



# MATES

**MATERIALS AND TECHNOLOGY ENGINEERING AND SCIENCE**

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## INTRODUCING MATES

The purpose of the Materials and Technology Division is to facilitate quality assurance and quality improvement in the design, construction, and maintenance of transportation facilities. We accomplish this through materials sampling and testing; development and publication of highway and bridge specifications; developmental and applied research, and a varied program of technical investigation services; and by providing investigative services at the request of the Districts and other Divisions. This newsletter, "Materials and Technology Engineering and Science," (MATES) is intended to assist the M&T Division in fulfilling its mission by disseminating technical information to the Bureau of Highways Divisions and District Offices, and other Bureaus within the Department, to keep them abreast of the current changes in materials quality standards and technological advancements as they affect the transportation industry.

Our Division continuously reviews and investigates highway design standards and construction procedures in order to provide better quality and performance of the Department's transportation network. Many times the technical findings are documented but the information is not disseminated throughout the Department because of delays in publishing a final report, or the review process involved in the changing of specifications. MATES is intended to give updated reports to readers on problems and technical investigations that the M&T Division is studying so they can be advised of the latest information in a timely manner. MATES will also report on problems that are being experienced in the field, and will advise on recommended changes that are being proposed, along with the technical rationale that supports those changes. Our Division sincerely hopes that MATES will be of assistance to its readers, and welcomes any suggestions that would improve this publication and better fulfill the Department's mission. Feedback is necessary and welcome: let's hear from you!

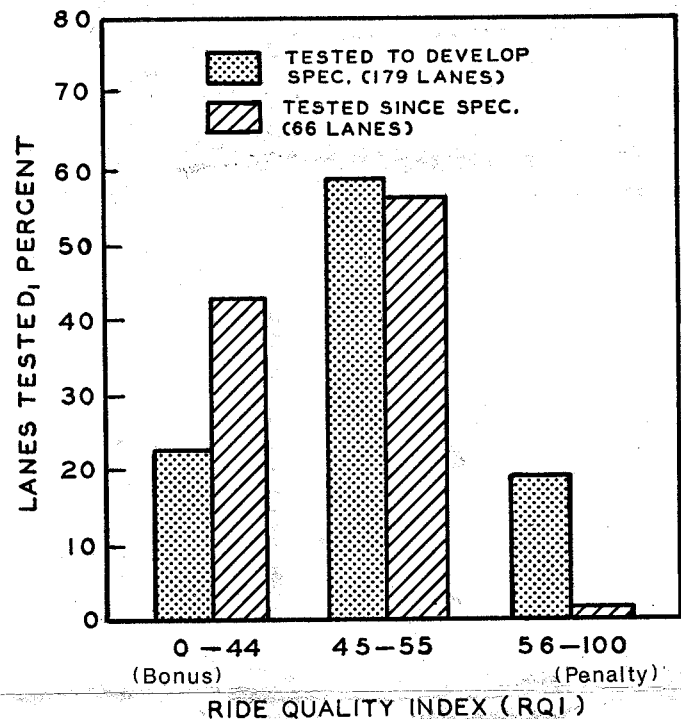
- Marty O'Toole

### RIDE QUALITY SPECIFICATION PROVIDES SMOOTHER RIDING CONCRETE PAVEMENTS

Michigan motorists traveling newly constructed concrete pavements are enjoying a smoother ride as the result of a newly adopted Ride Quality Specification. This specification was designed to motivate contractors to build the smoothest riding concrete pavement that they possibly could. It offers a reward, in the form of a bonus payment, to contractors who build smooth pavements, and it penalizes—by deducting money from their payment—if the pavement offers a poor ride. To show just how effective this new specification has been, the percentage of new concrete pavement lanes with a 'good ride' rating has almost doubled since its adoption. Further, the percentage of new concrete lanes with a 'poor ride' has been reduced by over 90 percent. Thus, not only does the specification provide a reward to those contractors who produce a pavement with a superior ride quality, but it has resulted in a greater portion of these pavements being of higher quality, and the percentage of pavement with a poor ride quality has become minimal.

In developing such a specification, Materials and Technology had to make certain that it did not create unreasonable smoothness standards that would cause contractors economic or technological problems. Therefore, smoothness criteria were developed based on roughness data taken from paving projects that were built from 1974 through 1976, a period with no ride quality specification. The roughness data were collected immediately after pavement construction with the Division's Rapid Travel Profilometer (RTP), and this information was then converted into a 'Ride Quality Index' (RQI) value. The graph visually depicts the improvement in the RQI value (the lower the

number, the better the ride) between the pavements used to develop the specification, and the pavements tested since it went into effect.



Testing Laboratory  
U of M 1913

Research Laboratory  
MSU 1939

Investigation and Research Division  
1924

Testing and Research Division  
1933

Materials and Technology Division  
1985

"Committed to superior transportation services and facilities"

What is Ride Quality Index, and how was it developed? The RQI used for measuring the roughness in this specification was developed in the Materials and Technology Laboratory. As noted earlier, the pavement surface is surveyed using a device called an inertial rapid travel profilometer (RTP) which provides an actual 'profile picture' of the pavement surface. It is patterned after a unit developed by the General Motors Corp., and it was constructed by our own research personnel. Over the years, we have made many modifications to improve the device, and our unit is nationally recognized as state-of-the-art.

Of course this is only half the issue; next the relationship between the measured pavement profile and the motorist's 'feel' for the roughness or smoothness of a pavement had to be established. In 1973, M&T conducted a ride quality study in which a panel of people rode over a set of pavement sections that had been carefully selected to represent various types and degrees of roughness. After carefully surveying the panel's reaction to the selected pavements, these data were compared with the profile data from the RTP on the same pavement sections. From these two sets of data, it was possible to predict an 'average' person's rating of a pavement's riding quality. The result was a roughness measuring

unit called the RQI, or Ride Quality Index. This, then, gave us the tool with which to implement a Ride Quality Specification.

Michigan's ride quality program has received national recognition and, because of this, MDOT is currently participating in a National Cooperative Highway Research Program (NCHRP) to investigate the relationship between measured road profile and user's opinion of ride quality. This study will also update existing programs by taking into account the relationships using today's smaller size vehicles. Early indications of this study are that the same properties of a pavement's profile that were objectionable using large size cars are also objectionable with small cars. All of this would indicate that the Ride Quality Specification for concrete pavements, and the unit used for measuring pavement roughness, will continue to succeed in providing a better and smoother ride on Michigan's concrete roadways.

- Bob Felter

Anyone desiring further information on this program should contact Bob, Supervisor of M&T's Pavement Performance Group at (517) 322-1641.

## TECHADVISORIES

The brief information items that follow here are intended to aid MDOT technologists by advising or clarifying, for them, current technical developments, changes or other activities that may affect their technical duties or responsibilities.

### NEW MATERIALS ACTIONS

The New Materials Committee recently:

Approved: the following concrete patching products:

Five Star Highway Patch  
Durapatch Hiway  
Burke Fast Patch 928

Rejected: Set 45, a concrete patching product long used by the Department in the past. It did not pass the latest test criteria for fast set concrete patching materials developed by the Research Laboratory.

### MDOT RESEARCH PUBLICATIONS

"Use of Boni Fibers on M 99 in Lansing: Final Report," Research Report No. R-1274. The purpose of this project was to evaluate the feasibility of using polyester fibers ('Boni Fibers') in bituminous overlay mixtures made with recycled asphalt pavement. A 500-ft section was constructed with this material and its performance evaluated after two years of service. Laboratory tests of the modified mixtures were made to compare tensile properties with those of the conventional mixes used on the major portion of the M 99 construction project. No difference in field performance could be observed, even though laboratory tests indicate some improvement in tensile properties.

### NEW INFORMATION

The updated, computer-generated, Aggregate Source Inventory is now available. It contains statewide information—by county—of aggregate sources, locations, and pertinent test information. It is available to MDOT personnel by County, District, or the entire state. Interested parties who are not affiliated with the Department may obtain the complete copy only, from the MDOT Contracts Section in Lansing for \$12, plus tax.

### MATERIALS OR PROCEDURE ADVISORIES

The second draft of Independent Assurance Test Procedures for aggregates, portland cement concrete, soil and bituminous density, and bituminous plant inspection has been sent to the Districts for review and comment.

### NEW SPECIFICATIONS OR CHANGES IN SPECIFICATIONS

Following are Supplemental Specifications recently sent to the Design Division for use in subsequent proposals:

Sawed Timber Posts and Blocks for Beam Guardrail, 6.13 (5c), dated 07-31-86. As the result of their failure to pass the pendulum test as performed by the Southwest Research Institute on sample guardrail posts submitted by the Department, the following species of wood were removed from the subject specification: elm, eastern hemlock, red pine, eastern white pine, and the 6-in. by 8-in. jack pine. The 8-in. by 8-in. jack pine was left on the list.

20AAA, 20AA, and 20A Dense-Graded Aggregates Used in Top Course Bituminous Mixtures, 7.10 (8c), dated 06-24-86. The Kalamazoo District Office has received complaints recently concerning some premature surface failures. They feel that there are probably several reasons for the failures but that a contributing factor is the high percentage of clay ironstone particles contained in the top course mixture. Therefore, the specification was changed so that in addition to the 5.0 percent restriction of shale and siltstone, the clay ironstone particles shall not exceed 12.0 percent in material from Allegan, Calhoun, Kalamazoo, and Van Buren Counties.

Prestressed Concrete Beams, 5.05 (1b), dated 07-28-86. There are a few natural gravel deposits which can produce an aggregate that will meet the requirements for a 6AA aggregate for use in a prestressed concrete beam. Therefore, a change was made in the subject specification that will permit a good quality aggregate from a natural gravel deposit to be used in a prestressed concrete beam in addition to a crushed stone aggregate from a quarry.

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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