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# Developing effective rockfall protection barriers for low energy impacts

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Recently, important progresses have been made towards the development of high capacity rockfall barriers (100 kJ - 8000 kJ). The interest of researchers and practitioners is now turning to the development of fences of minor capacity, whose use becomes essential in areas where rockfall events generally have low intensity and the use of high capacity barriers would be accompanied by excessive costs and high environmental impact. Low energy barriers can also provide a cost-effective solution even in areas where high energies events are expected. Results of full-scale tests are vital to any investigation on the behaviour of these structures. An experimental set-up has been developed at The University of Newcastle (AUS), to investigate the response of low energy rockfall barrier prototypes to low energy impacts. The Australian territory, and in particular New South Wales, is in fact characterised by rockfall events of low-to-medium intensity (50 kJ - 500 kJ) and the need of protection structures working within such energy range, is particularly felt [1]. The experiments involved the impact of a test block onto three spans, low energy barrier prototypes, made of steel structural posts, fully fixed at the base, side cables and a steel meshwork constituted by a double twist hexagonal wire net [2]. Test data enabled the development, calibration and assessment of FE models [3], on which non-linear and dynamic analyses have been performed addressing the effect of the block size. Results have shown that the response of the structure is strongly governed by the net. Data from tests conducted on the sole net and on the entire barrier showed in fact a similar trend, different to what typically observed for high capacity barriers, whose behaviour is also led by the presence of uphill cables and brakes. In particular, the numerical analyses have demonstrated a dependence of the net performance on the block size. In particular, a loss of capacity in the order of 50% occurred as the block size dropped from 1000 to 450 mm, with a realistic velocity observed to get the perforation of the net. The results of the study provide an important insight on the behaviour of low energy barriers. Data also shed an important light on the testing procedures which should be followed when full-scale experiments are performed on these structures, highlighting the need of considering the whole spectrum of potential block sizes.

References

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