Designation: E1110 – 06

Standard Classification for Determination of Articulation Class[1]

This standard is issued under the fixed designation E1110; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This classification provides a single figure rating that can be used for comparing building systems and subsystems for speech privacy purposes. The rating is designed to correlate with transmitted speech intelligence between office spaces.

1.2 Excluded from the scope of this classification are applications involving female speakers or children,[2] languages other than English, and sound spectra other than speech. Thus excluded, for example, would be comparisons of building systems or subsystems for their effectiveness in reducing transmitted noise from machinery, industrial processes, bowling alleys, music rooms, places of entertainment, and the like.

NOTE 1—Published work by Pearsons, et al, may eventually permit the restriction on female speakers to be relaxed.[3]

2. Referenced Documents

2.1 *ASTM Standards:*[4]

E1111 Test Method for Measuring the Interzone Attenuation of Open Office Components

2.2 *ANSI Standard:*

S3.5 –1969 Methods for the Calculation of the Articulation Index[5]

3. Summary of Classification

3.1 Articulation class (AC) is the sum of the weighted sound attenuations in a series of 15 test bands. It is calculated as follows:

$$AC = \sum_{f_i} A(f_i)w(f_i) \quad (1)$$

where:

f_i = the center frequency of the bands from 200 to 5000 Hz,

$A(f_i)$ = the measured attenuation in decibels in the one-third octave band with center frequency f_i, and

$w(f_i)$ = the weighting for that band, from Table 1.

3.2 The sound attenuation for each band is determined in accordance with Test Method E1111. In Test Method E1111 interzone attenuation is substituted for sound attenuation.

4. Significance and Use

4.1 Each weighting factor given in Table 1 represents the fraction of overall speech intelligence contained within the associated one-third octave frequency band.

4.2 The weighting factors in Table 1 are obtained by multiplying each individual one-third octave band weighting factor of ANSI S3.5-1969 by 300. Articulation class (AC) values are thus related to but distinctly different from articulation index (AI) values. In particular, the AC considers only the effect of signal attenuation; while the AI considers such additional factors as speech level and spectrum and background sound level and spectrum.

NOTE 2—The AC is similar to the DAI rating proposed by Warnock[6] and has been shown to correlate with AI values derived from ANSI S3.5, except where the AI approaches 1 or 0 (AI values range between 1 and 0 and approach 0 with increasing privacy and nonintelligibility). Articulation class values give the reverse. They usually exceed 100 and increase with increasing privacy and nonintelligibility. Extensive comparison between AC ratings and subjective judgments of open-plan speech privacy has not yet been accomplished.

5. Presentation of Results

5.1 The AC shall be reported to the nearest multiple of ten. It is recommended that the AC be reported together with the unweighted sound attenuation for each test frequency band and other data required for the appropriate sound attenuation test method.

6. Keywords

6.1 architectural acoustics; articulation class; open office; open-plan space; sound attenuation; speech privacy

[1] This classification is under the jurisdiction of ASTM Committee E33 on Environmental Acoustics and is the direct responsibility of Subcommittee E33.02 on Open Plan Spaces .

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[2] This is based on a similar exclusion in ANSI S3.5.-1969 which is no longer published.

[3] Pearsons, K. S., Bennett, R. L., and Fidell, S., "Speech Levels in Various Noise Environments," *National Technical Information Service Research Report,* PB-270 053, 1977.

[4] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[5] No longer available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[6] Warnock, A. C. C., "Studies of Acoustical Parameters in Open-Plan Offices," *Journal,* Acoustical Society of America, Vol 63, 1978, pp. 832–840.