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### **A Rut is a Rut is a Rut?**

Rut depth measuring methods have improved since road engineers first became concerned about the problem. Initially, agencies simply conducted a visual assessment after a rainstorm to determine the extent of water ponding (and thus rutting) within road lanes. An improvement to this approach was the "straight edge" method which produced accurate results but had the limitation of being extremely labor intensive and dangerous for staff.



Automation of rut depth measurement has been in widespread use for network-level data collection for some time, but the accuracy and reliability of available automated systems vary substantially.

### **Low Point Rut Depth Measurement Systems**

Low point rut depth measurement systems (most commonly, three- and five-sensor rut bars) have serious limitations in their measurement of road rutting, and can grossly misrepresent the average rutting of a roadway network. Unless these rut bars can be kept in precisely the same transverse position along the entire length of the road lane, accuracy of rut depth measurement (i.e. maximum rut depth) cannot be ensured.

For example, if three sensor measurements are taken 300 mm (about 1 foot) either left or right of the true rut path, the results can vary drastically. Inaccuracies will be compounded year after year, as the likelihood of achieving the exact same transverse position of the rut bar within the lane will be miniscule. As a result, low point rut depth measurement systems do not produce reliable, reproducible measurements on a continuous basis.

The LTPP publication entitled "[Adequacy of Rut Bar Data Collection](#)" published by the FHWA in 2001, states that a "three-sensor rut bar does not provide repeatable and accurate rut depth measurements, and therefore, would not provide adequate network-level rut depths for pavement management systems." Further, it goes on to state that "if a five-sensor rut bar is used for network-level data collection, care should be taken to ensure that the transverse location of the rut bar is consistent from year to year and that the mean values are adjusted to reflect more realistic rut depth values."

## High Point Rut Depth Measurement Systems

Roadware offers two high point rut depth measurement systems, both of which surpass low point systems in terms of accuracy and repeatability. The ARAN **Smart Rutbar** is a 37 point configuration using ultrasonic transducers mounted at 100 mm (4 in.) intervals along the rut bar. The large number of sensors produces a better representation of the profile of a 3.7 m (12 foot) road lane. The Smart Rutbar system also has its own processor for real-time calculation of rut depth. Maximum rut depth (with an accuracy of 1.5 mm or 0.06 in.) is measured regardless of driver wander or the presence of double ruts, and repeatable results can be achieved year after year.

The ARAN **Laser XVP** (Laser Transverse Profiler) is a 1,280 point laser-based system that measures the transverse profile of a 4 m (13 foot) lane. The 1,280 raw data points may be separately recorded or can be filtered in real-time to produce a 40 point transverse profile. The Laser XVP also provides superior accuracy and repeatability over low point rut depth measurement systems, with rut accuracy of 1 mm (0.04 in.), and gives a true transverse profile of the lane width.

Both the Laser XVP and the Smart Rutbar can measure road cross slope, calculate mill and shim quantities, and ponding depth with the use of ARAN software applications.

Please contact us at 800-828-2726 or [info@roadware.com](mailto:info@roadware.com), or visit us at the National Conference on Pavement Management in Norfolk, Virginia, USA or other locations [www.roadware.com/conferences](http://www.roadware.com/conferences) to discuss your rut depth/transverse profiling requirements.



**Roadware is the world's leading provider of data collection equipment and services for the roadway management sector**

**Products and services include:**

- Automated data collection and analysis services
  - for asset management applications
  - for pavement management applications
- ARAN automated data collection equipment

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