High Tensile Steel Systems for Natural Terrain Hazard Mitigation

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Abstract

In construction, high tensile steel is mainly used for pre-stressed concrete structures and stranded anchoring systems. Mitigation and stabilisation systems against natural hazards such as rockfall, debris flow, open hill landslides and slope instabilities have been continuously researched, developed and improved over the last 3 decades. Throughout this development process, high tensile steel in combination with special production processes has proven to be the key for performance enhancement.

The paper focuses on the development of protection systems and the guidelines and standards such as BUWAL (Swiss) and EOTA (European) applied in this process. The latest developments in this ongoing process are a 5000 kJ rockfall barrier, capable of stopping a 16 t boulder at a velocity of 25 m/s, and debris barriers suitable for stopping several 1000 m3 of debris depending on site topography and debris composition. The monitoring and measurement systems used in the real case testing of these barriers show that such performance can only be achieved by use of high tensile steel wires for the main components such as ropes, high performance net panels and anchoring system.

In parallel to the barrier systems high tensile steel mesh systems are commonly used in Europe for slope stabilisation of both, soil and rock slopes. Such systems are available since 10 years time and frequently used to substitute shotcrete on man made slopes. Similar to shotcrete they come in combination with nailing and/or anchoring and are fully dimensionable.

Finally a closer look into the corrosion protection of such high tensile steel structures is given. The use of advanced alloys in the galvanization process such as Aluminium Zinc coating enhance the lifetime by a factor of 3-4 compared to standard galvanized steel. This technology was used in the Tuen Mun Road Widening Project for the first time in Hong Kong about 8 years ago and the results observed so far confirm the theoretical background.