Avalanche Protection Systems: Static Defence Structures
Trumer Schutzbauten is your experienced and competent partner in terms of rockfall protection, avalanche protection and rock/slope stabilisation. Scientific research in perfect harmony with nature and the need for protection of mankind are the forces that drive the development and are the basis of the company’s principles.

Different from rockfall catchment fences, an avalanche protection system, or snow net, is a static defence structure that prevents snow avalanches from starting in their first stage of occurrence.

Static defence structures, along with forests, provide the primary method of mitigating avalanche hazards in many European countries and so have a long history of development. In other parts of the world, these systems - especially systems using flexible netting - are becoming more common.

In Europe, the design and installation of avalanche protection systems follow the guidelines set by the Swiss Federal Institute for Snow and Avalanche Research entitled “Defence Structures in Avalanche Starting Zones: Technical guidelines as an aid to enforcement”.

Avalanche protection systems by Trumer Schutzbauten provide an environmentally friendly, low maintenance and highly effective method of mitigating avalanche hazard where applicable.

The use of snow net systems is becoming common place for ski areas, as well as protecting buildings, roads, railways and utility corridors.

The extreme flexibility and minimal amount of material used make these systems more easy to install than other traditional measures such as terrace walls and snow bridges.
Unlike other avalanche mitigation methods such as control through triggering with explosives or engineering works that mitigate the effects of an avalanche in progress, static defence structures prevent an avalanche from ever occurring. If properly designed, this has many obvious benefits, including but not limited to:

- Virtually no maintenance throughout the year;
- No need for costly road, rail or facilities closures;
- Not weather dependent (i.e. unlike helicopter bombing or other artillery methods);
- No exposure of personnel to hazardous situations;
- Encourages reforestation;
- Eliminates hazard from furthest point away from elements at risk.

Though the initial investment in an avalanche protection system may be higher than, for example, the annual maintenance cost for avalanche forecasting and mitigation for a site, over the lifespan of the structure the cost benefits are often far greater. This is especially true when considering the secondary costs resulting from the closure of infrastructure being protected.

Avalanche protection systems are normally used on slopes between 30 - 50 degrees. The spacing of individual rows is determined according to the Swiss guidelines and ranges from 8 - 35 metres.
The Omega-Net is a vital component of avalanche protection systems, which makes them unique in their strength and flexibility.

The cornerstone of the avalanche protection systems by Trumer Schutzbauten is the unique net material used to form the primary support structure for retaining the snow masses: the Omega-Net.

Though its roots are with rockfall catchment fences, the high flexibility, small mesh size and high strength of the net allows the forces exerted by the snow mass to be evenly distributed throughout the system, with no need of a finer, supplementary mesh layer.

The Omega-Net used for avalanche protection systems is a 7 wired spiral rope with a diameter of 6.0 to 7.5 mm and which is pre-bent with a curve diameter of approximately 125 to 150 mm.

Unlike rockfall catchment fences, the net components are mounted on the upslope side of the system and are stretched by the lower bearing rope.

During the winter, snow deposition on the slope causes the nets to deflect. The forces exerted by the snow mass are distributed within the avalanche protection system and led into the ground via the posts, bearing ropes and anchors. In this manner, the downslope forces of the snow layer are compensated, allowing the snow to remain in place, where it has come to settle.

As the snow melts, the nets will return to their initial geometry, ready for the next seasons snow fall.
The use of the Omega-Net as the primary mesh component eliminates the need for shackles to attach the mesh to bearing ropes.

Each avalanche protection system is designed based on parameters collected at the site of installation, these include (but are not limited to): slope, snow height (normal to slope), snow density, and glide coefficient. Calculations are then carried out internally to dimension each of the components of the system accordingly.

Once designed, fabrication of the components is carried out to yield a unique system specially designed for the conditions on the slope intended. In this regards, three types of base plates/foundations are available to best suite the local geotechnical conditions.

Structural components are dimensioned on a per site basis, yielding a cost efficient and technically correct solution.
When it comes time to build the structure, the less pieces there are, all the better.

Avalanche protection systems by Trumer Schutzbauten have a modular configuration that can easily adapt to local topographic features as well as simplifies the installation.

Individual components of the system can be assembled into packages prior to installation. This greatly reduces the amount of helicopter or crane time required during the erection of the fence and the amount of manpower required.

Connections between components are designed to be as simple as possible to aid in the construction of the fence and the redistribution of forces throughout the system.

Pre-flight preparations as seen here greatly reduce the amount of time and manpower required for installation.

Similar to rockfall catchment fences, the posts and net packages are erected together, before stringing the bearing ropes through the system.

Once all posts are positioned, net packages can be opened and sewn together, thus completing the system.
Avalanche protection systems by Trumer Schutzbauten offer superior performance in rock and snow. Avalanches that utilize the Omega-Net are extremely flexible and durable, while at the same time light weight. This combination yields a structure that is easy to install in even the most adverse terrain. Where local snow conditions make these types of defence structures permissible, avalanche protection systems offer a cost effective mitigation method that is in operation 365 days a year. They help eliminate other more costly and sometimes dangerous maintenance-centred approaches that are reliant on weather, available resources and expertise. Avalanche protection systems by Trumer Schutzbauten is the answer to your need of protection for infrastructure, permanent structures and loss of life from snow avalanches. Avalanche protection systems use the same components as their rockfall catchment fences and so have the highest resistance to rockfall of any other system. Avalanches net systems are much less obtrusive than other static defence measures such as snow bridges and snow rakes. Even in the summer, they are virtually transparent and have minimal impact on the aesthetic environment. During the winter, the systems become even more transparent as they fill with snow.

Due to the spring effect between the upper and lower bearing ropes, avalanche systems using the Omega-Net can easily conform to irregular topography. Maximum surface area is achieved through the use of triangular nets at the edge of systems. A flexible anchor is used for the lower (upslope) bearing rope in order to maintain maximal elasticity of the system.
Weissenbach 106
5431 Kuchl
Austria
Tel.: +43 6244 20325
Fax: +43 6244 20325-11
E-mail: office@trumer.cc

Production:
Handelsstrasse 6
5162 Obertrum am See
Austria

720 - 999 West Broadway
Vancouver, BC
Canada V5Z 1K5
Tel.: (604) 732-0325
Fax: (604) 521-0324
E-mail: canada@trumer.cc

www.trumer.cc