A N ACCURATE knowledge of loading gauge clearances is critical if a rail operator is to be certain that loads can be carried safely. But over time the clearance along a line can change for several reasons. The track can move out of position, perhaps being lifted during maintenance, and tunnels can deteriorate.

There are several ways to measure lineside clearance, of which the two most widespread are mechanical and laser. An improved laser design jointly developed by Plasser American Corp and Riegl GmbH of Austria is now in use with New York City Transit and Taipei Metro.

With older equipment, users had to stop the recording car to measure each cross-section, which took up to 5 min. Even with a ‘fast’ recording time of 1 min per cross-section, it took nearly 17 h to measure a 1 km tunnel with one section every metre.

Measurement around this circle can be taken up to 40 times per second. The speed at which measurements can be carried out is inversely proportional to the number of points measured during each revolution and the accuracy required (Table I). There is also an option to measure individual points without rotating the beam. It is possible to calculate average measurements by taking two or more crosscuts in one sampling interval, which is usually 250 mm.

Using the survey data, the distance between the laser and the target is calculated. The computer also records the position of the rotating mirror prism and the intensity of the back-scattered light from the target. All the measurement options are set from within the Plasser Computer Measuring & Analyser System, so the user does not need to interact directly with the software. Data is transferred via a TCP/IP ethernet. The control system gets a pulse every data sampling interval, keeping the data synchronised with the car’s other measuring systems.

Plasser has produced a software package called TunnelClient, to evaluate the measured cross-sections. It can display and print individual sections, including automated printing of profiles at a pre-settable distance. There are 10 different user definable clearance diagrams, analysis of sections against a clearance diagram, with adjustments for curvature and superelevation. The system can also display the minimum clearance between two locations. Data can be output in ASCII and database upload formats.

With additional software, the equipment could also measure the distance to the neighbouring track or the height of the used ballast.