On how to consider the avalanche danger when planning transport infrastructure in ski resorts

("La pianificazione di infrastrutture nei comprensori sciistici in considerazione del pericolo valanghe")

Jürg Schweizer

WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland

Snow avalanches endanger transport infrastructure as well as ski runs in mountain resorts. To enable safe recreation, ski runs are controlled by artificially releasing avalanches by explosives or occasionally by permanent protection measures such as snow fences. Avalanche accidents in ski resorts are rare and have only caused 5 fatalities in the last 20 years in Swiss ski resorts – compared to more than 20 per year while recreating out of bounds or in the backcountry. Often these accidents are due to unexpected avalanches from complex and difficult to control avalanche starting zones. Though it is not possible to avoid the avalanche risk completely, the risk can considerably be reduced by proper planning of mountain infrastructure.

In Switzerland, the Federal Office of Transport FOT has to approve plans for all transport infrastructure, in particular cableway systems. As part of issuing an operating license after a modification or a construction of an installation an avalanche evaluation study is needed. The FOT in collaboration with experts from SLF has recently developed new standards on how to consider the avalanche danger when planning transport infrastructure in ski resorts.

The guidelines describe how the avalanche danger (and the danger resulting from snow creep) shall be evaluated, how protection measures need to be designed and what should be done to safely operate the cableway as well as the ski runs. For the latter ones well established guidelines issued by the Swiss Commission for avalanche prevention on ski runs (SKUS) already exist. It is essential that in the planning stage the avalanche danger, in particular on terminal stations and the masts are assessed. Often, with slight modifications of the track, the danger can be limited. If not, the buildings as well as the masts need to be designed to withstand the pressure from a flowing avalanche as well as from the creeping snowpack. For example, for a cableway providing access to the mountain, the terminal stations have to withstand the impact of avalanches with return periods of 30 and 300 years (extreme event). For masts, avalanches with return periods of 10 and 100 years need to be considered. These requirements shall guarantee that under normal circumstances no damage to the infrastructure occurs, in particular in situations when avalanche control measures fail and an unexpected large avalanche occurs. For the safe operation often closures and artificial release of avalanches by explosives are required. These temporary preventive measures need to be described in a safety concept. Ski runs should not be designed such that long stretches (longer than about 500 m) can be reached by frequent avalanches (with return periods of less than 1-2 years) or that they are endangered by avalanches from complex, difficult to control starting zones.

The new guidelines aim at establishing the acceptable risk and how this can be reached. They are therefore helpful for the ski resort owner/operator, the licensing office as well as the planer and avalanche expert. The draft of the guidelines has now been applied for several years; the guidelines will become effective in the fall of 2013.