

HIGH SPEED PROFILER



Highway Speed or Full Sized Profiler

Pavement roughness testing is performed on approximately 25,000 miles of roadway annually in Pennsylvania. Historically, pavement roughness data was collected for the interstate system and one half of the other routes every year. That way, data was collected for the entire system every two years. Beginning in 1996, the entire National Highway System (NHS) was tested every year; non-NHS routes followed the same biennial cycle. Therefore, the annual network testing totals are:

Interstate Routes	2,740 segment miles
Non-Interstate NHS Routes	7,187 segment miles
½ other routes	16,690 segment miles
TOTAL	26,617 segment miles

IRI data is also collected for recently repaved, new or rebuilt roads, these miles vary from year to year.

RITU currently owns three full sized highway speed Mobile Data Recorders model (MDR) 4185-L2, manufactured by International Cybernetics Corporation, of Largo, Florida. These devices, called Road Profilers, are vans equipped with an on-board computer that is interfaced to lasers and accelerometers which are mounted along the front bumper. The system hardware consists of an IBM-PC compatible computer System Unit with associated LED monitor, compact keyboard, printer and RS-232C Serial Interface. A Data Measurement Subsystem installed in the System Unit provides interfaces to a wheel mounted distance transducer and a custom designed Event keyboard.

The system accepts a downloaded RMS file containing all roadway information as an input database for test data. Vehicle location and roadway features are displayed on the computer screen in a Straight Line Diagram (SLD) format, and the software accepts operator inputs verifying segment locations, known as “events.” Routes can be tested in increasing or decreasing segment order, and test sections may begin on a segment beginning, ending, or any permanent landmark feature.

There are two laser height sensors and two accelerometers. One height sensor and one accelerometer is located over each wheelpath; they function together to allow road profile and surface height data to be collected independent of the travel speed and vehicle characteristics.

An additional laser height sensor is located between the wheelpaths; this sensor along with the height sensors located at the wheelpaths measure pavement rutting information.

The test method and equipment used for pavement roughness data collection are defined in ASTM E 950.



Road Profiler Computer Control System

Two people are used to perform testing, a driver and an operator. Typically, the operator is a permanent Roadway Programs Technician 2, and the driver is a temporary Roadway Programs Technician 1. Testing is typically performed during the months of March through November, but can vary depending on weather conditions. During the winter months, test results may misleadingly indicate rougher roadways due to the pavement surface characteristics caused by colder pavement temperatures.

Roughness testing is typically performed while traveling at normal highway speed continuously along a route within a county from the beginning of the route to the end. The operator signals the beginning of each segment as the vehicle travels along the route. The laser sensors make measurements at the rate of 32,000 per second, and a profile value is recorded for each

traveled distance of six inches. Average IRI values are determined for each tenth mile and for each segment.



Custom Bumper containing Lasers and Accelerometers

The results of pavement roughness testing are International Roughness Index (IRI) values, expressed in terms of slope, typically inches per mile.

The following table defines standard adjectival categories and nomenclature for the evaluation of IRI for various classes of roads. The IRI ranges were originally based on the groupings in the Federal Highway Administration's "Highway Statistics Manual." These ranges have been modified to reflect ride quality in terms of customer satisfaction based on results of a study by Dr. Theodore H. Poister titled "Quality Thresholds from the Motorists perspective."

IRI Categories	Interstate Routes	NHS Non-Interstate Routes	Non-NHS Routes with ADT \geq 2000	Non-NHS Routes with ADT < 2000
≤ 70	Excellent	Excellent	Excellent	Excellent
71-75	Good			
76-100	Fair	Good	Good	Good
101-120		Fair	Fair	
121-150	Poor	Fair	Fair	Fair
151-170		Poor	Poor	Poor
171-195		Poor	Poor	Poor
196-220				
> 220				

IRI Ranking Categories