TABLE 2

Comparison of Scales of Sound Intensity and Loudness

Identification	Decibel scale of intensity	Arithmetic scale of intensity	ASA proposed loudness scale[108a]
Threshold of feeling (varies with frequency)	120	1,000,000,000,000	560,000
	110	100,000,000,000	220,000
	100	10,000,000,000	88,000
Pneumatic drill at ten feet	90	1,000,000,000	38,000
	80	100,000,000	17,000
	70	10,000,000	8,000
Ordinary conversation at three feet	60	1,000,000	4,400
	50	100,000	2,200
	40	10,000	1,000
Tick of watch at three feet	30	1,000	360
	20	100	100
	10	10	14
Threshold of hearing at 1000 cycles/sec. (energy approx. 10^{-16} w./sq.cm.)	0	1	1

A logarithmic scale is much more convenient than an arithmetic scale for sound-level measurements or comparisons, and the *decibel* (or *phon* in some countries) has been generally adopted as the logarithmic unit for sound measurements. The bel is the base-10 logarithm of actual sound intensity, which is simply multiplied by 10 for the more convenient decibel scale.

Sound measurement may be either objective or subjective. In the objective method, physical instruments record electrically the quantity of energy or acoustical pressure, while in the subjective method, the human ear is used as a sound comparator. The tuning fork and the audiometer are subjective instruments. They are usually employed to determine the masking effect of a sound or noise. Objective instruments may either determine the sound levels in decibels without regard to frequency, or they may be equipped to analyze noise according to its component frequencies. The latter type of instrument requires considerably more skill in operation and interpretation than does a sound-level meter.

IV. Sanitary Conditioning

A well-lighted, heated, and sound-conditioned factory or office is certain to be also a sanitary workplace, because employers and employees both have realized the needs for industrial sanitation much longer than they have understood the requirements for light, sound, and air conditioning. In fact, the state laws and city ordinances throughout the country have for several decades been quite specific on sanitary requirements in public places, and the agreement on specifications has been strengthened by the appearance in 1935 of a code approved by the American Standards Association and sponsored by the United States Public Health Service.[110]

[108a] Proposed Standards for Noise Measurement, as adopted June 26, 1933 by the American Standards Association Committee on Acoustical Measurements and Terminology. *J. Acoust. Soc. of Amer.*, *5*, 109 (Oct. 1933).

Many state departments of health and labor and other organizations have issued bulletins on such subjects as housekeeping,[111] industrial waste disposal, drinking facilities, toilet facilities, cross connections between industrial and potable water supplies,[112, 113] and the hazards of back siphonage due to improper plumbing, as well as the installation of tanks or vats of dangerous liquids in a manner that permits their contents to enter the drinking-water-supply system.

"The Installation and Maintenance of Toilet Facilities in Places of Employment" is the subject of a very thorough survey of the provisions of state laws throughout the country.[114] A similar survey has been made on "Sanitary Drinking Facilities, with special reference to drinking fountains."[115–117]

Figure 5 indicates the type of information required for the proper location of industrial sanitary facilities. Some codes and laws are definite concerning space requirements and clearances, and they should be consulted to avoid conflicts and oversights when remodeling or building.

Industrial eating facilities generally are required to comply with the ordinances or laws relating to public eating places in force in the vicinity, which are designed along the lines of well-developed communicable disease-preventive technics.[118] The necessity for rapid feeding of large groups of industrial workers has accentuated the requirement of strict control of sanitary conditions in factory cafeterias.[119]

The sanitary engineer is a specialist whose services are just beginning to enter large-scale industry as a professional entity. His employment in the past has generally been in the capacity of complete engineering control of environmental conditions following a period of specialized training in industrial hygiene technics. However, the problems of food, water, and milk control, and sewage and waste disposal in large industrial properties are becoming extensive enough to deserve

[110] (Industrial sanitation in manufacturing establishments), *ASA Code Z4.1-1935*. Sponsored by U.S. Pub. Health Service, New York.

[111] R. F. Vincent, *The Industrial Housekeeping Manual*. Natl. Foremen's Institute, New York, 1945.

[112] R. F. Goudey, *J. Am. Water Works Assoc.*, *33*, 39 (1941).

[113] F. M. Dawson and A. A. Kalinske, *Report on Plumbing Cross-Connections and Back-Siphonage Research*. Natl. Assoc. Master Plumbers, Washington, D.C., 1938.

[114] *Women's Bureau, U.S. Dept. Labor Bull.* No. *99* (1933).

[115] *Women's Bureau, U.S. Dept. Labor Bull.* No. *87* (1931).

[116] "Final Report of the Joint Committee on Plumbing of the Public Health Engineering Section of the American Public Health Association and the Conference of State Sanitary Engineers, October, 1930," *U.S. Pub. Health Repts.*, *46*, 170 (1931).

[117] "Final Report of the Committee on Sanitary Drinking Fountains," *J. Am. Water Works Assoc.*, *11*, 483 (1924).

[118] *U.S. Pub. Health Bull.* No. *280* (1943).

[119] J. M. Lents, *Factory Management and Maintenance*, *103*, 124 (Dec., 1945).