

MATT System

Overview

A sound quality assurance program is one that must be capable of providing information to users and not just data. It is information prepared from analysis of data that is important. Such information should be provided rapidly, economically, and efficiently. Such information flow can only be accomplished through the use of computers. However, a necessary prerequisite to this flow or feedback of information is its availability at a centralized location, namely, computer files. This requirement further mandates a fast data-entry system for on-going operations. The Materials Test (MATT) data-reporting system provides a user-oriented quality assurance feedback system. The system is an on-line computer-based system through which data generated on construction projects can be entered, corrected, updated, and retrieved through the department's terminal network. The system, which has been in operation since mid-1978, is capable of providing information not only to those responsible for monitoring the construction projects but also to those involved in the planning, design, evaluation, research, and maintenance of pavement systems. The MATT System integrates sampling, test reporting, certification and evaluation of construction projects and materials. It provides quick access to construction information via remote computer terminals providing formatted input-output capability.

The MATT System also provides

- 1) A continuous log of major construction materials tested at a centralized location,
- 2) Improved monitoring of projects for compliance with specifications,
- 3) Accelerated preparation of final project certification, and
- 4) Timely statistical profiles on construction and materials.

The MATT System provides an integrated computer-based system by which the Materials and Testing Section and the various districts of the Louisiana Department of Transportation and Development (DOTD) can transmit the construction and materials test data through terminals for storage, retrieval, and analysis. The goal is to provide easy access to the construction and materials test data for final certification of construction projects and also for evaluation of construction and materials quality assurance and acceptance procedures.

Specifically, the MATT System is intended to provide benefits as follows:

- 1) Standardization of reporting procedures coupled with savings in time spent manually in typing, auditing, or spot-checking various test reports,
- 2) Availability of a continuous log of major material tests within computer files,
- 3) Streamlining of the final audit of sampling and testing compliance and an accelerated certification of construction items,
- 4) An organized and easily accessible data file for comparative and statistical analyses with respect to processes, sampling and testing frequency, producer profiles, and specification revisions and updates, and
- 5) Serve as an important component of an overall pavement management system.

The MATT System is geared towards quick access to construction and materials information via remote computer terminals that provide formatted input-output capability. The following principles serve as a base:

- data-entry system as opposed to a full on-line system,
- exception reporting to minimize printing of unneeded data,
- overnight off-line processing of test results as opposed to immediate on-line valuation,
- elimination of many manual, duplicated, and non-standard reporting procedures.

Overview of System Operation

The DOTD computerized Materials Test (MATT) System is composed of a number of smaller subsystems. Three subsystems -- project, specification, and name -- provide support to the total system and are basic to the test file subsystems. No data can be entered on any of the materials included in the test file subsystems unless the project information, the specifications governing the material to be used on that project, and the names of the project engineer, contractor, and material sources are already on file in the computer.

Each of the subsystems is identified on the MATT Main Menu. Each screen is a replica of the input data form. In other words, a particular screen displayed looks similar to the input data form. This similarity provides for easy and rapid entry of test data.

The input forms for recording data are combination work-report forms. The header information on most of the forms is basically the same. These forms accompany samples sent to the laboratory for testing. The project inspectors record data pertinent to the project and sample identification in the top portion of the form (header information), and the laboratory records the test data generated by them in the respective test fields.

- **On-Line Operation**

The System is capable of on-line entry, inquiry, correction, update, & deletion of data. The input forms are filled out with the appropriate information by project and laboratory personnel and sent to the terminal operator for data entry. Fields of information that are considered mandatory for data entry are edited to be required entries (to standardize the reporting procedures throughout the state). The operator enters a selection from the MATT Menu. The selection triggers the computer system to display the correct screen for that subsystem onto the terminal. The information from the input form is then entered onto the screen and transmitted to the computer where it is edited for errors. Once the input is error-free, the program does the necessary data manipulations, after which a record is written to the test file for overnight processing in an off-line mode.

- **Off-Line Operation**

Test results entered during the day are processed that night by the test processor against the appropriate specification record and are flagged according to whether they pass or fail. The test processor creates logging and exception report files. The data stored in the test file can be accessed for inquiries, updates, or deletes.

MATT System Files

The MATT System uses these files: name, specification, project, mix design / JMF, test, and logging and exception report.

- **Name File**

The name file is a prerequisite to the overall operation of the MATT System. The file is an on-line file and contains the code numbers and the corresponding names and locations of materials sources, sample submitters (project engineers, etc.), contractors and private testing laboratories.

- **Specification File**

The specification file is also a prerequisite to any material test data entry. The file contains both standard and project specifications, except for those materials classified as "miscellaneous", for which there are no specifications entered.

- **Project File**

Project information is obtained directly from the TOPS System. Roadway Cross Section includes information such as project location, route number, length, cost, type of surface, and base, shoulder, and related dimensions.

- **Mix Design / JMF File**

The mix design file contains information related to the mix design of both asphaltic concrete and portland cement concrete. The file is a prerequisite to entering data on the acceptance criteria of these two materials.

- **Test File**

Test results of all materials appear in this file. The file contains processed test data, including pass-fail flags, of the following materials or tests: aggregates; asphalt cements; liquid asphalts; portland cements; steel bars; steel wires; structural concrete slump, air, and strength data; paving concrete strength and thickness data; asphaltic concrete stability, compaction, gradation, and smoothness data; soil analysis test data; density and moisture test data of embankment and base course; thickness and width measurements of base course; and miscellaneous materials (currently totaling 154). Of all the materials subsystems, the miscellaneous subsystem is the most comprehensive and flexible. The user has complete flexibility in adding new materials to this file and creating his or her own screen for those materials. Adding and modifying existing miscellaneous screens are processed through the Materials Automation or Qualifications Units.

- **Logging and Exception File**

The logging and exception file is a temporary file of one-day duration. It contains data in report format that was entered the previous day and is retrieved daily by the Materials and Testing Section and the districts.

MATT System Output Reports

To function effectively, a quality assurance program must be able to provide the needed information feedback not only to those involved in testing and inspection but also to those in the planning, design, evaluation, and maintenance phases of the pavement system. A necessary prerequisite to such information flow is the availability of a computer-based data system such as MATT.

- **Daily Construction Monitoring Reports**

Each day two types of reports are routinely provided to the project engineer responsible for day-to-day monitoring of the construction project. These reports are the logging reports and the exception reports. The logging reports are the summary-type reports that consist of information relative to the sample or test such as project number, sample identification, purpose, material type, quantity, item number, and pass-or-fail comment. In some cases, critical numerical values of the measured characteristic are also listed on the printout. Such reports provide a quick means of review for the engineer of the inspection, material, and test control level associated with the project activities.

The distribution of these reports is based on the sample submitter, the terminal through which data are entered, and the laboratory performing the test (laboratory number). With these three criteria, it is possible to retrieve reports on a given test at three places. If a sample is submitted by an engineer in district A, tested by district B, and entered by district C, the report on this sample will be transmitted to all three districts. This greatly minimizes delays associated with mailing of reports especially by the Materials and Testing Section to the nine district laboratories and 60 project engineer offices statewide.

Samples indicated as failing on the logging reports are supplemented with exception reports. Exception reports are complete test reports providing all test data for the particular failing sample. Such exception reports provide the submitter with the total test record for the sample.

- **2059 Reports**

During the life of a construction project, constant monitoring is required to ensure that sampling and testing frequencies and specification conformance are satisfied, according to contract requirements, on the multitude of materials incorporated into the project. At the end of the project, this quality assurance check is duplicated to prepare a final document identified as Form 2059. This final effort is geared toward compilation of all documents generated on that project, with emphasis on cross-referencing of passing and failing samples & an explanation of the disposition of failing materials, tests, etc.

The MATT System provides a computer-generated final document at the user's request usually in a matter of minutes. The basic format of this computer-generated 2059 report is similar to that of the daily logging reports except that it is item number oriented. All materials are reported under the contract item number for which they were sampled and tested. Also, all coded fields appear decoded in the report.

The computer-generated 2059 report has three parts. Part 1 consists of a listing of all materials or tests under their respective item numbers. Part 2 lists the disposition of the failing samples as appearing in the Remarks 2 field of each failing test report. Part 3 lists all the asphaltic concrete job mixes and portland cement concrete mix designs issued on the project. This report is reviewed by district and headquarters personnel prior to final acceptance of the project.

- **Analysis and Evaluation Reports**

These reports are the summary type reports that are available through data retrieval from the vast materials testing data base inherent to MATT. Data may be retrieved for almost any purpose such as specification analysis; pay reduction distribution; variability with respect to material type, material source, sampling and testing procedures; and failure ratio in relation to sampling and testing frequency.

Summary

The MATT System provides the Louisiana Department of Transportation and Development with an efficient user-oriented materials test data entry and retrieval system for daily construction monitoring and final project certification. The tedious and time-consuming process of manually typing and processing the multitude of reports generated during project construction has been reduced to a minimum. A continuous log of tests is maintained in an organized and efficient manner in computer files for use by materials, construction, planning, design, research, and administrative personnel. Logging and exception reports are provided daily to field personnel for project monitoring, while special reports are available at user request for short and long term decision making. The MATT System is geared toward providing important input to the FHWA-mandated pavement management system.