

QUALITY CONTROL & QUALITY ASSURANCE PLAN (QC/QA) FOR MDT PROFILING

JUNE 2006

Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, MT 59620-1001

TABLE OF CONTENTS

	<u>PAGE</u>
1.1 Purpose.....	3
1.2 Management Responsibilities.....	3
1.3 Staff Requirements.....	3
1.4 Training	4
1.4.1 New Field Personnel	4
1.4.2 New Office Personnel	4
1.4.3 Review Training	4
1.5 Procedures.....	4
1.5.1 Reference Documents	5
1.5.2 Field Activities	5
1.5.2.1 Preventive Maintenance	5
1.5.2.2 Coordination	7
1.5.2.3 Data Collection	7
1.5.2.4 Data Processing & Reporting.....	7
1.5.2.5 Problem Documentation and Response	7
1.5.2.6 Data Storage in Profiler	8
1.5.3 Office Activities	8
1.5.3.1 Data Review	8
1.5.3.2 Data Storage in Office	8
1.5.3.3 Data Processing & Reporting.....	8
1.5.3.4 Problem Documentation and Response	9
1.6 In-House Quality Control Reviews.....	9
1.6.1 Field Quality Control Reviews	9
1.6.2 Office Quality Control Reviews	10

LIST OF FIGURES

	<u>PAGE</u>
Figure 1. MDT Ride Data Flow.	6

MONTANA DEPARTMENT OF TRANSPORTATION (MDT)

RIDE DATA COLLECTION QC / QA PLAN

1.1 PURPOSE

The purpose of the ride data collection QC / QA plan is to insure that the procedures used by MDT in the collection and processing of ride data comply with all current MDT guidelines and result in the delivery of a quality data product. The QC / QA plan also provides for corrective actions when deficiencies are encountered and encourages actions that support continuous improvement.

1.2 MANAGEMENT RESPONSIBILITIES

Some of the management roles specified below can be held by the same person. Also, the management responsibilities can be instituted for each district or for the entire state. The QC / QA Manager should oversee all districts thus ensuring data collection uniformity.

Management personnel and their responsibilities in the ride data product are:

- **Engineering Project Manager (EPM)** - Ultimately responsible that the data product complies with the ride specification program.
- **Profile Coordinator** - Responsible for all aspects of the profile data product including scheduling, data collection, and processing procedures. The Profile Coordinator must be thoroughly familiar with the field data collection activities from the operation of the profiler to the field quality checks. This person must also be thoroughly familiar with the data processing procedures. This person is the chief problem solver and trouble shooter.
- **QC / QA Manager** - Responsible for developing and implementing procedures for compliance of all current MDT guidelines. For the ride data product, this includes regular reviews of the field data collection and office data processing procedures, documentation, and reporting of findings and follow up reviews to determine if corrective actions have been implemented and whether they are effective.

1.3 STAFF REQUIREMENTS

Some of the roles specified below can be held by the same person. The staff positions and responsibilities involved in the ride data product are:

- **Data Analyst** - Responsible for evaluating ride data for quality, QC checks, and performing the incentive/disincentive calculations. Familiar with profile concepts, the processing software, and all protocols.
- **Field Personnel** - Responsible for operating the profiler, data collection, and data reporting in accordance with the most current MDT guidelines. This includes calibration and maintenance activities. Also, responsible for coordination of field activities with participants, and helping to solve field related problems.

1.4 TRAINING

The collection and processing of ride data is a specialized task that requires well-trained personnel. The following subsections detail the training program for new and existing staff involved with profiling activities.

1.4.1 NEW FIELD PERSONNEL

Prior to operating a MDT profiler, field personnel will complete an extensive training program. The program will include a thorough review of the reference documents listed in Section 1.5.1 and the following items:

- Background information (history and theory) about profilers;
- Current MDT profiler including electronics, sensors, etc; and
- Paperwork required for profiler activities.

Once field personnel become acquainted with the profiler, there will be at least two weeks of operations training. Operations training will include vehicle operation, sensor calibration, vehicle maintenance, data collection, and data reporting.

There will be a thorough review of the first set of ride data and paperwork collected by the new field personnel. If there are any issues with this work, the responsible field personnel will receive additional training. The first data collection trip by new field personnel will also be subject to a review. It is the goal of MDT to resolve data collection and reporting issues as early as possible.

1.4.2 NEW OFFICE PERSONNEL

Office activities include data handling and incentive/disincentive calculations using the most recent Ride Specification. Prior to conducting office activities, office personnel will receive the following training:

- The Data Analyst shall be familiarized with the ride data. Although it is not necessary, this person may have moved into this position from the field. In other cases, familiarity with the topic will be developed in the review training seminars and by working closely with the Profile Coordinator.
- The Profile Coordinator will complete the same type of profile review and operations training as the field personnel. Although it is unlikely that these individuals will collect ride data on a regular basis, an understanding of what the field personnel experience is important and may lead to improved data collection, data handling and reporting. In other cases, familiarity with the topic will be developed in the review training seminars and by working closely with the Data Analyst.

1.4.3 REVIEW TRAINING

A training seminar will be conducted annually. All personnel involved in the ride data product will be required to attend. A meeting agenda will be prepared, which will cover topics such as field and office procedures, new protocols and guidelines, results of reviews, etc. All training schedules are subject to change due to software upgrades, changes in equipment, or updates to protocols.

1.5 PROCEDURES

Data collection, processing, and reporting procedures have been divided into two areas: field activities and

office activities. Figure 1 illustrates the ride data flow and activities that are performed. The following sections describe the quality control efforts for the field and office activities.

1.5.1 REFERENCE DOCUMENTS

The operations procedures are contained in a number of documents as described below. It is imperative that those guidelines are followed completely to ensure consistency in operations. These documents, on file at each MDT District, should be reviewed annually by all personnel. As new documents are received, they will be distributed to the appropriate personnel. If any documentation is unclear, questions should be addressed to the Profile Coordinator or QC/QA Manager as soon as possible. Specific problems with the procedures or software should be identified using the established problem report procedures and format.

The procedures for profile data collection are contained in the following documents:

1. MDR 4080 / 4097 Mobile Data Recorder (MDR) Operation Manual, International Cybernetics Corporation (ICC).
2. Profiler Operations Manual (POM) for MDT Profilers (most recent version).
3. MT – 422 Document (most recent version).

1.5.2 FIELD ACTIVITIES

Field personnel must understand the purpose, interpretation, and significance of the data they are collecting. The goal is to collect quality data. Data with missing elements, incorrect, or incomplete information does not meet the MDT's ride program objectives.

1.5.2.1 PREVENTIVE MAINTENANCE

Preventive maintenance is routinely performed under MDT's equipment maintenance program. All profiler maintenance must be performed before mobilizing for data collection.

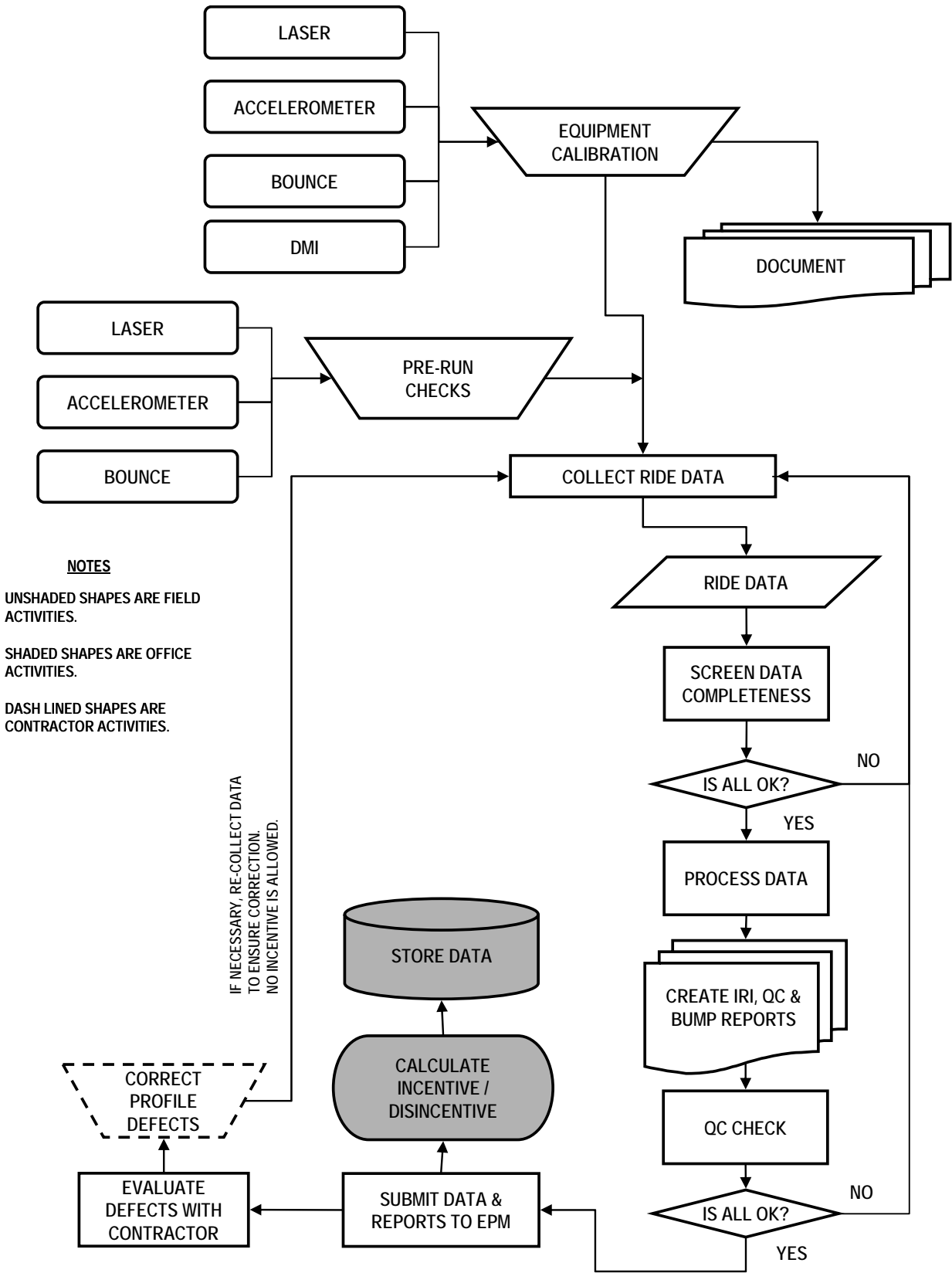


Figure 1. MDT Ride Data Flow.

1.5.2.2 COORDINATION

Field personnel must be prepared when they travel to the construction site. It is their responsibility to gather all required documentation forms, equipment, and instructions. Field personnel must coordinate with the EPM so that they understand the schedules and required testing. If testing occurs in conjunction with project traffic control, field personnel should coordinate activities with the EPM or resident engineer. In any case, field personnel need to have contact names in case problems arise at the project.

Field personnel must ensure all equipment is in working order and that any batteries are fully charged. Field personnel must also document and immediately report any equipment malfunctions or breakdown to the Profile Coordinator.

1.5.2.3 DATA COLLECTION

Data collection must follow the established procedures as outlined in the reference documents listed previously.

Prior to going to the construction site, field personnel should make sure the equipment and vehicle meet the calibration requirements. Upon arrival at the construction site, the field personnel will use the construction site location layout (e.g., map) to ensure reflective tape or cones are positioned properly.

Longitudinal profile data will be collected in accordance with the most recent version of the Profiler Operations Manual (POM). Field personnel should collect at least two profiler runs. A constant vehicle speed should be maintained during the operation. Once the data has been collected, the operator should make sure that spikes can be explained. The proper file naming convention should be used.

1.5.2.4 DATA PROCESSING & REPORTING

Field personnel process the profiler runs using the current software. Field personnel create Quality Control and Bump Reports to evaluate the profiler runs acceptability. Once the field personnel are confident the runs are acceptable, the Roughness and Bump Report are provided to the EPM.

The Bump Report indicates the locations of potential defects. These will be reviewed with the EPM and Contractor. The location will be physically examined to determine if, at the EPM's discretion, the location should be considered a defect.

The Roughness Report is transferred to the EPM for incentive/disincentive calculations.

1.5.2.5 PROBLEM DOCUMENTATION AND RESPONSE

Any time field personnel encounter a problem with data collection, he / she should:

- Attempt to resolve the problem, immediately.
- If unable to resolve the problem, the field personnel should try to contact the Profile Coordinator for assistance. Consequently, the Profile Coordinator will have knowledge of the problem and, if it cannot be corrected immediately, will plan to resolve the problem. Either the field personnel or the Profile Coordinator should document the problem, the activities attempted to resolve it, and whether or not they were successful. The documentation should specifically state whether or not the problem was corrected, and if so, how.

- Field personnel must maintain contact with the Profile Coordinator on a continuous basis. Any feedback from the Profile Coordinator regarding the correction of previous problems must be shared among all field personnel. To accomplish this, a discussion between the Profile Coordinator and all field personnel should occur regularly (e.g., monthly during construction season).

1.5.2.6 DATA STORAGE IN PROFILER

Profile data collected at a site by the profiler should be backed up to a removable storage media (e.g., Zip disk). The location of the data files will depend on directory structure that is employed by the districts. The profiler should not leave a test site unless all data have been backed up. No collected profile data should be deleted from the hard disk until the district has copied the profile data to the MDT Ride Specification Share Drive. The original copy should remain on the profiler computer until notification to delete is provided by Profile Coordinator.

1.5.3 OFFICE ACTIVITIES

Like field personnel, the office personnel must understand the purpose, interpretation, and significance of the data they are reviewing and processing. The office personnel's goal is to ensure complete, logical, and quality information in a timely manner.

1.5.3.1 DATA REVIEW

The Data Analyst reviews all data upon receipt to verify that the data has been properly collected, recorded, and submitted. Before the data is entered and copied into the appropriate location, the Data Analyst should:

- Check all the documentation for correct and complete entries. If any entries are incorrect or incomplete, determine and note the causes.
- Check the file name and file size of the electronic data files.

Any problems should be presented to the Profile Coordinator and documented.

1.5.3.2 DATA STORAGE IN OFFICE

The backup disk is transferred to the MDT Ride Specification Share Drive. Once transferred, the disk can be recycled and reused by field personnel. Additionally, original data can be deleted from the profiler.

Documentation should be filed in appropriate location at MDT District. It is the responsibility of the office personnel to ensure data can be accessed readily and proper storage procedures are followed.

1.5.3.3 DATA PROCESSING & REPORTING

Office personnel utilize the Roughness Report for incentive/disincentive calculations. The incentive/disincentive calculations are based on the type of project. The appropriate pay factor equations should be obtained from EPM or most recent version of MDT Ride Specification. Office personnel should be aware of excluded portions of pavement.

Once incentive/disincentive calculations are performed, results should be filed in appropriate location at MDT District.

1.5.3.4 PROBLEM DOCUMENTATION AND RESPONSE

Any time office personnel encounter a problem with the data, he / she should:

- Should document problem.
- Upon notification of a problem, the Profile Coordinator must document the receipt of the problem notification, develop a plan to correct the problem, investigate the resolution of the problem, and finally, indicate what was tried and what did or did not work. When necessary, problem resolution can be assigned to the Data Analyst or the field personnel.
- The Profile Coordinator should generate a problem report anytime a problem exists in the system. This includes hardware, software, and physical equipment used to collect and process the profile data.

1.6 IN-HOUSE QUALITY CONTROL REVIEWS

Quality control reviews will be performed by the QC/QA Manager or their designee periodically on the following schedule:

- | | |
|--|---|
| <ul style="list-style-type: none">• New field personnel:<ul style="list-style-type: none">— First assignment— Six month re-inspection• Experienced field personnel:<ul style="list-style-type: none">— Each staff minimum once per year— Responsive inspections | <ul style="list-style-type: none">• New office personnel:<ul style="list-style-type: none">— First assignment after training— Six month re-inspection• Experienced office personnel:<ul style="list-style-type: none">— Each staff minimum once per year— Responsive inspections |
|--|---|

These reviews may be either announced or unannounced. Reviews will be performed both in the field and in the office. Reviews are meant to ensure the data collected, processed, and stored is of the highest possible quality. Details of the reviews specific to the field and office activities of the ride data product are outlined in the following sections.

1.6.1 FIELD QUALITY CONTROL REVIEWS

Quality control reviews of the ride data collection in the field will be conducted by the QC/QA Manager. During the course of each review, field personnel are required to conduct testing operations as "typically" done, which includes coordination of personnel at the construction site, construction site safety, pre-testing or setup activities, data collection activities, and data handling activities. The reviewer will accompany the field personnel to the construction site and will observe all phases of the ride data collection process. The reviewer will not assist with any of the data collection. During the field review, the reviewer will also inspect equipment and supplies, and review activity records filed in the profiler.

At the conclusion of the field quality control review, the reviewer will document his/her findings. The report will be submitted to and reviewed with the field personnel, Profile Coordinator, Data Analyst, and EPM.

1.6.2 OFFICE QUALITY CONTROL REVIEWS

Quality control reviews in the office will be conducted by the QC/QA Manager. During the course of each review, the reviewer will follow the data through all phases. The reviewer will not assist with any of the data processing but rather will comment on the process using the process flow chart in Figure 1.

At the conclusion of the office quality control review, the reviewer will document his/her findings. The review forms will be submitted to and reviewed with the Data Analyst, Profile Coordinator, and EPM.