



Interaction of avalanches and snow pressure on rockfall barriers and dynamic rock fall impacts on snow supporting structures

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In the last 10 years tests of rockfall barriers were performed to minimize the cost of maintenance in regard of a maximum of safety. The outcome of these 1:1 tests was an optimized generation of ring net barriers, which are able to absorb kinetic energies up to 3000 kJ. Since rockfall events causes big dynamic load on a relatively small barrier area, last research was concentrated on the coverage of small area impacts. In contrast is the interaction of rockfall barriers with snowpacks and avalanches. The influence area is much bigger and snow pressure can act over a longer period. Not properly designed rockfall barriers can be damaged under such loading. The interaction of rockfall barriers with snow pressure and small avalanches is studied in a test area in Fieberbrunn in the Austrian Alps since 2002. The test barriers were damaged in winter 2003/04.

Snow supporting structures are built to prevent the release of avalanches. The structures are designed for snow pressure loads. Because of the stiffness of the systems they are much more vulnerable to rockfall impacts than rockfall barriers. Flexible snow nets can absorb higher kinetic energies compared to rigid steel bridges.

We focus in our paper on case studies with rockfall barriers and snow supporting struc-

tures. To enlarge the base of experience on the behaviour of these constructions in alpine areas and to understand better their limits, a survey through Austria, South Germany and Switzerland was made. Sites with damaged or undamaged rockfall barriers or snow supporting structures were investigated in winter and summer. The behaviour of the structures is analysed in regard of the event size (e.g. snow pressure, avalanche or rockfall impact), the terrain properties and the construction type. The back calculations of the rockfall events were made with the simulation software Rockfall 6.1. The main goal of the research project is to achieve better understanding in planning and dimensioning of rockfall barriers exposed to small avalanches and snow pressure or snow supporting structures exposed to rockfall. First concepts for an optimal choice of the structure type in relation of the climate, topography, protection goal and rockfall or avalanche action will be proposed. Finally we present ideas for optimizing rockfall barriers against snow pressure and small avalanche impacts.