Progress Report on Noise Abatement: 1961

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In 1952 the Highway Research Board set up a special task committee to conduct a study on roadside design to reduce traffic noise, dust, and fumes. This special task committee made its preliminary study during 1953. This initial study on abatement of highway noise with special reference to roadside design was published the following year in the 1954 Annual Report of the Committee on Roadside Development, pp. 55-78. A condensed version of this first report on "Abatement of Highway Noise with Special Reference to Roadside Design" is included in HRB Bulletin 110, pp. 1-14 (1955).

The second report of the special task committee on roadside design to reduce traffic noise, dust, and fumes is contained in this same publication (HRB Bulletin 110, pp. 34-47).

Two supplemental reports have been issued on abatement of highway noise with special reference to roadside design. The first supplemental report was published in the 1959 Report of the Committee on Roadside Development, pp. 25-26. The second supplemental report appeared in the 1960 Report of the Committee on Roadside Development, pp. 9-10. Both of these supplemental reports included supplemental references covering the 1956-1958 and 1958-1960 periods. Selected Bibliographies on Vehicle Noise and Fumes were published by the Highway Research Board in 1958. The status of the problem of vehicle noise control is well presented in summary form on pages 1 and 2 of HRB Bibliography 22 which includes a complete list of references on the subject up to the time of publication in 1958

It is logical that these references deal largely with the problem of stopping traffic noise at the source; that is, most consideration is given to those aspects of the problem concerning vehicular design and maintenance. The control of traffic noise, however, from the standpoint of highway design has not received as much attention. It seems reasonable that the benefits that may be attained from improved highway design should generate benefits that supplement those obtained from proper vehicle design and maintenance, especially in the more critical highway sections where additional relief from traffic noise is required. Improved roadside design is needed to abate the noise, generated by heavy volumes of traffic, that is particularly annoying to dwellers on abutting property. Extra protection should be afforded for residence properties, motels, hotels, hospitals, schools, and the like.

Field tests are needed for general uniformity and agreement on acceptable noise levels for different land-use areas (industrial, commercial, and residential) through which new highways may be located. Roadside tests are needed for determining the most effective and economical methods for abating highway noise to abutters. Types of conditions for roadside tests to determine effectiveness of various methods of abating noise are outlined on pages 38 and 39 of HRB Bulletin 110.

Such field tests will aid planners of arterial routes in their aim to keep traffic noise to a minimum where locations are near developed residential communities or through potential neighborhood areas. Such roadside tests will aid in evaluating the effect of plantings of different types and design for abatement of traffic noise. Through such tests, highway engineers would gain a better understanding and appreciation of the advantages of depressed roadways and of retaining walls with and without sound-absorptive vines and other vegetative cover for the purpose of noise abatement as a functional part of complete highway design.

ENGINEERING THE HIGHWAY ENVIRONMENT FOR NOISE ABATEMENT

There is a double advantage in applying these methods of abatement to modern highway planning in and near residential areas. Hedges and trees properly located along traffic arteries not only can have a highly aesthetic value and serve as purifiers of the air and as traps for dust and exhaust fumes, but they can also effectively deaden the noise of traffic. This has been proved by extensive tests carried out by the Acoustical Laboratory of the Medical Academy in Dusseldorf, Germany, in collaboration with local associations for nature conservation and the combating of noise. Published reports on these investigations indicate that the following provisions are steps in the right direction:

1. Planning of throughways so that the road surface is slightly below the surface of surrounding territory, together with provision of planted roadside slopes to absorb sound and deflect it upward.
2. Where such major roads pass through wooded areas, provision of breaks through the trees parallel to the flow of traffic.
3. Provision of staggered rows of grass strips, hedges, and trees along the highway. It was found that alternating rows of conifers and broadleaf trees was especially effective in dispersing and absorbing sound waves in the frequency range produced by mixed vehicular traffic.

TRAFFIC NOISE SURVEY

Early in 1960, the Department of Highways and Traffic of the District of Columbia initiated a highway traffic noise survey within the District to ascertain:

1. The existing noise levels for varying land uses, street intersections and highway conditions in various areas.
2. The variance in existing noise levels by location, by time of day and by varying distances from the centerline of adjacent roadways.
3. Noise levels acceptable to the public for varying land uses under varying types of highway conditions.
4. The existing noise levels at predetermined locations on and adjacent to proposed Innerloop Freeway.
5. The expected noise levels on and adjacent to the Innerloop Freeway after construction.

The agreement with the "consultant" provides for the selection of nine separate areas for appropriate study along major proposed Federal-aid highway routes, each of which includes an existing park and school site. The nine areas will comprise three residential, three light industrial, and three downtown business areas. Where feasible, the noise measurements will be conducted at each location at the curbline and at distances of 75, 100 and 200 feet measured from the centerline of the roadway.

It is hoped that the findings of this current study may be reported during the coming year, including methods of noise reduction applicable to the urbanized type of highway construction program in the District of Columbia; the effects of highway features, such as walls, barriers and other special design features; the effects of landscaping such as types of planting, distances from roadway, etc.; and a comparison of increase in traffic flow to increase in traffic noise.

A list of recent references on traffic noise follows.

1. "Plants Deaden Traffic Noises." Arborist's News, Volume 25, No. 10, pp. 78-79, October 1960. Reprinted from "Trees in South Africa," April-June 1960. "The steady increase of traffic-produced noise in and around cities has induced many countries to take energetic steps to combat this disturbing by-product of our modern way of life. Growing attention is paid to improvements of silencing systems and to their enforced use by the main offenders. Fortunately, there remain other methods of countering these noises, which can be applied in the meantime while there is hope that science one day will provide us with more silent means of transportation..."
2. Kuyten, K.D., "The Meaning and Measurement of Perceived Noise Level." Noise Control, Volume 6, No. 5, pp. 12-27, September-October 1960. The term "perceived noise level" was first derived to intercompare the relative noisiness of jet and propeller airplane noise as heard by listeners. A number of other types of noises, taken from the acoustic literature, are analyzed and presented in terms of perceived noise levels and loudness levels. Calculated perceived noise levels seem to agree better than calculated noise levels with subjective comparisons of these noises.
3. Wiener, Francis M., "Experimental Study of the Airborne Noise Generated by Passenger Automobile Tires." Noise Control, Volume 6, No. 3, pp. 13-16, July-August 1960. To measure and analyze airborne tire noise, a microphone, equipped with a windscreen, was mounted near the tire-road interface on the rear fender of a typical passenger automobile. Noise levels were measured for the car coasting from a speed of about 60 mph down to 15 mph with the engine off and transmission in neutral. Two degrees of road roughness and several different materials of tire construction were used in the tests. Noise levels and noise spectra are given in the paper for several test conditions.
4. Miller, Laymon N., "A Sampling of New York City Traffic Noise." Noise Control, Volume 6, No. 3, pp. 39-43, May-June 1960. Measurements of street noise were made from the upper floors of three hotels in New York City. The data show excursions of maximum and minimum noise levels for typical day and night conditions.
5. Anderson, Floyd C., "Subjective Noise Meters." Noise Control, Volume 6, No. 1, pp. 7-10, January-February 1960. Article describes meters under development to make direct readings of such subjective ratings of noise as loudness, loudness level, and speech interference level.
6. "A Primer of Noise Measurement." General Radio Company, West Concord, Massachusetts. 4"x7" booklet, 24 pages, 1959. This pocket-size booklet is written for the many people who are anxious to know something about noise reduction but who lack either the time or the background necessary for a detailed, formal treatment of the subject.... Whatever your noise problem, the best way to start out is with a clear understanding of the principles involved and in that way avoid the expense of wrong guesses. Headings include: What is Sound? Sound-Pressure Level. The Sound-Survey Meter. Maintenance of the Sound-Survey Meter. About These Weighting Networks. Techniques of Use. Speech Interference. Annoyance. Hearing Damage. Other Uses. Other Equipment. Noise-Reduction Methods. Conclusion.
7. Richards, E.J., "Noise Annoyance and Its Assessment." Engineering (Great Britain), 190: 4925, pp. 362-364, September 9, 1960.
8. "Swedish Campaign Against Traffic Noise." State Transport Review (Bombay, India), 10: 6, pp. 16-17, February 1960.
9. Nordqvist, Stig., "Will Noise be Sound at a Distance of 300 Feet?" (Blir Buller Ljud pa 100 m Avstand?) Svenska Vagforeningens Tidskrift (Sweden), 46: 5, pp. 197-202, June 1959. (English Summary, p.236.)

10. Neal, H.R., "Battle Against Noise Goes On." Iron Age, 183: 22, p. 83, May 28, 1959. (Engine and Road Noise Largely Overcome by Acoustical Engineers.)
11. California. Legislature. Assembly. Interim Committee on Transportation and Commerce. "Report on Motor Vehicle and Highway Problems." Sacramento, Assembly of the State of California, 1959. 60 pages. (Truck and Passenger Car Noises, pp. 50-51; Siren Noises, pp. 51-53.)
12. "Noise: Symposium held at the Institution of Mechanical Engineers." Engineering (Great Britain), 186:4835, p. 608, November 7, 1958. (Includes noise from vehicles.)
13. Thomas, Dean G., "Truck Exhaust System Noise - Problems and Solutions." New York, Society of Automotive Engineers, 1958, 16 pages. (Preprint of paper for presentation at SAE summer meeting, June 8-13, 1958.)
14. Meister, F.J., "Measurement of Traffic Noise in West Germany." Journal of the Acoustical Society of America, 29: 1, pp. 81-84, 1957. Building Science Abstracts, 30: 7, p. 224, July 1957. Highway Research Abstracts, 28: 3, p. 3, March 1958.