

## Task 2: Handheld Retroreflectivity Data Collection Protocol

### Introduction

Pavement marking retroreflectivity condition information is collected by Mn/DOT staff using both handheld and mobile (van) equipment. This information will serve as the primary pavement marking performance metric within the Mn/DOT Pavement Marking Tool (a GIS based tool to view and query condition information).

Specific to the handheld devices (see Figure 1) a protocol for data collection is needed to ensure consistency on when, where, and how the field data are obtained. This effort is identified within the project scope as follows.

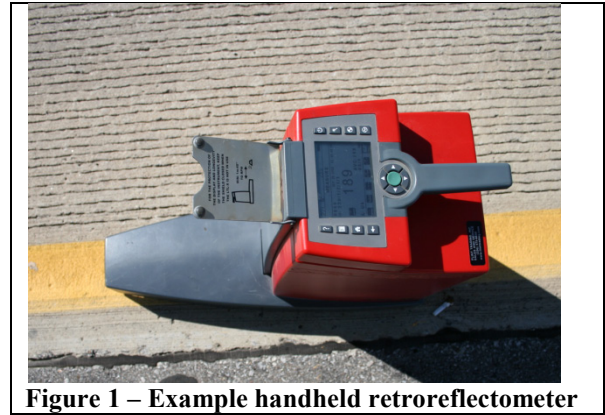


Figure 1 – Example handheld retroreflectometer

*Task 2 – Develop data collection protocols for using the handheld (LTL-X) devices available to the districts. The data collection protocol will define sampling rates, collection method, and frequency. The research team will work with central office and district staff to address the data collection needs, constraints in terms of time and personnel, and format.*

This section serves as documentation on Task 2 findings and recommendations. This protocol is specific to the collection of network level pavement marking retroreflectivity information to be incorporated within the Mn/DOT database.

### Recommended Protocol

The research team investigated various sources to develop this recommended protocol. These included current ASTM practices, Iowa DOT data collection protocol, and other available information. This information is summarized below:

#### Sampling Frequency:

##### *ASTM Practice:*

The currently proposed practice calls for taking 20 retroreflective readings equally distributed over 400 feet within a 2 mile segment. This level of sampling is designed for compliance based testing on new pavement markings.

##### *Iowa DOT Practice:*

The Iowa DOT protocol collects 12 readings equally distributed over 160 feet within a 4 and/or 5 mile segment. This level of sampling is intended for network level pavement marking management.

##### *Proposed Mn/DOT Practice:*

In an effort to balance consistency, objectivity, and field data collection time, the following three options were considered.

- Method 1 – Collect 20 readings equally distributed over 400 feet within a 4 mile segment.
- Method 2 - Collect 10 readings equally distributed over 200 feet within a 2 mile segment.
- Method 3 - Collect 5 readings equally distributed over 200 feet within a 2 mile segment.

Each method tries to balance the impact of variability over a segment versus the time required to collect the data. Of the three, the research team recommends Method 1 which results in a more representative value (given that we are collecting 20 readings over 400 feet) and minimizes crew exposure and time. The sampling frequency was modified to be

*Recommendation: Method 1 but adjusted for Mn/DOT skip line spacing criteria (16 readings over 400 feet within a 4 mile segment) - see Figure 2.*

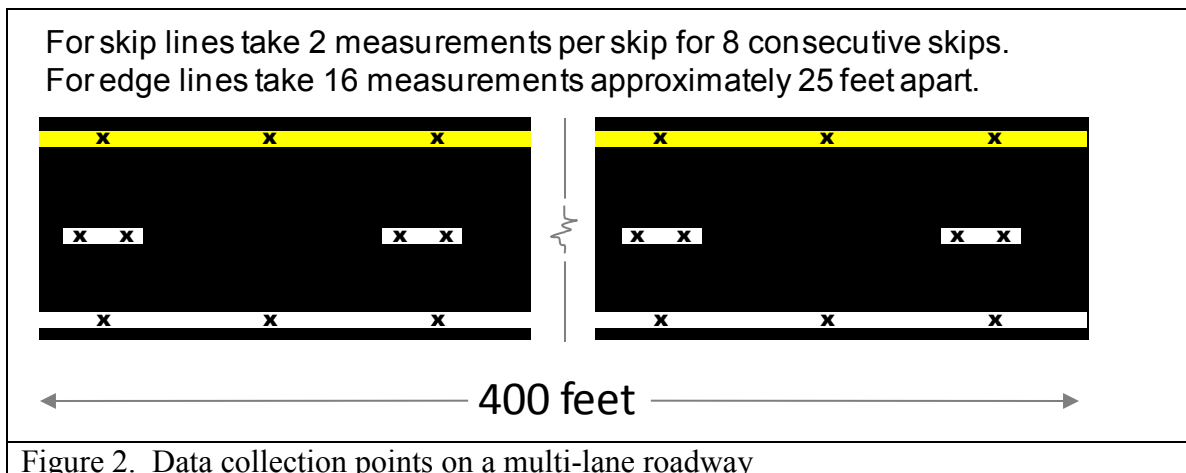
**Data Collection Procedure:**

**When** – Annually during the months of April, May and June (prior to the paint season). This time frame allows the Districts/Central Striping to utilize the retroreflectivity information to plan for their summer paint season.

**Where** – For consistency over time, the research team recommends collecting the data at the same locations each year (using milepost markers as a reference). Accuracy and efficiency can be improved by creating a database containing route and milepost locations where data are to be collected. These databases should be uploaded into each handheld instrument by district.

**How** – The recommended field data collection process follows:

1. Calibrate the handheld instrument according to the manufacturers’ recommendations.
2. Locate the field sampling locations using the milepost marker. Care should be taken to select areas that are typical of the marking section, avoiding areas of paint tracking or contamination.
3. All measurements should be taken in the direction of travel (with the milepost). On the centerline of undivided highways, measurements should be made in both directions of travel. If two center marking lines exist, alternate between each line and by travel direction.
4. On all traffic lines take the reflectivity reading centered on the line. On edge lines take 16 equally spaced readings within the 400 foot sampling area regardless of the condition of the line. On lane lines, take 2 readings on each skip for 8 consecutive skips, see Figure 2.



5. Data entry for handheld instrument
  - a. Set the device to average based on 16 readings.
  - b. Select route and milepost from the pre-loaded list.
  - c. Enter direction of travel “1” with milepost and “2” against the milepost. On two-lane roadways, the yellow centerline direction is always recorded as a “1”.
  - d. Select the line type to be measured.
  - e. Select the marking material type (if known).
  - f. Take retroreflective readings using the defined procedure.