



## **A new testing station about full-scale testing for rockfall protection systems**

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Rock blocks which detach from slopes overhanging urban areas, roads, railways and other infrastructures create one of the most frequent hazards in mountainous areas. Some of protection systems against rockfalls are designed to mitigate the effects of a foreseen movement by intercepting and stopping falling rock blocks. Despite the worldwide application of this kind of protections, the global behaviour of such a system has been poorly investigated, for the time being, and only at a reduced scale. The behaviour of these protection systems at real scale has been widely extrapolated, however these theories have still not been investigated by performing relating test at scale 1. The French Public Work Laboratory (LCPC) has decided to build a new testing station to work on that topic.

This new testing station located in French Alps is able to drop heavy loads (up to 20 tons) from the top of a cliff down to structural systems in order to test their resistance to big shocks and study their dynamical behaviour at this high energy level. As the fall height can reach near 70m, the impact velocity can actually reach 35 metres per second and the energy released during the impact can be as large as 13 500 kilojoules. The experimental area at the bottom of the cliff which can be impacted by a block is 12 metres wide. This allows to test not only rockfall protection systems at scale 1 but also some parts of building structures too.

To avoid damaging test-structure during a block drop due to dynamical effects, the dropping hook was designed with a special system. This one consists of a reversed mass which can be adapted to the dropped block and dropped together with the block. Moreover, it is very important to pay attention on repeatability of results concerning new devices for experiments. Whatever fall height the impact point is hit so with a precision of 50 centimetres.

Such an experimental facility needs to be equipped with a relevant instrumentation. High capacity stress sensors, accelerometers and high speed cameras are available for experiments. They have been chosen for their capacity to work with an important length of cables. The monitoring with these experimental devices is performed at a high sample frequency suitable and for a very short load like an impact. A radio controlled system allows triggering monitoring and dropping at the same time. Due to bounce risk with the dropped block the safety of personal is ensured by strict operating rules. An observation platform has been located on an embankment along the test-site in order to follow experiments without risk.

Two years were necessary for the test-site construction and its equipment. First tests on rockfall nets fences were performed at the end of 2009.