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Australian Standard®

ACOUSTICS—METHODS OF ASSESSING AND PREDICTING SPEECH PRIVACY AND SPEECH INTELLIGIBILITY

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Association of Australian Acoustical Consultants

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CSIRO Division of Building Research

Department of Employment and Industrial Relations

Department of Public Works

Experimental Building Station

Institution of Engineers Australia

Public Works Department, W.A.

Royal Australian Institute of Architects

Royal Melbourne Institute of Technology

State Pollution Control Commission, N.S.W.

University of Adelaide

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PREFACE

This standard was prepared by the Association's Committee on Architectural Acoustics. It describes objective and subjective methods of estimating speech intelligibility and predicting speech privacy and applies to the determination of speech intelligibility in auditoriums, class rooms, lecture rooms, conference rooms, etc, and speech privacy conditions in offices, conference rooms, hotels, motels, dwellings, and schools.

The results obtained using the methods in this standard should be used with caution because of their limitations.

During the preparation of this standard reference was made to ANSI S3.14—1977, Rating Noise With Respect to Speech Interference.

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for

ACOUSTICS–METHODS OF ASSESSING AND PREDICTING SPEECH PRIVACY AND SPEECH INTELLIGIBILITY

FOREWORD

Speech intelligibility and privacy depend on many factors, including acoustic factors, such as—

(a) the level of the speech signal, its frequency spectrum;

(b) space characteristics, such as reverberation and ambient sound level;

(c) non-acoustic factors, such as the type of message, talker and listener characteristics, choice of test material, etc; and

(d) random and quasi-random factors, such as individual differences between talkers and listeners, the effect of randomization of speech test material, etc.

Because of the above factors, caution should be exercised in the application of this standard and the results therefrom.

The following objective and subjective methods of predicting or assessing speech communication and speech privacy are described in this standard:

(i) *Objective methods of predicting speech communication.*

A. Determination of the speech interference level (*SIL*) of an ambient sound and relating this to the maximum distance over which it is estimated that reliable speech communication may take place.

B. Determination of the overall ambient sound pressure level, in decibels(A), and relating this to the maximum distance over which it is estimated that reliable speech communication may take place.

C. Determination or prediction of the articulation index (*AI*) and relating this to the possibility of understanding connected speech.

(ii) *Subjective method of assessing speech communication.* Direct measurement of the percentage speech intelligibility (*SI*) using a test crew of talkers and listeners and selected speech material and relating this to the possibility of understanding connected speech.

(iii) *Objective method of predicting speech privacy.* Prediction of the estimated acceptability of the acoustic environment with respect to speech privacy, account being taken of such factors as vocal effort, source and receiving area characteristics, attenuation between source and receiving area, and ambient sound pressure level in the receiving area.

(iv) *Subjective method of assessing speech privacy.* Direct measurement of the percentage speech intelligibility (*SI*) using a test crew of talkers and listeners and selected speech material, and relating this to the articulation index (*AI*) and thence to an assessment of the degree of speech privacy.

The acceptability of a speech communication/privacy condition depends on the conditions being investigated and in particular on the type of message being communicated. The greater the redundancy of information content in an ensemble of messages, the greater will be the intelligibility of communication in a particular acoustic environment. Conversely, lack of familiarity with a language, or with the vocabulary used on the part of the talker and/or listener, or the presence of a hearing disability in the listener, will have a significant effect on the acceptability or otherwise of a communication environment.

Generally speech levels vary widely for different talkers and a standard deviation of 6 dB is typical, thus both speech communication and speech privacy may be significantly altered according to the individual talker's speech level. Speech communication is also affected by the clarity of enunciation and speed of delivery of individual talkers. For speech privacy, the nature of the task performed by the listener will also affect the acceptability of the situation.