
97	Pipe threader, paper cutter, bulldozer	3
100	Electric drill, router, pile driver, lawnmower	2
102	Belt sander, chainsaw, circular saw, plaster demolition	1.5
105	Drop forge hammer, air gun, textile loom, offshore platform pipe noise	1
110	Bulldozer, air hammer, jackhammer, paving machine	.5
115	Riveter, oxygen torch	.25

\* Sources: Allowable sound levels taken from OSHA, *Occupational noise exposure*. Corresponding sounds data adapted from E. Berger, et al., *Noise Navigator sound level database*. Retrieved from [www.e-a-r.com/pdf/hearingcons/Noise\\_Nav.xls](http://www.e-a-r.com/pdf/hearingcons/Noise_Nav.xls). Corresponding sounds are based on average decibels reported in published research studies, with an average range of 25.5dB for the sounds measured.

Wireless communication headsets are a practical solution to reducing dangerous levels of background noise and allowing teams of almost any size to communicate clearly and effectively.

- Wear earplugs or other hearing protective devices when involved in a loud activity
- Be alert to hazardous noise in the environment
- Protect the ears of children who are too young to protect their own
- Make family, friends, and colleagues aware of the hazards of noise.
- If you suspect hearing loss, have a medical examination by an otolaryngologist (a physician who specializes in diseases of the ears, nose, throat, head, and neck) and a hearing test by an audiologist (a health professional trained to measure and help individuals deal with hearing loss). [21]

#### **Wireless communication headsets:**

##### **Clear team communication *and* hearing protection**

Wireless communication headsets are rapidly becoming the best practice for simultaneously protecting hearing and enabling communication in high-noise environments. Hearing protection devices, such as headsets, can reduce noise exposure by 20 to 30 decibels. Personal protective equipment is also less expensive and more practical than other interventions, such as engineering controls, [25] purchasing newer, less noisy equipment, or rotating personnel to minimize noise exposure. [26] Simply stated, wireless headsets are a practical solution to reducing dangerous levels of background noise and allowing teams of almost any size to communicate clearly and effectively. Properly designed and configured, they also leave the wearer's hands free and allow unrestricted movement around the worksite.





Figure 1  
Basic, single-site wireless  
team communication system

Wireless communication systems allow intrasite team communication, as well as the ability to communicate with remote users over a radio.

Wireless headset systems allow not only communication with the team but also the ability to monitor and communicate over one or more radio channels to reach individuals at other locations. This is particularly important for emergency personnel, who might otherwise be forced to choose between helping with a rescue or staying in their vehicle to communicate with their team and other responders.

### Deploying a wireless headset system

Although an infinite variety of configurations are possible, the basic building blocks of a wireless communication system are fairly straightforward:

- One or more wireless headsets
- Base station to allow communication between and among headsets
- Optional radio-transmit interface to allow communication between the worksite and remote users over a mobile radio.

Figure 1 depicts a simple configuration for two to four users who need to communicate with each other at a single site.

A wireless team communication system should also include the option for transmitting over a mobile or portable radio, allowing remote communication. Because there are literally hundreds of radio models available from dozens of manufacturers, a wireless system should have the flexibility to connect with all or most existing radios. Ideally, communication between workers on site should be segregated from radio communication with remote users. Typically, this is accomplished by employing either push- or toggle-to-talk functionality on the headset itself for radio



transmissions. Figure 2 depicts a configuration for two separate work crews who need to communicate with each other and with remote users over a radio.

While these configurations provide a top-level overview of how wireless headset systems can be deployed on a worksite, potential purchasers should be aware that the features, functionality, and durability of these systems vary greatly from manufacturer to manufacturer. The next section examines some of these features in detail and offers practical advice on what to look for in a wireless headset system.

### How to choose a wireless headset system

Wireless headset systems are available in a wide variety of configurations and price ranges. To ensure a system meets your needs, consider the following factors carefully.

- **Is the system truly wireless?** A number of so-called “wireless” systems actually require a wire from the headset to a radio or belt pack. While these systems allow freedom of movement, the use of a belt pack or radio wire creates many of the same problems inherent in hardwire systems, particularly tangled cords. Moreover, belt packs generally have less transmission range than self-contained systems worn on the head.
- **How knowledgeable is the dealer and what kind of support and training does he or she receive from the manufacturer?** The dealer from whom you purchase your system is a critical link in ensuring the final solution meets your needs. Look at the dealer’s longevity and reputation in the industry and do not hesitate to ask for references. Reputable manufacturers choose their

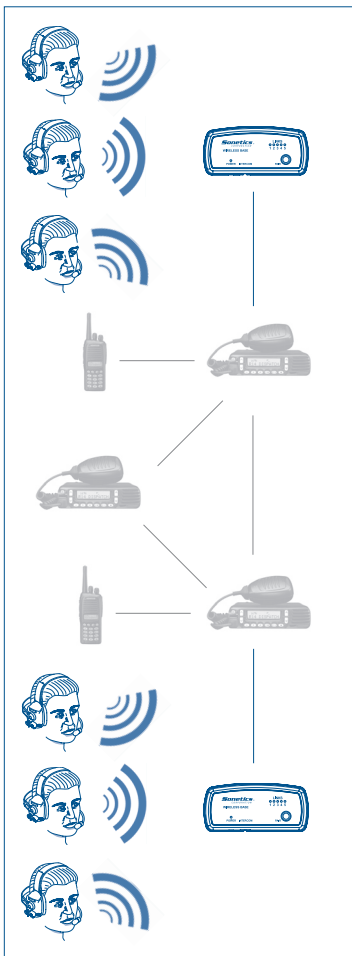


Figure 2  
Multi-site wireless communication system with connection to remote users via a mobile radio

DECT transmission technology generally offers up to 30 times the coverage area of Bluetooth and is less subject to interference in the 30MHz - 1.8GHz spectrum.

dealers carefully and educate them to act as “problem-solvers,” not just “order takers.” Problem-solving dealers ask lots of questions, and will attempt to thoroughly understand your situation before recommending a solution. Advanced wireless headset systems offer a wide variety of configuration options that allow customization to your specific application. Your dealer should be fully informed and aware of what options are available.

- **Does the system use DECT or Bluetooth technology?**

Transmission technology can dramatically affect how well wireless systems perform in the field. Systems that employ Bluetooth technology generally have a limited range and are subject to interference from nearby communication devices, especially those operating on the 2.4 GHz or 5 GHz channels. Look for systems that use Digital Enhanced Cordless Telecommunications (DECT) technology. DECT units generally offer up to 30 times more coverage and are less subject to interference in the 30MHz – 1.8GHz spectrum. DECT transmissions also have multipath capability, meaning that the signal will bounce up, over, and around objects in order to establish the best possible connection. For enhanced security, DECT signals are digitally encoded to ensure privacy in the transmission of sensitive information.

- **Is the system full-duplex or half-duplex?** Half-duplex systems allow communication in both directions, but only one direction at a time, similar to a walkie-talkie. Once a party begins transmitting, all other transmissions are essentially “locked out” until the first transmission is over. Full-duplex systems allow communication in both

Full-duplex systems are preferable to half-duplex systems because they allow communication in both directions simultaneously, an important safety consideration.

directions simultaneously, ensuring clear and complete communication. (The term “multiplexing” is sometimes used to describe full-duplex communications between more than two parties.) Full-duplex or multiplex capabilities are an important safety consideration because they allow the parties to speak and hear others at the same time.

- **Is the system radio-compatible?** Wireless systems should have the capability of interfacing with mobile radios to allow communication with remote users. Given the large number of radio makes and models available, look for a system with maximum interface flexibility.
- **Can the duplex capabilities be configured to your specific needs?** To minimize the chance of “cross-talk,” or multiple conversations taking place simultaneously, the system should allow you to establish a hierarchy of who can talk to whom — *especially* who is allowed to broadcast over the radio.
- **Is the system scalable?** As your needs expand, your wireless system should be able to expand with you. Advanced wireless systems should be able to accommodate up to 60 users.
- **Is the system comfortable to wear and easy to use?** Before purchasing, physically try on a headset. It should be lightweight and fit snugly, but comfortably, over the ears. If you are purchasing hard hat-compatible headsets, try one on while actually wearing a hard hat to ensure a comfortable fit. The controls should be readily accessible, preferably with a simple push-to-talk button or toggle-to-talk switch for accessing the radio and allowing complete

If the system you are considering is billed as “wireless,” it should be *truly* wireless and not require a wire attached to a belt pack.

hands-free communication with the team. And if the system is billed as wireless, it should be *truly* wireless and not require a belt pack.

- **What is the system’s Ingress Protection Rating?** The Ingress Protection Rating, or IP Code, is an international standard that rates the degree of protection against the intrusion of solids and liquids into an electrical unit. A wireless headset should have a minimum rating of IP65, which indicates that the unit is completely impervious to dust and is capable of withstanding a stream of water for three minutes without damage to the interior components.<sup>†</sup>
- **What is the range of the system?** The greater the range, the more effective the system will be for your application, since obstacles and vehicles may reduce range. Look for a minimum 1500-foot line-of-sight transmission capability, bearing in mind that system performance will deteriorate at the outer limits of the range.
- **What is the Noise Reduction Rating?** Noise Reduction Rating (NRR) is simply the measurement, in decibels, of how well a hearing protector reduces noise as specified by the Environmental Protection Agency. The higher the NRR number, the greater the noise reduction. While wearing hearing protection your exposure to noise is equal to the total noise level minus the NRR of the hearing protectors in use. For example, if you were exposed to 95dB of noise but were wearing a headset with an NRR of 24, your actual noise exposure would be 71dB. Look for an NRR of at least 24.

<sup>†</sup>Water projected by a 6.3mm nozzle, 12.5 liters per minute, at a pressure of 30 kN/m<sup>2</sup> from a distance of 3m.

Make sure the system you are buying is designed for use in your operating environment, and ask about warranty and repair policies.

- **What is the operational temperature range?** Extreme temperatures can affect battery life and headset operation.
- **Are all components necessary for operation included in the purchase price?** The price you pay should deliver a *complete* system that is ready for operation. Accessories such as battery chargers and charging cables should be included, not “added on” as options.
- **What about warranty and service?** Not all wireless headset systems are equally reliable and durable over the long term. Make sure the system is designed for use in your operating environment, ask about warranty, repair, and replacement policies, and try out the manufacturer’s technical support prior to making a decision. A two-year limited warranty is standard in the industry and some vendors provide extended plans of up to five years.

Wireless headset systems are a safe and convenient method of ensuring clear communication among team members when operating in high-noise environments. Clear communication is an essential element in every team’s effectiveness and productivity; it could even save a life.

**Sonetics Corporation offers a complete line of team communication solutions for high-noise and other challenging environments. To learn more, visit our Web site: [www.soneticscorp.com](http://www.soneticscorp.com). To discuss a solution for your specific needs, contact your local Sonetics dealer, or call 1-800-833-4558.**

## References

- [1] L. Hansen, "Why won't they listen?," *Occupational Hazards*, vol. 66, no. 9, pp. 45-50, September 2004. [Online]. Available: [http://www.l2hsos.com/publications/why\\_wont\\_they\\_listen.pdf](http://www.l2hsos.com/publications/why_wont_they_listen.pdf). [Accessed 25 October 2011].
- [2] F. Campbell, "Occupational Stress in the Construction Industry," Chartered Institute of Building, Berkshire, 2006. [Online]. Available: <http://www.ciob.org.uk/sites/ciob.org.uk/files/WEB-INF/files/documents/stress.pdf>. [Accessed 25 October 2011].
- [3] R. Haslam, "Contributing factors in construction accidents," *Applied Ergonomics*, vol. 36, no. 4, pp. 401-415, July 2005.
- [4] Canadian Centre for Occupational Health and Safety, "Common factors in forklift accidents," 2 May 2011. [Online]. Available: [http://www.ccohs.ca/oshanswers/safety\\_haz/forklift/accident.html](http://www.ccohs.ca/oshanswers/safety_haz/forklift/accident.html). [Accessed 25 October 2011].
- [5] "Poor communication faulted in Wyoming mine accident," *Rapid City Journal*, 7 April 2008. [Online]. Available: <http://www.ciob.org.uk/sites/ciob.org.uk/files/WEB-INF/files/documents/stress.pdf>. [Accessed 25 October 2011].
- [6] "Fatal Indiana County mine accident blamed on communication," *Pittsburgh Tribune Review*, 24 July 2008. [Online]. Available: [http://www.pittsburghlive.com/x/pittsburghtrib/s\\_579152.html](http://www.pittsburghlive.com/x/pittsburghtrib/s_579152.html). [Accessed 25 October 2011].
- [7] "National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling holds a meeting to discuss the preliminary findings related to the root causes of the BP Deepwater Horizon disaster," *Political/Congressional Transcript Wire*, 3 December 2010.
- [8] "Big risks and bigger blunders; BP changed few practices despite a catalog of crises long before gulf disaster," *International Herald Tribune*, 14 July 2010.
- [9] "Take action to curb train accidents," *Africa News Service*, p. 1008126u0247, 6 May 2003.
- [10] Jacobs Consultancy, "Report of the independent review panel, San Bruno pipeline explosion," 9 June 2011. [Online]. Available: [http://www.cpuc.ca.gov/PUC/events/110609\\_sbpanel.htm](http://www.cpuc.ca.gov/PUC/events/110609_sbpanel.htm). [Accessed 25 October 2011].
- [11] "Nuclear Fuel Services to be fined \$140,000 for Texas plant violations," *Nuclear Waste News*, p. 1, 15 September 2010.
- [12] Transportation Safety Board of Canada, "Fatal accident to passenger vehicle involving the ferry, "Queen of New Westminster," Departure Bay, British Columbia, 13 August 1992." Report number M92W1057. [Online]. Available: <http://www.tsb.gc.ca/eng/rapports-reports/marine/precedentes-earlier/m92w1057/m92w1057.asp>. [Accessed 25 October 2011].
- [13] "A lack of communication," *National Fisherman*, p. 8, June 2005.
- [14] R. Pyne and T. Koester, "Methods and means for analysis of crew communication in the maritime domain," *The Archives of Transport*, vol. 17, no. 3-4, pp. 193-208, 2005. [Online]. Available: [www.he-alert.org/documents/published/he00640.pdf](http://www.he-alert.org/documents/published/he00640.pdf). [Accessed 25 October 2011].
- [15] G. Dupont, "About us," [Online]. Available: <http://www.system-safety.com/whoweare/a%20little%20bit%20about%20us.htm>. [Accessed 25 October 2011].
- [16] G. Dupont, "Avoid the dirty dozen with safety nets," [Online]. Available: <http://www.ihst.org/LinkClick.aspx?fileticket=ciDdCM%2FCInw%3D&tabid=1784&language=en-US>. [Accessed 25 October 2011].

## References

- [17] E. Salas and D. Maurino, Eds., Human factors in aviation, Boston, MA: Academic Press, 2010, p. 302.
- [18] American Tinnitus Association, "Tell me more about my tinnitus," [Online]. Available: <http://www.ata.org>. [Accessed 25 October 2011].
- [19] National Institute for Occupational Safety and Health, "Work-related hearing loss," NIOSH Publication Number 2001-103, 2001. [Online]. Available: <http://www.cdc.gov/niosh/docs/2001-103>. [Accessed 25 October 2011].
- [20] Better Hearing Institute, "New study reveals financial dangers of leaving hearing loss unaddressed," 18 February 2011. [Online]. Available: [http://www.betterhearing.org/press/news/Hearing\\_loss\\_income\\_and\\_unemployment\\_pr021811.cfm](http://www.betterhearing.org/press/news/Hearing_loss_income_and_unemployment_pr021811.cfm). [Accessed 25 October 2011].
- [21] National Institute on Deafness and Other Communication Disorders, "Noise-induced hearing loss," [Online]. Available: <http://www.nidcd.nih.gov/health/hearing/pages/noise.aspx#symptoms>. [Accessed 25 October 2011].
- [22] Oshax.org, "OSHA decibel levels - hearing protection," [Online]. Available: <http://www.oshax.org/info/articles/decibel-levels>. [Accessed 25 October 2011].
- [23] Purdue University, "Hearing Conservation Program," [Online]. Available: [www.purdue.edu/rem/home/booklets/HCRpdf](http://www.purdue.edu/rem/home/booklets/HCRpdf). [Accessed 25 October 2011].
- [24] Occupational Safety and Health Administration, "Occupational safety and health standards – Occupational noise exposure. OSHA. Occupational safety and health standards – Occupational noise exposure. 29 C.F.R. 1910.95," [Online]. Available: [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9735](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735). [Accessed 25 October 2011].
- [25] B. Witt, "Protecting against extreme noise," 1 April 2011. [Online]. Available: <http://ehstoday.com/ppe/hearing-protection/protecting-against-extreme-0401>. [Accessed 25 October 2011].
- [26] B. Ewigman, "Efficacy of an intervention to promote use of hearing protection devices by firefighters," *Public Health Reports*, vol. 105, pp. 53-59, 1990. [Online]. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1579990/pdf/pubhealthrep00198-0055.pdf>. [Accessed 25 October 2011].



## SIDE-BY-SIDE COMPARISON

When shopping for a wireless headset system, you may find it useful to compare the features and functionality of each system under review. The following chart may be helpful in comparing features at a glance.

Feature	Sonetics	_____	_____
<b>Truly wireless?</b>	Yes; a belt pack or radio wire is <u>not</u> necessary		
<b>Range</b>	1600 feet line-of-sight		
<b>DECT or Bluetooth?</b>	DECT		
<b>Full- or half-duplex?</b>	Full-duplex		
<b>Configurable duplex?</b>	Yes, with a variety of push- and toggle-to-talk options		
<b>Noise Reduction Rating</b>	26		
<b>Radio-compatible?</b>	Yes, with over 400 models		
<b>Maximum users</b>	60		
<b>Secure communication?</b>	Yes; digital and fully encrypted		
<b>Comfortable headsets?</b>	ComLeather and closed cell foam ear seals for comfort		
<b>Ingress Protection Rating</b>	IP65		
<b>Knowledgeable dealer?</b>	Dealers extensively trained to act as problem-solvers		
<b>Battery life</b>	24 hours of operation on a two-hour charge		
<b>Operating temperature</b>	-40° to +158° F		
<b>Microphone</b>	Noise-canceling electret		
<b>Battery charger and heavy-duty automotive charging cable</b>	Included		
<b>Warranty</b>	Two year standard; expandable to five years		