

# Guardrail Impact Performance According to EN 1317: A Literature Review

Mentor Çejku<sup>1\*</sup>[0009-0009-0735-5895] and Parid Milo<sup>1</sup> [0009-0007-3935-5406]

<sup>1</sup> Department of Mechanics, Polytechnic University of Tirana, Albania  
mcejku@fim.edu.al

**Abstract.** Guardrails are essential components of passive road safety systems, designed to reduce the severity of run-off-road accidents by preventing collisions with hazardous roadside elements such as obstacles, opposing traffic, bridges, and embankments. Their primary function is not to abruptly stop vehicles but to safely contain and redirect them, minimizing injury risk to occupants and other road users. In Europe, guardrail performance is evaluated according to the EN 1317 standards, which define testing procedures, performance classes, and impact severity criteria for road restraint systems. This paper reviews the impact performance of guardrails with a focus on EN 1317 Parts 1, 2, 4, and 5, supported by related standards and recent literature. Key performance indicators include impact severity, working width, dynamic deflection, and post-impact vehicle behavior. The review identifies a critical gap between laboratory certification and real-world conditions, particularly concerning system degradation, installation variability, maintenance practices, and validation of numerical models.

**Keywords:** Guardrail, EN 1317, road resistant systems, impact performance, impact severity, working width, vehicle penetration, W-beam barriers.

DOI: <https://doi.org/10.15157/tultechbook.3.c17>

## References

- [1]. EN 1317-1. Road restraint systems – Part 1: Terminology and general criteria for test methods.
- [2]. EN 1317-2. Road restraint systems – Part 2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicles parapets.
- [3]. EN 1317-3. Road restraint systems – Part 3: Performance classes, impact test acceptance criteria and test methods for crash cushions.
- [4]. EN 1317-4. Road restraint systems – Part 4: Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.
- [5]. EN 1317-5. Road restraint systems – Part 5: Product requirements and evaluation of conformity for vehicle resistant system.
- [6]. EN 1317-6. Road restraint systems – Part 6: Pedestrian resistant system – Pedestrian parapets.

- [7]. ISO 6487:2012. Road vehicles – Measurement techniques in impact tests – Instrumentation.
- [8]. ISO 10392:2011. Road vehicles – Determination of centre of gravity.
- [9]. Bruski, D., Pachocki, L., Sciegaj, A. and Witkowski, W. (2023). Speed estimation of a car at impact with a W-beam guardrail using numerical simulations and machine learning. *Advanced in Engineering Software*, 184, 103502.
- [10]. Soltani, M., Baghaee Moghaddam, T., Karim, M. R., and Ramli Sulong, N. H. (2013). The safety performance of guardrail systems: review and analysis of crash tests data. *International Journal of Crashworthiness*, 18(5), 530 – 543.