

TABLE 7 (continued)

3. Infectious diseases, such as mumps and meningitis, that usually occur during childhood.
4. Heavy dosage of certain drugs, particularly quinine, but individual susceptibility varies widely.
5. Mechanical damage from a blow on the head or an explosion.
6. Presbycusis, a permanent and progressive degeneration of the hair cells and/or nerve endings that normally accompanies advancing age.
7. Exposure to intense noise (see Section III.P).
- B. Lesions of the auditory nerve, usually caused by tumors.
- III. Disorders of the central nervous system.
- A. Organic changes that may accompany:
 1. Advancing age, including effects of arteriosclerosis.
 2. A skull fracture, penetration wound, brain tumors, multiple sclerosis, and cerebral palsy.
- B. Nonorganic disturbances:
 1. Psychogenic deafness, a kind of hearing loss that cannot be shown to involve any organic disorder and often may yield to psychiatric treatment.
 2. Malingering, the willful feigning of a hearing loss for gain, usually monetary.

Any such listing will be complicated by certain boundary-line disorders and cases of so-called "mixed" hearing impairment that cannot properly be placed entirely in one group. The table is not a complete catalogue, but most impairments important in adults are included. Disorders that may be present in the newborn infant are omitted because they are of little importance in the working population. For example, congenital malformation of any part of the auditory apparatus may be present at birth. Such disorders do not complicate industrial hearing conservation programs.

The diagnosis and specification of the cause of the disorder become, in general, more difficult in the groups headed "Receiving Apparatus" and "Central Nervous System." For many of these disorders the characteristics are not specific and the cause is incompletely known.

P. CHARACTERISTICS OF HEARING LOSS RESULTING FROM NOISE

Early losses in hearing sensitivity resulting from most industrial noise exposures ordinarily are not recognized by the individual and can be detected only by pure-tone audiometry. This is because the initial hearing loss is usually in the frequency range between 3000 and 6000 c.p.s. and does not noticeably affect the hearing for speech. As the impairment increases because of continued exposure to intense noise, losses begin to appear at 2000, 1000, and finally 500 c.p.s. When the hearing loss at these frequencies is sufficiently great, a reduction in the hearing for speech at conversational intensities is noted.

Hearing loss beyond the "range of normal" in an individual exposed to noise may represent a permanent hearing loss, but a certain amount of hearing sensitivity is often recovered when the individual is removed from the noise environment.

ment. Most of the improvement in the threshold will occur within a short time (probably less than a week) after removal from the noise.

There is good evidence to indicate that these shifts in the threshold of hearing are most obvious during the first year or so of noise exposure. A person who has not been in a noisy environment for long usually will show considerable improvement in his hearing following removal from the noise. Those with considerable hearing loss resulting from many years of noise exposure are likely to show only slight improvement.

There are two major pathways that conduct sound to the inner ear, the normal pathway and a bone pathway that circumvents the ear canal, the drum membrane, and the ossicles. Hearing by "bone conduction" through the skull is much less sensitive than hearing in the normal manner by "air conduction." A comparison of the bone- and air-conduction thresholds will often yield important diagnostic information about the condition of the conducting apparatus. For instance, a hearing loss by air conduction coupled with no hearing loss by bone conduction indicates a malfunctioning of either the external or middle ear, but not the inner ear. On the other hand, a person with a significant noise-induced hearing impairment will have a hearing loss by bone conduction as well as by air conduction.

Q. RELATIONS OF HEARING IMPAIRMENT TO NOISE EXPOSURE

Prolonged exposure to intense noise may cause a hearing impairment. The known data relating hearing loss to noise exposure are described in detail in a report by the American Standards Association.²⁰ Although insufficient data are available on exposure to noise that is either extremely intense, produced by impact or intermittent in nature, it is possible in other instances to make an estimate of the average of the pure-tone hearing losses that a group of workers may be expected to incur.

As yet there are insufficient data to describe properly the distribution of individual noise-induced hearing losses about the average for a given noise exposure. However, the susceptibility to noise clearly varies widely from individual to individual. Some severe noise exposures can cause either a negligible hearing impairment or almost complete deafness in an individual, depending upon whether he is highly susceptible or very resistant to impairment by noise.

Even if the information relating a noise exposure to the distribution of hearing impairments that it may produce were complete, it still would be impossible, without additional information, to estimate the practical seriousness of a noise exposure. The missing information is the relation between a man's pure-tone hearing loss and his disability resulting from the hearing loss. The number of people who can claim compensation for their hearing disability and the magnitude of their claims will depend upon which of the several methods of computation are

²⁰ The Relations of Hearing Loss to Noise Exposure, Z24-X2, American Standards Association, New York, 1954.