4. Speech Communication

Most of the important speech sounds are contained in the mid-frequency region. The intelligibility of speech depends on the intensity levels of the speech and the background noise. If the background noise is increased, the speech level also must be increased to preserve intelligibility. There is, however, an optimum intensity range for speech. The ear can discriminate small differences in intensity at normal speech levels better than at very high or very low levels. For noise levels above 100 db in the mid-frequency region, the speech level may be top-of-the-lungs volume at mouth-to-ear range without achieving intelligibility. Under these conditions, the speech intensity may reach the listener's threshold of pain.

The use of ear protection will reduce both the noise level and the speech level received by the ear. The ear will, therefore, operate in a more normal range. A direct comparison of the intelligibility of speech in noise with and without soft rubber ear plugs was performed at Harvard.[35] The conclusions were as follows:

1. that wearing of the plugs afforded welcome relief from the discomfort of exposure to intense noise;
2. that the annoyance of breath blasted into the ear, and the pain of shouting directed into the ear, are eliminated by use of properly fitted plugs;
3. that, when a brand of soft rubber plugs is worn in noise, the intelligibility of speech is at least as good as, and perhaps better than, the best performance of an unplugged ear;
4. that the maximal mouth-to-ear distance for intelligible speech is in nowise decreased by use of these plugs.

The above conclusions do not necessarily apply to the "filter" or "valve" type of ear plugs. These plugs have little noise reduction in the low frequency range and increased reduction in the highest two or three frequency bands. If the noise is primarily in these two or three bands, some increase in intelligibility will be gained by the filtering action of the ear plugs. If this is not the case, little improvement should be expected. For predominantly low frequency noise, this type of plug may even decrease intelligibility by attenuating the two higher speech bands, but not the noise. In addition, the mid-frequency region is a more important contributor to hearing loss than the high-frequency region.

5. Establishment of an Effective Ear Protection Program

An ear plug is only as good as its fit. Unless the ear plug is properly inserted before every noise exposure, the program will not be successful. Therefore, it is necessary that the employees be educated concerning the hazard of noise and carefully instructed as to the method of inserting ear plugs.

It is wise to present the employee with many different kinds of ear protection, and let him choose the type he likes best. Having had an opportunity to select his own ear protectors, the employee may feel a greater inclination to use them properly. In addition, there are wide variations in the shape and size of ear canals. No one plug can fit all ears.

It is especially difficult to "sell" employees on an ear-plug program when the noise is intermittent in nature. The desire or necessity to converse during quiet periods is inhibited if full protection for the noisy periods is maintained. It is tiring to use a raised voice if the only reason for its use is the set of plugs in the listener's ears. If the plugs are continually removed and reinserted, a proper fit probably will not be maintained. If under these circumstances the employees will not accept complete ear protection, the filter, helmet, or muff type of protection may be helpful.

There is no simple, positive way to police an ear-plug program. A periodic audiometric program will help to discover the unusually susceptible individuals and those who are careless about the wearing of ear protection. If a man shows a disproportionate threshold shift, his case should be investigated carefully. If improper ear protection or no protection has been worn, steps should be taken to see that good compliance with the program is obtained in the future. A combination of plugs and muffs may be used if the need for additional protection is indicated. In some cases these measures may prove inadequate and it will be necessary to remove the man from the noisy environment.