

Acoustics of Auditoriums in Public Buildings
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Table of Contents

Chapter 1. Principal Acoustical Characteristics of Auditoriums and Concert Halls

- 1.1 Pattern of Sound Reflections
- 1.2 Reverberation Time
- 1.3 Diffusion of the Sound Field

Chapter 2. Evaluating the Acoustical Quality of Auditoriums

- 2.1 Subjective Evaluation of Speech in Auditoriums
- 2.2 Objective Methods of Evaluating Speech Intelligibility
- 2.3 Methods and Criteria for Subjective Evaluations of Halls for Musical Programs
- 2.4 Correlation of Subjective and Objective Measures for the Evaluation of Halls for Musical Performances
- 2.5 Objective Evaluation of Interfering Acoustical Effects

Chapter 3. Engineering Procedures for the Acoustical Design of auditoriums

- 3.1 Prediction of Geometrical Reflections
- 3.2 Prediction of Reverberation Time
- 3.3 Sound Absorbing Material and its Location
- 3.4 Prediction of Acoustical Measures
- 3.5 Elimination of Interfering Acoustic Factors

Chapter 4. Utilization of Scale Models in Auditorium Acoustics

- 4.1 Similarity Conditions in Simulation
- 4.2 Scale and Materials of Models
- 4.3 Sound Sources and Receivers for Modeling
- 4.4 Subjective Evaluation of the Acoustics of Rooms Using Scale Models
- 4.5 Acoustical Measurements in Scale Models

Chapter 5. Acoustical Design of Rooms of Various Function

- 5.1 Auditoriums for Speech
- 5.2 Halls for Musical Programs
- 5.3 Rooms for Combinations of Speech and Musical Programs

Chapter 6. Examples of Acoustical Designs

- 6.1 Soviet Army Academic Theater Hall
- 6.2 Hall of the Children's Musical Theater
- 6.3 Universal Hall in Havana
- 6.4 Cinema-Concert Hall of the Culture Palace in Zelenograd
- 6.5 The "Druzhba" ("Friendship") Hall in Moscow

References

Introduction

One of the main goals of architectural acoustics is to provide optimum speech intelligibility and sound quality in auditoriums of public buildings. Acoustical input is required in the construction of new buildings and during the refurbishment of existing buildings whether they are general purpose or specialized facilities. A proper acoustical solution is particularly important for those halls where most activities take place without electro-acoustical sound reinforcement. However, favorable acoustical conditions are also quite important in halls where sound amplification systems are used.

At earlier stages in the development of architectural acoustics, the acoustical design of halls was reduced mainly to providing an optimum reverberation time. However, further technical developments and experiences of people operating halls have shown that it is not sufficient to consider only reverberation time. This is especially true for the assessment of acoustical conditions in particular areas of the development of new local criteria of acoustical quality related to the diffusion of the sound field as well as to the details of sound reflections. These new criteria were developed in studies of the correlations between objective acoustical parameters and subjective evaluations. Acoustical prediction techniques have also improved acoustical measurement methods. In addition to the analysis of the acoustical parameters that include the specific features of the initial portion of the reverberation process. The more common use of acoustical scale models

has made it possible to more precisely predict the acoustical quality of auditoriums. The further development of acoustical design techniques remains a current challenge.

Despite considerable advances in auditorium and concert hall acoustics, the goal of providing good acoustical conditions in halls appears to be not so simple. In halls for musical performances, the relation between objective acoustical characteristics and subject evaluations of acoustical quality is still not clear enough. Particular difficulties arise in acoustical designs related: to the large dimensions of halls, to multi-purpose requirements, and to the necessity to observe a compromise between the acoustical and other technological requirements. One should also not forget that the success of an acoustical design depends to a considerable extent upon how completely the acoustician's recommendations are followed in carrying out the design. Ignoring, or partial acceptance of recommendations usually leads to acoustical deficiencies in the hall.

Recently, studies in the field of auditorium acoustics have attracted particular attention. In the Soviet Union, the Research Institute of Building Physics (NIISF) is the leading institution conducting such studies. The most important developments are associated with acoustical measurement methods (particularly impulse techniques), with scale and electro-acoustical modeling, as well as with problems of predicting and evaluating the acoustical quality of spaces for various functions. In addition to scientific developments, the direct participation of NIISF in the design and construction of unique halls is also of great importance. The following are examples among the works executed with NIISF taking part: renovating the great hall of the Soviet Army Central Academic Theatre, Moscow; halls of the Union House and Moscow State Conservatoire; as well as new constructions such as the Universal Hall in Havana, the Hall in the Moscow Children's Theater, halls of the Culture Palace in Zelenograd, sports halls of the 1980 Olympic Games, and a number of others.

The current book is an attempt to elucidate problems related to acoustical quality in halls of public buildings in terms of the current state of the art in architectural acoustics. Acoustical properties of spaces are discussed and many objective acoustical measures are presented. Methods of evaluating the acoustical quality of spaces for speech and musical programs are analyzed in detail. In this book, much attention is paid to the methods of the acoustical design of auditoriums including scale modeling. Examples are also given of acoustical solutions carried out in full-scale halls.

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