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Engineering a Better Solution

Maccaferri's motto is 'Engineering a Better Solution'; We do not merely supply products, but work in partnership with our clients, offering technical expertise to deliver versatile, cost effective and environmentally sound solutions. We aim to build mutually beneficial relationships with clients through the quality of our service and solutions.

GLOBAL ENGINEERS

In the second half of the 19th century, we invented Gabions and dramatically changed the civil engineering landscape. We are still changing today. We work every day to find better solutions for our clients at every degree of latitude and longitude. Our worldwide network grows through innovation and diversification of sectors of activity and through an increasing range of high quality and environmentally friendly products and applications.

OFFICINE MACCAFERRI GROUP PROFILE

Founded in 1879, our Group soon became a worldwide reference in the design and development of advanced solutions, with offices in over 70 subsidiaries and 20 factories worldwide.

Our mission is to pursue excellence through continuous improvement, while delivering to customers engineered solutions that are innovative, advanced and environmentally friendly. We are committed to outstanding safety, quality and sustainability, to create value for all stakeholders as well as our communities.

MACCAFERRI APPLICATIONS

- | | | | |
|--|---|---|---|
|  RETAINING WALLS & SOIL REINFORCEMENT |  SOIL STABILISATION & PAVEMENTS |  DRAINAGE OF STRUCTURES |  FENCING & WIRE |
|  HYDRAULIC WORKS |  BASAL REINFORCEMENT |  TUNNELLING |  AQUACULTURE NETS/CAGES |
|  ROCKFALL PROTECTION & SNOW BARRIERS |  COASTAL PROTECTION, MARINE STRUCTURES & PIPELINE PROTECTION |  LANDSCAPE & ARCHITECTURE |  CONCRETE FLOORING, PRECAST & OTHER USES |
|  EROSION CONTROL |  ENVIRONMENT, DEWATERING & LANDFILLS |  SAFETY AND NOISE BARRIERS | |



Snow Avalanche Mitigation

Peak Protection, Proven Innovation

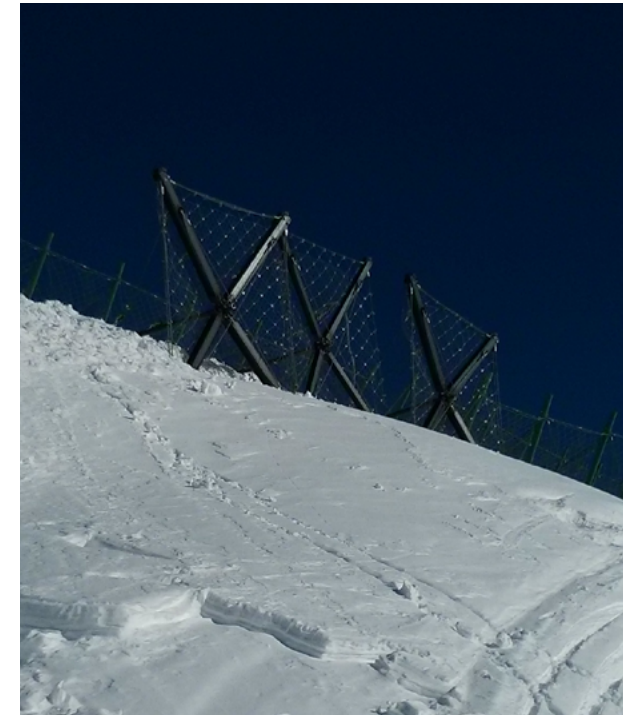
SNOW AVALANCHES

An avalanche is a sudden, fast-moving mass of snow, ice, or debris that descends down a mountain slope.

The **staggering force of avalanches**, capable of carrying tons of snow and debris at **astonishing speeds**, underscores the critical need to **mitigate their risk**. This imperative is not only to **protect the lives and properties** of mountain communities but also to underscore the **destructive potential** of these natural events.



"Drawing from **decades of experience**, Maccaferri has become a **trusted leader** in the field of snow mitigation, delivering **proven solutions** that withstand the harshest winter challenges and the most challenging site conditions. "



AVALANCHES RISK REDUCTION

An avalanche is a **rapid descent of snow** and/or ice down a mountainside, triggered by a **disruption in the equilibrium conditions** of the snowpack.

Once this balance is disturbed, the mass of snow slides downslope, carrying everything in its path. Avalanches begin when the equilibrium is disrupted, progressing from the **detachment area**, through the **sliding area**, and ending in the **deposit area**, which are key considerations for mitigation strategies.

Avalanche risk encompasses the impact of snowpack instability on people, infrastructure, and communities. Although precise avalanche forecasts are elusive due to **variable conditions**, insights from snowpack characteristics, weather forecasts, and event history provide valuable context for **assessing the potential risk and danger of avalanche generation**.



THE DETACHMENT AREA

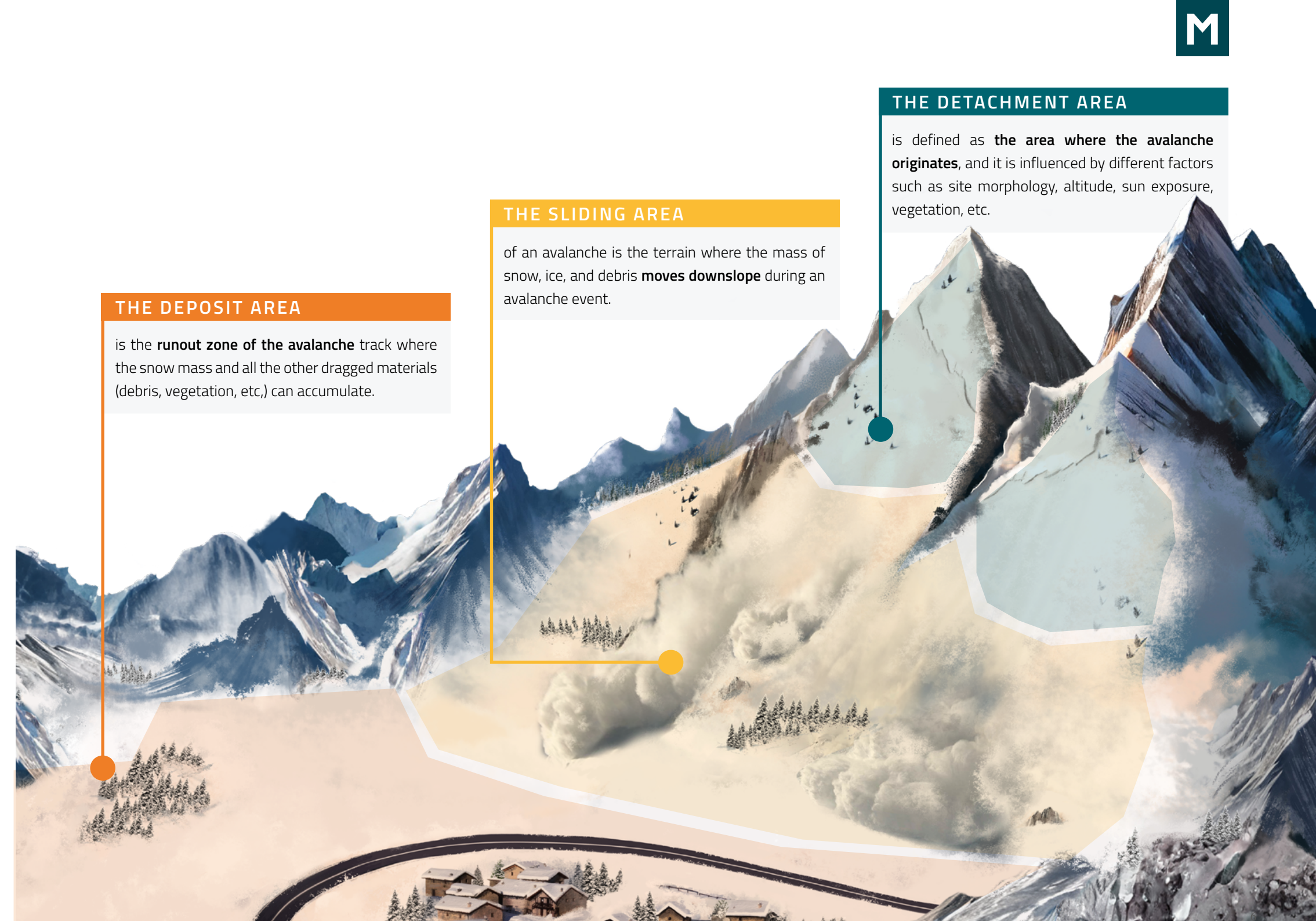
is defined as **the area where the avalanche originates**, and it is influenced by different factors such as site morphology, altitude, sun exposure, vegetation, etc.

THE SLIDING AREA

of an avalanche is the terrain where the mass of snow, ice, and debris **moves downslope** during an avalanche event.

THE DEPOSIT AREA

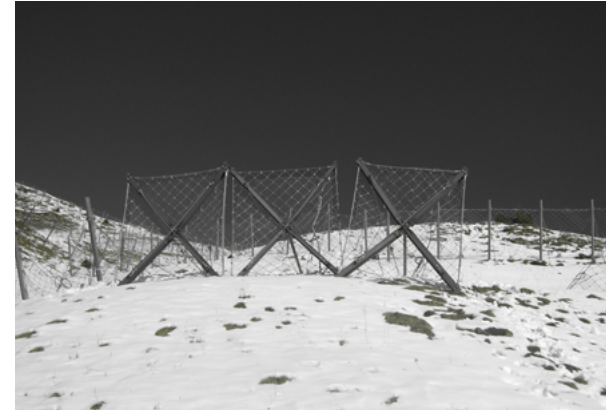
is the **runout zone of the avalanche** track where the snow mass and all the other dragged materials (debris, vegetation, etc.) can accumulate.



ACTIVE SOLUTIONS

These systems are designed to **prevent and mitigate the initiation of avalanches** by **addressing triggering factors**, such as the use of snow nets, umbrellas, wind deflectors, and snow rakes.

Active protection systems focus on **controlling snow movement and minimizing the chances of detachment** through three main approaches: enhancing ground roughness, regulating snow accumulation (e.g., using wind deflectors), and supporting structures to retain the snowpack.



READYMAC SNOW

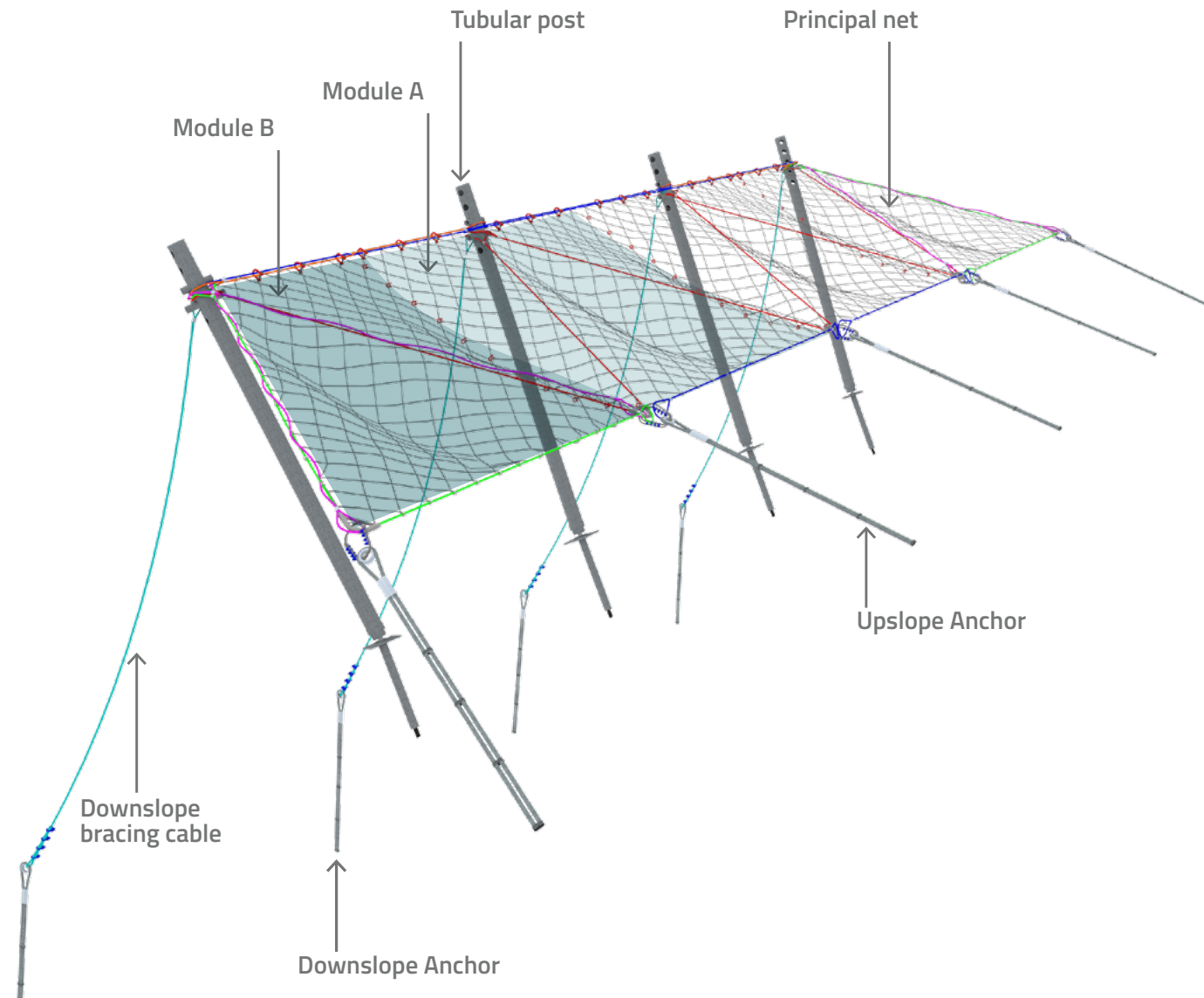
AVAMAC

They can be realized with:

- M Modification of the soil** increasing the roughness of the slope, and then decreasing the possibility of detachment;
- M Control of the snow transported by the wind** using structures such as wind deflectors;
- M Retention of the snow cover** with avalanche protection systems such as snow nets, umbrellas, snow bridges, snow racks, which are installed along multiple lines parallel to the detachment area. Those structures give external support to the snow layers, limiting the avalanche initiation.

AVAMAC structures serve the crucial purpose of **stabilizing the snow layer** in the **detachment area**, aligning with the function of Snow Nets.

However, these structures are **uniquely designed** in accordance with the **latest standards** outlined in **EAD 340109-00-0106: Flexible Avalanche Protection Kit**. This **innovative kit** comprises retaining nets, posts, cables, and anchors, engineered to efficiently transmit snow loads to the ground. Notably, AVAMAC structures offer **distinct and optimized features** compared to conventional Snow Nets, enhancing their effectiveness in mitigating avalanche risks.



CERTIFICATION

The AVAMAC solution, designed as an active snow nets system against avalanches, holds a CE mark under the **EAD 340109-00-0106: Flexible Avalanche Protection Kit**. This recognition by the European Union establishes **AVAMAC as a standard of quality**.



ETA 22/0461
1301-CPR-2157 CE mark on AVAMAC: Flexible
Avalanche Protection Kits.



AESTHETIC INTEGRATION

AVAMAC goes **beyond functional excellence** to provide an active solution against snow avalanches with an **added aesthetic appeal**, making it **well-suited even for natural parks**. The **seamless integration of design and robustness** makes AVAMAC an ideal choice that **effortlessly blends into natural surroundings**, ensuring both structural integrity and visual aesthetics.

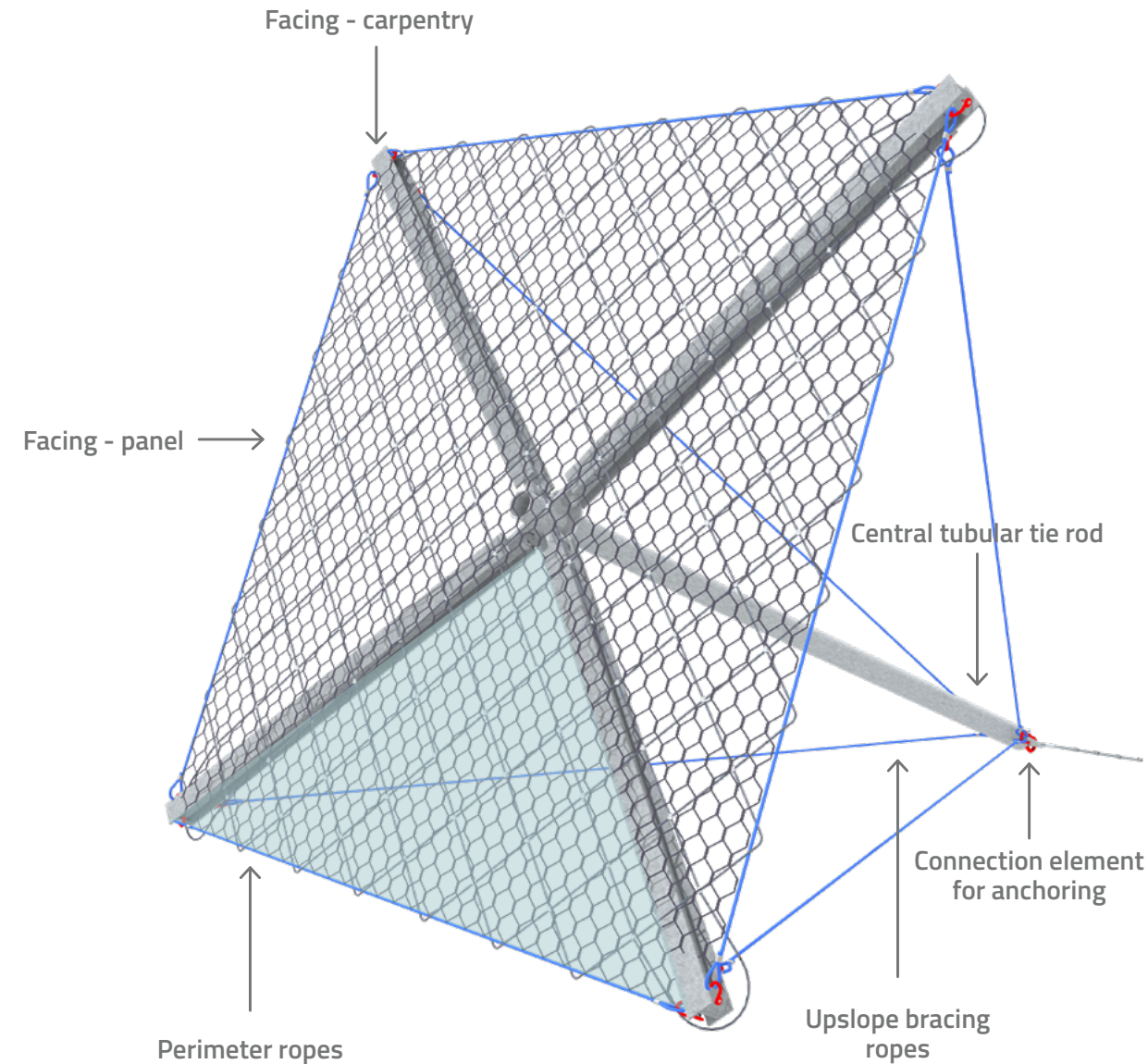
ROBUST DESIGN

The AVAMAC structure's **innovative design** excels in supporting heavy snow loads. Its **flexible, continuous** framework, coupled with **both downstream and upstream anchoring**, ensures **resilience and adaptability**. The system is optimized for **quick installation** and continuous improvement, making it a **robust and efficient solution**.

READYMAC SNOW

The mono-anchored umbrella systems are **single-element structures**, anchored to the ground by means of a **deep flexible anchor**, and aimed at **stabilizing the snowpack** in areas of possible avalanche detachment areas.

These technologies allow the **mitigation of the avalanche risk** in the detachment area according to the most recent regulations and scientific research in the sector.



PRE-ASSEMBLED

The deployment of fully **pre-assembled ReadyMac Snow structures streamlines the installation and transportation processes**. These structures are carefully aligned along contour lines and can be effortlessly placed on leveled and organized ground. ReadyMac Snow systems excel in **installations within challenging and hard-to-reach conditions**, showcasing adaptability for transportation via helicopters.



EASY INSTALLATION AND TRANSPORT

Umbrella snow structures are generally installed and aligned along contour lines. Positioned **directly on the ground**, which is pre-leveled and meticulously arranged, these systems exhibit a remarkable ability to be installed even in **highly impervious and challenging-to-access conditions**. This adaptability makes them suitable for convenient helicopter transportation to overcome geographical obstacles.



SINGLE-ANCHOR DESIGN

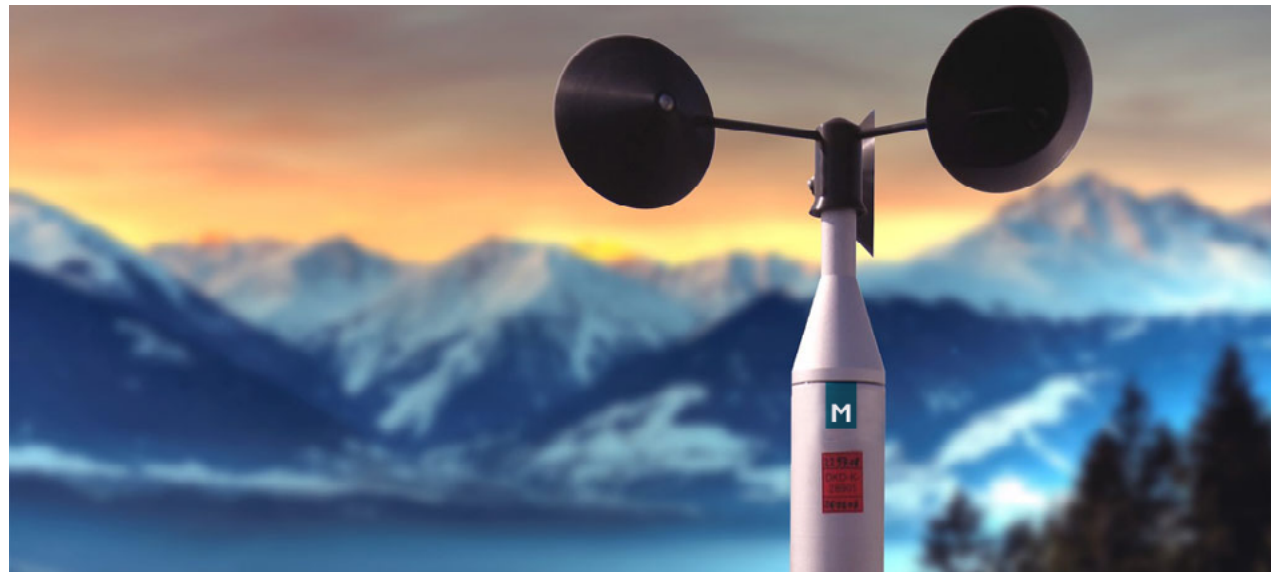
ReadyMac Snow structures, featuring a **single-anchor design**, assure **straightforward installation** even in extreme conditions, **highlighting simplicity** and **heightened safety**. These structures remain **efficient** and **high-performing**, contributing to cost reduction and establishing them as an economical choice.



PASSIVE SOLUTIONS AND MONITORING

Geotechnical safety against avalanches relies on **three key strategies**: passive solutions, active measures, and monitoring.

Passive measures fortify structures with concrete to divert, halt, and **contain snow**, **minimizing impact without impeding detachment**. Active solutions directly address snow instability. Meanwhile, **advanced monitoring**, like **HelloMac Snow**, assesses avalanche prone areas in real-time, aiding **proactive decision making for enhanced safety**. Engineers deploy this comprehensive, three-tiered approach effectively to mitigate geotechnical risks.



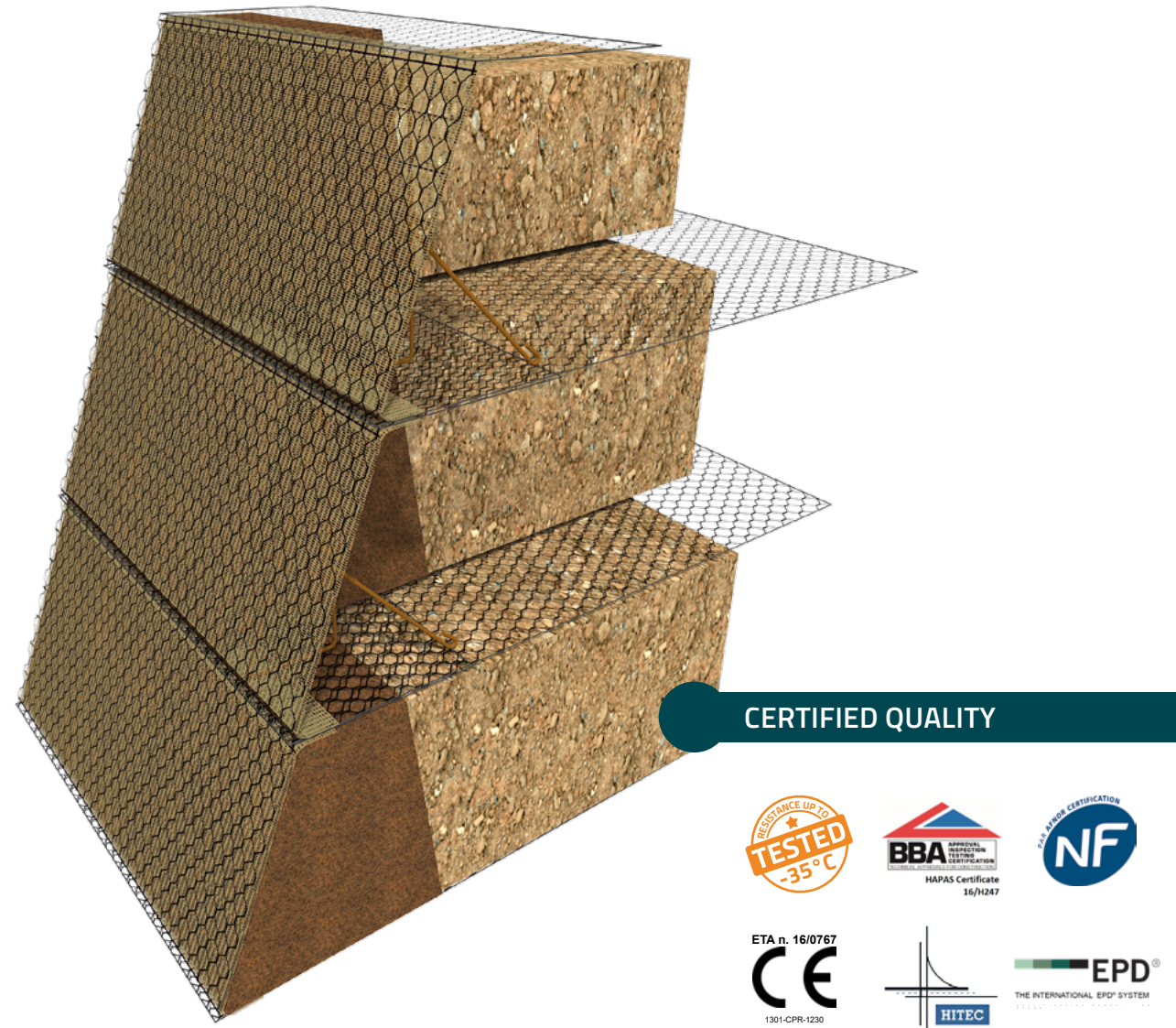
TERRAMESH™

MONITORING

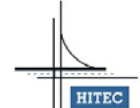
By **combining passive protection** strategies with the **monitoring capabilities** of HelloMac Snow, a **comprehensive approach to avalanche risk mitigation** is achieved. This integrated system offers both physical barriers strategically placed **to dissipate avalanche energy** and advanced monitoring for **early detection**, forming a robust defense against avalanche-related risks.

The PoliMac® coated TerraMesh™ is an **optimal choice for avalanche-prone areas**.

Engineered to withstand **temperatures as low as -35°C**, this **eco-friendly modular system** offers **enhanced resistance against avalanche impacts**. Its **robust design** ensures reliable protection, making it a **dependable solution for reinforcing slopes and embankments** in challenging alpine environments.



CERTIFIED QUALITY



ROBUST DESIGN

TerraMesh™ solutions, with their integrated double twisted steel wire mesh and DT soil reinforcement, offer a **seamless and connection-free structure**, making them ideal for applications such as avalanche protection. Their **high panel resistance and distributed load capacity** make them particularly well-suited for effectively mitigating the impact of avalanches.

DURABILITY

All TerraMesh™ solutions are constructed with **PoliMac® coated wire mesh**, a revolutionary coating known for significantly **enhancing durability**, especially in harsh climatic conditions. Notably, PoliMac® excels in low-temperature environments, making TerraMesh™ an optimal choice for projects in extremely challenging and cold climates.



EASY AND FAST INSTALLATION

TerraMesh™ solutions stand out with their **swift installation** speed and the convenience of **utilizing on-site materials**. Engineered for durability, these structures excel in **efficiency**, making them a top choice for projects that require a quick and flexible construction process.



AESTHETICALLY APPEALING

TerraMesh™ not only excels in functionality but also offers **aesthetic appeal**, making it a **fitting choice even for natural parks**. The harmonious integration of design and durability makes TerraMesh™ an **ideal solution that blends** seamlessly with natural environments, ensuring both structural integrity and visual aesthetics.



HELLOMAC SNOW

Maccaferri is dedicated to **advancing safety standards through smart solutions** like HelloMac. This **cutting-edge technology** redefines benchmarks in civil, environmental, and geotechnical engineering.

HelloMac stands as a **symbol of innovation**, exceeding industry standards and **enhancing safety, efficiency, and sustainability** across various projects. Whether in civil infrastructure, environmental conservation, or geotechnical endeavors, HelloMac plays a pivotal role in **driving advancements and shaping the industry's future** globally.



ULTRASONIC LEVEL SENSOR

The ULTRASONIC LEVEL SENSOR is a **cutting-edge technology** integrated into the **HelloMac Snow** system for **comprehensive snow monitoring**. This sensor utilizes **ultrasonic waves** to precisely **measure the depth of snow cover** in real-time. By emitting ultrasonic pulses and calculating the time it takes for the signal to bounce back, the sensor provides **accurate and continuous data on snow levels**.



SNOW TEMPERATURE PROFILER

The SNOW TEMPERATURE PROFILER, integrated into the **HelloMac Snow** system, is an **essential component for advanced snow monitoring**. This profiler is designed to measure and analyze the **temperature variations within the snowpack**. By capturing temperature data at different depths, the profiler provides a **detailed understanding of the thermal characteristics** of the snow.



WIND SENSOR

HelloMac Snow Wind's cutting-edge WIND SENSOR measures **real-time wind speed and direction**, providing crucial data for weather forecasting, energy optimization, and structural safety. Integrated for **enhanced efficiency and safety**.

HelloMac offers a suite of packages designed to meet diverse mounting needs.

From its **robust monitoring capabilities** to the **flexibility** of specialized packages, **HelloMac sets the standard** for comprehensive and customizable solutions in the realm of geotechnical engineering.



Among the diverse combinations of HelloMac, one notable variant is **HelloMac Snow**. This **innovative combination of sensors** includes an ultrasonic level sensor, wind sensors and snow temperature profiler. HelloMac Snow **enables the monitoring of avalanche-prone areas**, facilitating effective risk management.

Stay in control anytime, anywhere – HelloMac is now available as an app, allowing you to monitor your solution in real-time directly from your smartphone.





MACCAFERRI SUPPORT

Working with Maccaferri means having a **specialized support** for all the project phases.

In this case:

- Starting with the support in the **Avalanche risk assessment**
- Assisting with **Design of the protection system** (choice of the barrier, layout)
- Helping with the **Installation** (staking out)
- Supplying all the docs required such as **DOPs, ETAs & CE marks** - for certifying performance and quality
- And finally issuing **Certificate of correct installation** & helping with the maintenance (guide).



AVALANCHE RISK ASSESSMENT



DESIGN OF THE PROTECTION SYSTEM



INSTALLATION SUPPORT



DOP, ETA & CE



CERTIFICATE OF CORRECT INSTALLATION & MAINTENANCE GUIDE AND SUPPORT

FIND OUT MORE!

