

# The Use of Terrestrial Laser Scanning for Post–Accident Deformation Evaluation of a Rail Wagon

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## SUMMARY

Terrestrial laser scanning (TLS) surveying has been successfully used in recent years for crime scenes and accidents enabling to obtain a complete 3D topographic documentation of the location and the objects present, including metric information and images. The purpose of the project described in this paper is to produce a virtually complete digital record of a railway accident and provide high accuracy geometric information so that the causes of the accident can be explored as well as the restoration of the damage along with improving train safety. Specifically, the paper describes a recent rail accident which involved a train from the Urban Rail Transport Company of Athens, Greece. The particular train, which comprised six wagons and was stationery at the main parking and manoeuvring area, got loose and rolled at a speed of about 40km/h past a safe wall and onto the main street killing one pedestrian and injured several more. The unique, complex shapes of the damage on the wagons made capturing and analyzing the full geometric detail of the deformations using traditional methods such as tape measures and mechanical profilometers very difficult. The paper describes the workflow of the terrestrial laser scanner data capture and data processing. The collected scan clouds comprised over 90 million points and were processed using a number of proprietary and in-house software. A detailed high accuracy 3D model of the train has been created and is presented and geometric analysis results due to deformation with statistical evaluation will be given. A comparative analysis is given between pre- and post- accident dimensional data in 2D and 3D. Finally, a discussion is given on the metrological aspects of TLS for using this technology in complex accident investigation applications.