

Lines of duty

Mobile retroreflectometers constitute an essential – and more powerful – alternative to handheld devices as a means to confirm the performance of road markings. How do the two measurement technologies compare?

Words | **Kjeld Aabye, Delta, Denmark**



When road authorities, contractors, service providers and other personnel involved in measuring the retroreflection of road markings move from using handheld instruments to mobile retroreflectometers, they are often concerned about the correlation between the two types of instrument. Reproducibility with handheld instruments is

typically $\pm 5\%$. Can this level be achieved by a mobile system? And can mobile systems be used for contractual measurements?

Ramböll RST, a leading northern European road survey company, and Delta, a leading manufacturer of retroreflectometers, decided to carry out a test program in October 2013 to compare the two

(Above) **The accuracy of Delta's LTL-M mobile systems was tested in Sweden**

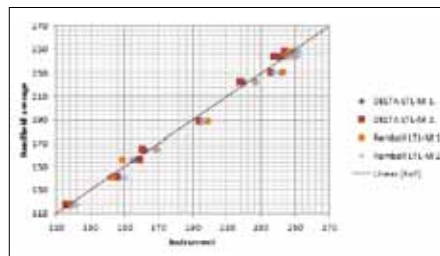
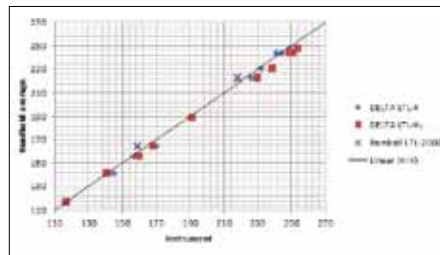


methods. The tests were undertaken on 10 sites around the Swedish city of Kristianstad, including road stretches used for the annual certification of mobile retroreflectometers operating in Sweden.

Two of Delta's LTL-M mobile retroreflectometers and three handheld instruments (LTL2000, LTL-X and LTL-XL) were used in the test program. A 100m stretch was measured at each test site. The marking types varied between smooth, dropflex, longflex, ladder and checkered.

The sample tests using handheld instruments were undertaken at 2m intervals on continuous lines and with two measurements per line segment on segmented lines. The average of all the handheld instruments was used as the baseline for determining measurement accuracy.

For the mobile instruments, each 100m stretch of road was measured twice. The average result of the center 5cm of the marking was used for



(Above) **Graphs comparing mobile and handheld equipment**

comparison to make the best possible correlation with the handheld instrument measurement width.

Comparable accuracy

The graphs (left) show the correlation between the individual handheld instruments and the individual LTL-M system respectively, compared with the average of the handheld instrument measurement values.

The following results were calculated for each instrument: absolute measurement error, systematic measurement error and repeatability (see Table 1).

The conclusion of the test is that the mobile systems and the handheld instruments both have absolute and systematic errors well below 4%, providing the same level of accuracy. In addition, the results show that there is a very good correlation between the handheld references and the LTL-M mobile retroreflectometer system.

Human visual perception of road markings is, in essence, a result of the retroreflection of the full width and length of a marking, rather than the center value of the stripe. Hence, full width and length measurements, as can be facilitated using the LTL-M mobile retroreflectometer measurement system, are more compatible with human perception than a handheld device providing spot measurements. ■

Table 1. Average measurements

Average absolute measurement error of handheld	1.4%
Average systematic measurement error of handheld	-0.5%
Average absolute measurement error of mobile	2.5%
Average systematic measurement error of mobile	3.1%
Average repeatability measurement error of mobile	1.1%