Michigan Department of Transportation - M•DOT

Mates

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MDOT'S HIGHWAY NOISE PROGRAM

The Department's highway noise mitigation and abatement program is focused on complying with Federal noise level requirements, addressing public concerns, resolving day-to-day noise problems, and providing training in noise enforcement.

Noise is unwanted sound. Congress recognized it as an environmental pollutant and passed the Noise Control Act of 1972. The act mandated that the government establish acceptable noise limits for aircraft, railways, highways, household appliances, and noise exposure in the work place. The Federal Highway Administration (FHWA) established guidelines to minimize the impact of noise associated with the construction and operation of highways. In 1974, the Environmental Protection Agency regulated maximum allowable noise levels for trucks engaged in interstate commerce.

In 1976, the FHWA promulgated highway noise legislation in the Federal-Aid Highway Program Manual (FHPM), establishing maximum recommended noise levels. The present authority for noise abatement is Title 23 Code of Federal Regulation, Part 772. These standards of measurements are in decibels and are "A" weighted (dBA). The units are logarithmic, and the "A" weighting is the filtering of sound to simulate the response of the human ear. Noise level equivalent (L_{eq}) is the noise descriptor used to define the average sound pressure level over a one-hour period. These descriptors are used to describe the noise level along highways. The FHWA established four land-use categories and their maximum allowable noise levels: commercial (72 dBA), residential (67 dBA), special areas (57 dBA), and interior residential (52 dBA). The FHPM also provided for FHWA participation in the cost of providing noise abatement when included in the roadway design. Figure 1 is a picture of a recent noise abatement project along I 696 in Royal Oak.

Figure 1

Federal legislation defines two types of funding. It established Type I funding for building new roadways or for adding additional lanes to existing roadways. MDOT must consider noise mitigation and abatement for these projects and include the recommendations in an environmental impact statement. Type II funding is available for retrofitting existing roadways with noise abating structures. Noise mitigation for this second group of roadways is voluntary and requires the establishment of state guidelines to define eligibility requirements and prioritize sites. In Michigan, the first inventory identified over 1000 sites (300 miles in length) which exceeded the FHWA noise criterion for residential areas (70 dBA).

Type I (new construction) projects require the preparation of environmental impact statements which address the noise issues associated with the selection of the best of the alternate routes. We calculate noise levels for the new facility using projected traffic volumes, speeds, and percent of commercial vehicles, together with geometric data. The department uses federally approved noise prediction procedures to determine whether noise abatement is warranted and economically justifiable. Since the beginning of the Type I program in 1976, the Department has constructed 19 miles of noise abatement structures along new, rebuilt, or widened roadways.

Noise barrier structures utilize earthen berms, wood, metal, precast concrete slabs, masonry brick and concrete block. Construction costs range between $200 and $350/lin ft, depending upon material, location, and the amount of traffic control required during construction. In one unique project along I 696 between I 75 and I 94, noise abatement consisted of noise-insulating about 200 homes. In this area, homes fronted on a two and three-lane service drive immediately adjacent to the six-lane depressed freeway. Noise levels were approximately 10 dBA above the Federal criterion for residential areas. It was not feasible to provide noise abatement by constructing our usual noise walls; therefore, MDOT provided each of the affected homes with attic insulation and central air-conditioning. Thus, during warm weather, windows may be kept closed to reduce the intrusion of traffic noise. This was an innovative approach to solving a difficult problem.

Current MDOT guidelines only consider residential sites having noise levels above 67 dBA which existed before the highway and where the cost of abatement averages under $27,000 per home. The current inventory of sites eligible under the latest guidelines includes 108 residential areas. Present MDOT policy provides funding for one Type II noise abatement project each year. These projects have a history of being very expensive -- about $1 million each. Michigan has built about 16 miles of noise barrier for Type II sites.

The Department receives an average of 100 noise complaints every year. Complaints originate from cities, legislators, or homeowners. Most are requests for the construction of noise barriers. However, some are related to construction noise, rumble strips, noisy pavements, and loud vehicles.

Highway construction can produce noise which is irritating to nearby residents. Without proper operation and attention, air compressors, pile drivers, haul vehicles, and other construction equipment can produce unnecessary noise. Pavement breaking equipment, jackhammers, and pavement milling machines can be especially noisy. In order to minimize these effects, construction specifications limit the allowable noise levels for construction equipment, hours of operation, and trucks. Figure 2 shows a concrete plant located on the I 696 construction project in Oak Park. This portable batch plant operated under restricted hours.

When drivers use concrete shoulders, they drive over rumble strips placed in the shoulder to alert motorists when they leave the main roadway. For residents located close to the roadway, the noise created by tires passing over these rumble strips is severely annoying. As a

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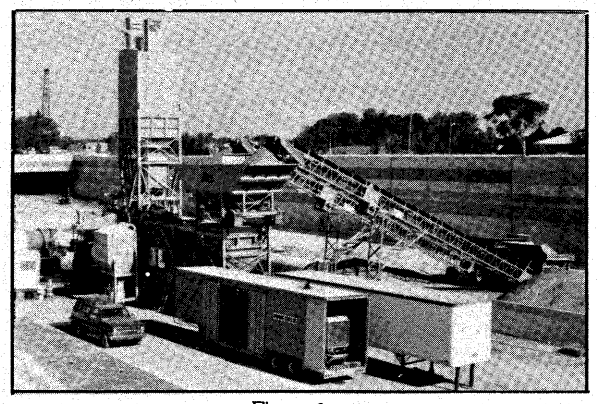

Figure 2

result, MDOT has required the contractors to place temporary sand-asphalt mixtures in the grooves of the concrete to minimize the sound. On one construction project a few years ago, the tining procedure (used to provide a friction-enhancing surface) resulted in a roadway surface which produced a loud, distinct sound when traversed by a vehicle. The frequency of the sound was similar to high C (520kHz). Motorists would frequently stop their cars and inspect their tires, thinking they had a flat or low tire. Residents living within a mile of the roadway complained about the noise. It was necessary to diamond-grind approximately three miles of two-lane pavement to eliminate the extra noise.

Another area of responsibility for the department relates to vehicle noise enforcement. The Michigan Vehicle Code (Section 707C) states that the department shall provide training in noise enforcement to police agencies. The enforcement program includes loaning noise measuring kits to approximately 40 cities throughout Michigan. In addition, MDOT provides one-day seminars to the police departments desiring the necessary special training. Seminars cover the fundamental theory of sound, operation of sound level meters, measurement of vehicle noise for enforcement, community noise measurements, and a review of local noise ordinances. The department maintains and calibrates the equipment on a regular basis. The police agencies utilize the noise meters and training to enforce the Michigan Motor Vehicle Noise Law and local noise ordinances.

The department noise mitigation and abatement program is a team effort. Personnel from the Bureaus of Planning, Highways, and UPTRAN, as well as the Executive Bureau, are involved with transportation-related noise assessment and mitigation. The department will continue to cooperate with cities and other local agencies to resolve noise-related problems and provide an effective program of noise abatement.

-Leo DeFrain

MARCH WAS RETIREMENT MONTH

Ralph Vogler, Engineer of Testing, retired after 37 years of service with the Testing Laboratory. One must be supremely dedicated to his work to stay with the same outfit for that many years. Ralph provided a great amount of technical expertise, leadership, and dedication to the materials testing area. His expertise in materials and the preparation and review of test methods and specifications often carried him outside the Department with his service on several ASTM and AASHTO committees. In 1990, Ralph was honored by receiving the Award of Merit and the honorary title of Fellow from ASTM. Even after retirement, Ralph continues his work with ASTM and no one could imagine him doing anything different. Our sincere best wishes continue to go to him as he tests the retirement challenge and revises his own specification for life without MDOT. The Department named the Grass Lake Rest Area on westbound I 94, east of Jackson in honor of Ralph's years of notable, dedicated service.

Bill Zakrajsek from our Technology Transfer Unit followed his former boss and MATES editor, Jim Alfredson, out the door--perhaps we should have locked it sooner. As the chief graphic artist, he coordinated the preparation of artwork and its reproduction for various research reports, technical articles, and publications like MATES. Zak began his "early" retirement on April Fool's Day, causing one of his cycling buddies to remark, "how appropriate!" There is a rumor that a notorious and now aged motorcycle gang will make one more run this summer for old times sake. More fodder for chronicles about Zak which are already full of woe and tribulation. Zak is another 37 year veteran. We will miss his creative talents and his dedication to quality workmanship.

Vernor Smith, known to many of us as the man behind the Materials Sampling Guide and the Materials Quality Assurance Procedure Manual, retired on March 31. Vern was responsible for keeping these documents current as technology and personnel changes dictated new ways of handling material quality assurance. These current procedures are not the way things were done when Vern joined the Michigan State Highway Department in 1956. Following several years as an aggregate inspector, a soils inspector, and a materials inspector in the Grand Rapids, Pontiac, and Redford Districts, Vern moved his family to St. Johns and began the central office portion of his career. He takes with him a wealth of knowledge about tested stock, certification, and testing procedures. Vern was a man of steel when enforcing the quality assurance procedures but did it with a velvet touch which earned the respect of his supervisors, peers, and many suppliers and manufacturers. Vern's integrity, knowledge, and easy style will be greatly missed.

We wish all three of our 37 year veterans the very best that retirement can bring them.

Have a Happy 4th of July

This document is disseminated as an element of MDOT's technical transfer program. It is intended primarily as a means for timely transfer of technical information to those MDOT technologists engaged in transportation design, construction, maintenance, operation, and program development. Suggestions or questions from district or central office technologists concerning MATES subjects are invited and should be directed to M&T's Technology Transfer Unit.

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