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Vertical impact of single rocks onto gravel layers

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Layers of gravel are frequently used as energy-absorbing system for structures subjected to rockfall. Herein, we deal with vertical impacts of single rock cubes, hitting gravel with one of their tips. We predict the penetration depth, the impact duration, and the maximum impact force, respectively, as functions of the boulder mass, its height of fall, and the indentation resistance of the gravel. Knowledge on projectiles impacting onto concrete and soil is incorporated into a dimensionless prediction model, derived in the framework of dimensional analysis [1]. This model is the basis for the design of rockfall experiments comprising heights of fall up to 20 m; and a rock boulder mass up to 20000 kg. From these experiments, the indentation resistance of gravel R is back-analyzed. A statistical analysis delivers the expected value of R, its 5 % quantile, and its 95 % quantile. This permits estimation of penetration depths caused by rockfall events which are beyond the experimental means of the current study. Finally, a model for the impact kinematics is deduced from experimental acceleration measurements [1]. It yields design diagrams for impact duration and impact forces, supporting probability-based engineering design of rockfall protection systems with gravel as an energy-absorbing component [1,2].

References

[1] Pichler, B., Hellmich, Ch., and Mang, H.A.: Impact of Rocks onto Gravel - Design and Evaluation of Experiments. *Int. Journ. of Impact Eng.* **31**(5):559–578, 2005.

[2] Pichler, B., Hellmich, Ch., Eberhardsteiner, J., and Mang, H.A.: Semi-Probabilistic Design of Rockfall Protection Layers. *Comp. Mech.*, available online

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