

ROADSIDE DESIGN to REDUCE TRAFFIC NOISE

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Highway landscape development is concerned with the complete development of the highway right-of-way and its environment—those factors that make for safe and pleasant driving as well as pleasant residential living along the highway. Roadside improvement is concerned, therefore, with the abatement of highway noise and fumes in direct relation to the uses of property abutting the highway. Highway Research Board Bulletin 110, issued in December 1955, as Publication 363, contains three separate studies. The two reports of 1953 and 1954 by the Special Task Committee on Roadside Design to Reduce Traffic Noise, Dust, and Fumes are combined with one paper on motor vehicle noise studies by D. M. Finch, Research Engineer, University of California. This bulletin brings under one cover (a) a review of what has been accomplished, (b) a summary of the present status of technical aspects in relation to highway noise, and (c) a proposed program for field tests to measure and evaluate noise-abatement methods. Before discussing the types of field tests that might be carried on in 1956, however, a resume of meetings during 1955 on the problem of noise should be helpful to those interested in the abatement of highway noise.

The year 1955 has witnessed increased activity through the publication of papers on noise and its control presented at meetings held in several cities across the country. The programs of these meetings are included in "Noise Control," a new publication of the Acoustical Society of America. The first issue of this magazine (Vol. 1, No. 1) appeared in January 1955. The magazine is directed to the reader who needs to know about noise control, whether he is an engineer, the manager of a factory, or an architect.

The highway engineer desiring to keep informed of current trends and achievements in the field of outdoor noise may be interested in the following articles published in "Noise Control" during 1955 (since Bulletin 110 was issued):

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"Fundamentals of Noise Control," pp. 10-18. This paper provides a common-sense approach to noise problems for the non-acoustically trained person. Although noise control can take many forms, only careful analysis will lead to the best solution to a particular problem.

"Twenty-Five Years' Research in Outdoor Noise," pp. 20-24 (see also HRB Bulletin 110, p. 13, selected reference 5). Perhaps the most significant trend in outdoor noise in the last 25 years has been the great increase in transportation noise. The automobile has brought about a great exodus from the city to the suburb, and noise-conscious engineers are trying to do something about the control of noise, still a big problem to the community.

"A Community's Reaction to Noise: Can It Be Forecast?", pp. 63-71. One of the authors of this excellent article is chairman of an exploratory subcommittee set up by the American Standards Association to investigate criteria for noise control in the realm of community living. Recognizing the suburbanites' desire for peace and quiet as an accepted ideal of community living, the Composite Noise Rating is presented as a possible way to assess the community's reaction even before the noise is turned on.

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This issue contains the papers presented at the Fifth National Noise Abatement Symposium, held in Chicago in October 1954, including discussions of quieter automotive vehicles and truck noise abatement (see also HRB Bulletin 110, p. 40, reference 5). The continuing efforts of automotive engineers to design vehicles which are quiet both inside and out has led to the attack on road rumble, axle noise, and tire noises, in addition to further attention to the reduction of exhaust noise through the use of new muffler design techniques.

Vol. 1, No. 3—May 1955

Papers in this issue were presented at the West Coast Noise Symposium, held in Los Angeles in December 1954. These include discussion of the "jargon" of the acoustical engineer and physicist which often shrouds the basic physical properties of noise in what appears to those in other fields to be complex terminology. The description of these relatively simple properties is exemplified by some easily performed experiments (p. 14). The various modern instruments for measuring noise are described and illustrated, and their purposes and ranges of application are outlined (p. 16). Techniques for noise measurement and evaluation of data are presented on page 22.

In the past five years there has been an unprecedented demand for more information and action on noise control. Steps now being taken to make living conditions quieter and therefore more healthful are described on page 34 under the title "Noise Abatement Comes of Age."

Vol. 1, No. 4—July 1955

Second two-week "Special Summer Program on Noise Reduction," p. 55. This program was given August 15-26, 1955, at Massachusetts Institute of Technology to present the latest developments in the field of noise reduction.

On page 45 appear reviews of two books: "Noise Simplified," and "Handbook of Noise Measurement."

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The best time to apply noise-control measures is in the design stage. Site selection, layout, and related techniques all influence the noise environment. The influence of terrain on sound traveling to the neighbors is discussed and illustrated on page 60 in the paper titled "Plant Planning for Noise Reduction," p. 58.

A summary of the West Coast Noise Symposium is included on page 64.

Vol. 1, No. 6—November 1955

Industrial zoning with regard to performance rather than use is a relatively new concept in city planning. The noise-level requirements for the City of Chicago are analyzed and the proposed code standards outlined on page 14 in the paper titled "Proposed City Zoning Performance Standard for Noise in Chicago."

On page 40 are presented "Some Observations on Small-Town Noise," such as: How quiet is a small town? Here is a report on the noise levels of a typical small town measured in a wide variety of locations within the town.

The Sixth Annual National Noise Abatement Symposium was held in Chicago in October 1955, followed by the Second Annual West Coast Noise Symposium in Los Angeles in December 1955.

The foregoing selections of articles have been cited as an aid to those to whom noise presents practical problems. In the related problem of fumes there is cited

also an article from the "Southwest Technical Calendar" for September 1955. This recent article presents the need for research and cooperative effort as the solution to "Air Pollution—Major Urban Problem."

Urbanization has not brought about an improvement in all aspects of modern living. For example, the disposal of wastes as a community function essential to community health and well-being is in most respects accomplished satisfactorily; however, those wastes that are collected and normally carried away by the air have received relatively little consideration until recently.

Southwest Research Institute has conducted three research programs relative to the smog problem in Los Angeles. The second and third programs were devoted to the control of automobile exhaust emissions. Experience gained thus far has shown that the problem is not to be solved except through a tremendous concerted research effort supported and financed by industry and the public. To date, industry, the Air Pollution Foundation, and a host of other groups have made considerable headway in solving this very serious and fundamental problem of urbanization. Recent Congressional approval of an appropriation for \$25,000,000 to be used by states and localities during the next five years to combat air pollution constitutes significant reinforcement to those who have been working with the problem.

The concluding paragraph of this article is quoted: "Unless timely research is conducted and air pollution is abated, the histories of the future may some day equate the urbanization of human activity with the suffocation of human communities."

To return to the discussion of types of field tests that might be carried on during 1956 for the abatement of highway noise:

Field tests needed for evaluation of highway noise abatement methods are outlined on pages 37-39 of Highway Research Board Bulletin 110. On page 38 of this recently distributed bulletin are listed a number of types of roadside tests to determine effectiveness in abating noise, such as:

1. Open highway section without trees or buildings (compared with 2).
 - A. Open level section.
 - B. Depressed section.
 - C. Raised section (embankments).
2. Highway section with buffer planting (measurements compared with 1).
 - A. Narrow type: 15- to 25-ft. width of buffer for short distances only.
 - B. Basic type: 25- to 35-ft. width of buffer recommended minimum.
 - C. Wide type: 35- to 45-ft. width desirable for effective results.
3. Highway section with retaining walls.
 - A. Face of wall bare (compared with B).
 - B. Face of wall covered with heavy growth of vines.
 - (1) Without any planting above the wall (compared with (2)).
 - (2) With planting above or back of the top of wall.

Distances from source should be uniform in the respective series of comparative field tests. For example, the microphone might be located 5 ft. above the ground in each case and, say, 75 ft. from the center line of the traffic lane used by the vehicle (nearest traffic lane).

A companion set of measurements might also be taken twice this distance from the source, say at 150 ft., and, if desired, at double this distance, say at 300 ft. from the center line of the traffic lane.

Equipment for testing procedures is listed in Table 2 on page 36 of Bulletin 110.

Units of measurement should be uniform throughout, as suggested, in order that the various field tests may be correlated and compared for evaluation.