DETERMINATION OF RETROREFLECTIVITY

1. SCOPE

This specification describes the procedure for determining the retroreflectivity of roadmarking material.

2. PRINCIPLE

The retroreflectivity is measured using a suitable retroreflectometer, in wet or dry conditions. Sufficient readings are taken to characterize the test area fully.

3. APPARATUS

- A retroreflectometer having 30 metre geometry, i.e. an entrance angle of 88.76°, and an observation angle of 1.05°. The instrument shall have a measuring area which can be readily identified or located by users. The retroreflectometer shall be calibrated against national or international traceable standards.

- The uncertainty of measurement related to retroreflectivity measurements is influenced by the instrument and its application. The value for repeatability and bias of the instrument should be stated in the Manufacturers handbook. A Technical Group of CEN/TC 226 WG2 provided a repeatability (95%CI) of the condition of wetness of approximately 5 $mcd.m^{-2}lx^{-1}$ for wet roadmarkings with Rl values up to 60 $mcd.m^{-2}\,lx^{-1}$.
- A water container with 1 litre graduations (e.g. a bucket)
- A stopwatch or equivalent timer.

4. MEASUREMENT DIRECTION

4.1 Retroreflectivity measurements of all markings shall simulate the viewing direction of the road user.

4.2 Where markings are observed by motorists travelling in opposite direction, e.g. centre-lines and flush medians, readings shall be taken in both directions. Each direction measured at each test site is to be reported separately.

5. PRACTICAL APPLICATION OF MEASURING INSTRUMENTS

5.1 Retroreflectometers are sensitive instruments. Confirming measurements shall be made at any time it is suspected that the instrument has been subjected to a shock. Repeat measurements should be made on an identical

item or marking at the beginning and end of a measuring session to check for any drift in results.

5.2 Instruments have a 'warm-up" period. Measurements shall not be made until the instrument is "warmed-up" and capable of providing consistent results.

5.3 Retroreflectometers in common use have a range of measuring area sizes and locations. When measuring retroreflectivity of markings which are significantly wider than the instruments measuring area width, measurements shall be taken progressively across the marking width to ensure that a true average is determined.

5.4 Errors in measurement can be caused by the incidence of stray light. The sensitivity to the instrument shall be determined by testing in full sunlight by comparing the values determined whilst unshielded against those determined whilst covered by a black cloth or similar device.

5.5 Retroreflectivity values are affected by their orientation. Particular care shall be taken when using hand-held instruments to ensure that there is no loose material, e.g. stray road metal under any of the support surfaces. Where support brackets are used, such brackets shall be in good condition and fastened securely.

5.6 Conducting wet retroreflectivity measurements under hot conditions can lead to condensation forming on the instruments optics. In these conditions check to ensure that condensation is not forming.

5.7 Conducting wet retroreflectivity measurements on hot pavement surfaces can lead to the water drying rather than draining away during the hold interval. Wet retroreflectivity readings shall only be carried out at times that the risk of evaporation is minimal or in hot conditions carry out cooling of the measuring area prior to tests.

5.8 Certain newly applied markings are hydrophobic, i.e. water forms puddles on surface rather than draining away. If hydrophobic marking materials are found during testing, which are shown to be compliant with all specification properties, a second wet retroreflectivty measurement shall be made after the marking has been subjected to trafficking for period of at least one month.

6. PROCEDURE

The test procedure shall be as follows:

6.1 Method 1.1 – Dry Testing – Nominally Flat Surfaces

6.1.1 The instrument shall be operated in accordance with the

manufacturers instructions and shall be in calibration against national or international traceable standards.

6.1.2 Readings shall be taken at sufficient locations to fully characterize the performance of the marking at each site and in each direction where applicable. Sufficient sites shall be tested in order to assess the performance of the marking system under a variety of exposure situations.

6.1.3 The readings at each location shall be grouped and averaged to determine the retroreflectivity for each site and in each direction where applicable.

6.1.4 Record all results.

6.2 Method 1.2 – Dry Testing – Audio Tactile Profile (ATP) Markings

6.2.1 The instrument shall be operated in accordance with the manufacturers instructions and shall be calibrated against national, international traceable standards.

6.2.2 The instrument shall be arranged such that its base plate is parallel and at the same height as the top surface of the audio-tactile blocks.

6.2.3 Three readings shall be taken on each block, one with the block being at the leading portion of the instruments measuring area, a second centralised over the block and a third reading with the block being at the trailing portion of the instruments measuring area. The three readings are to be averaged to determine the value for the block.

6.2.4 Readings shall be taken at sufficient locations to fully characterize the performance of the marking at each site and in each direction where applicable. Sufficient sites shall be tested in order to assess the performance of the marking system under a variety of exposure situations.

6.2.5 The readings at each location shall be grouped and averaged to determine the retroreflectivity for each site and in each direction where applicable.

6.2.6 Record all results.

6.3 Method 2.1 – Wet Testing – Nominally Flat Surfaces

6.3.1 The instrument shall be operated in accordance with the manufacturers instructions and shall be in calibration against national or international traceable standards.

6.3.2 Test sites shall be selected so as to avoid any areas of poor drainage or those that are susceptible to ponding.

6.3.3 One litre of clean fresh water shall be poured onto the marking from a height of approximately 500 mm, to cover the marking length of approximately 400 mm, endeavouring to complete the wetting exercise within 5 seconds.

6.3.4 Start the stopwatch (or timing on instrument), allow 60 ± 3 seconds to

elapse before taking readings.

6.3.5 Readings shall be taken as near as possible to those selected for dry testing.

6.3.6 Readings shall be taken at sufficient locations to fully characterize the performance of the marking at each site and in each direction where applicable.

6.3.7 The readings at each location shall be grouped and averaged to determine the retroreflectivity for each site and in each direction where applicable.

6.4 Method 2.2 – Wet Testing – Audio Tactile Profile Markings

6.4.1 The instrument shall be operated in accordance with the manufacturers instructions and shall be in calibration against national or international traceable standards.

6.4.2 The instrument shall be set up such that its base plate is parallel and at the same height as the top surface of the audio-tactile blocks.

6.4.3 Test sites shall be selected so as to avoid any areas of poor drainage or those that are susceptible to ponding

6.4.4 One litre of clean fresh water shall be poured onto the audio-tactile marking from a height of approximately 500mm, to cover the marking length of approximately 400mm, endeavouring to complete the wetting exercise within 5 seconds.

6.4.5 Start the stopwatch (or timing on instrument) and allow 60 ± 3 seconds to elapse before taking readings.

6.4.6 Readings shall be taken as near as possible to those selected for dry testing.

6.4.7 Three readings shall be taken on each block, one with the block being at the leading portion of the instruments measuring area, a second centralised over the block and a third reading with the block being at the trailing portion of the instruments measuring area. The three readings are to be averaged to determine the value for the block.

6.4.8 Readings shall be taken at sufficient locations to fully characterize the performance of the marking at each site and in each direction where applicable.

6.4.9 The readings at each location shall be grouped and averaged to determine the retroreflectivity for each site and in each direction where applicable.

7. REPORT

The following information shall be reported:

7.1 Unique identification of the marking material

7.2 Name of the testing authority

7.3 Date on which the testing was conducted

7.4 The name of the person performing the testing

7.5 The location of the test site(s)

7.6 The currency of the calibration

7.7 The average retroreflectivity to the nearest millicandela / square metre / incident lux ($mcd.m^{-2}lx^{-1}$) for:

a. Each marking item;
b. Each combination of markings at that location; and
c. In each direction where applicable.

7.8 The instrument used and the set-up procedure

7.9 Reference to this test method, i.e. NZTA T16:2009 Method 1.1, 1.2, 2.1 or 2.2