ROCKFALL MITIGATION SYSTEM
Product: HIGH ENERGY ABSORPTION (HEA) ROCKFALL PROTECTION PANEL

Introduction
The Maccaferri High Energy Absorption (HEA) cable net panels were used by Colorado Department of Transportation (CDOT) to construct rockfall attenuators (“hybrid barriers”) to address rockfall hazards along Interstate 70 (I-70) at the Georgetown Incline in Colorado. Rockfall attenuators were chosen in order to decrease velocities of falling rocks prior to their potential impact to the rockfall barriers that are located further downslope. The rockfall attenuators were successfully installed between February and May, 2010. See Figures 1, 2, 3, and 4.

Rockfall Issue at Site
Due to the large boulder sizes and the extensive and steep hillslopes that occur directly upslope of I-70 in this location, falling rocks have the potential for impact energies that exceed the capacities of site-feasible rockfall barriers that are on the market. A recent rockfall event had penetrated a barrier at this site, and CDOT responded with a mitigation plan that incorporates the use or rockfall attenuators to intercept and slow the falling rocks before they meet the downslope rockfall barriers (Figures 3 and 4).

The designs for these attenuators incorporated the use of Maccaferri HEA cable net panels (1/2 in [12mm] diameter, 8x8 in [200x200mm] mesh openings) (Figure 2). This rockfall mitigation plan included other mitigation measures that included additional Maccaferri systems/products (500kJ and 2000kJ barriers and also HEA cable panel and Double Twist Wire Mesh for a drapery system) that are discussed in other case studies.

Client:
COLORADO DEPARTMENT OF TRANSPORTATION

Main contractor:
MIDWEST ROCKFALL

Designer:
YEH AND ASSOCIATES

Products used:
HEA CABLE NET PANEL

Date of construction
FEB-MAY, 2010
Solution
A total of five rockfall attenuators were chosen as part of a solution by CDOT and Yeh and Associates to address the exceedingly high rockfall impact energies that can occur along the heavily travelled Georgetown Incline upslope of I-70 (Figure 1, 3, and 4). The design of all five of these rockfall attenuators incorporated the use of Maccaferri’s High Energy Absorption (HEA) cable net panels (Figure 2). These rockfall attenuators were constructed by suspending Maccaferri HEA cable net panels (approximately 17,000 ft² [1,600 m²] in total) from an upper, anchored support cable that runs through founded barrier style posts. The panels are draped freely over the ground surface to extend approximately 20 ft (6 m) from the support cable.

The Maccaferri HEA panels were chosen in part because they withstood repeated rockfall impacts with the least amount of damage when compared to 10 other (non-Maccaferri) rockfall mesh and cable net panels in the recent CDOT study, Colorado’s Full-Scale Field Testing of Rockfall Attenuator Systems (Arndt, Ortiz, and Turner, 2009) (see Technical Note: HEA Cable Net Panel - Performance Test). Test rocks of weights up 8,360 lb (3,800 kg) were released upslope to achieve realistic translational and rotational energies before impacting the attenuator systems throughout a series of 119 rolling tests.

When falling rock energy surpasses the resisting abilities of an available rockfall barrier, it becomes necessary to install rockfall attenuator(s) upslope in order to slow the falling rock(s) while it is in-route to the downslope barrier. The energy of the falling rock is dissipated by the attenuator when it hits and therefore lifts the mesh drapery. At that point, it is then re-directed to the ground and forced to work its way between the mesh and the ground surface. The strength and dynamic qualities of Maccaferri’s HEA panels make the product an ideal cable net panel to use as part of an effective attenuator system.

References: