

### ROCKFALL DRAPERY IN QUARRY REDEVELOPMENT DEMIX QUARRY, MONTREAL, QC, CANADA

#### ROCKFALL PROTECTION

#### Product: Simple drapery system - Steelgrid® HR

##### Problem:

A former quarry site in East Montréal is being converted into a biogas plant by the City of Montréal as part of its plan to reduce the carbon footprint of the City. During the period of 2006 – 2012, the City issued a series of tenders to install rockfall drapery systems in the quarry in order to mitigate the potential of rockfall hazards to equipment and personnel that work at the base of the rock slopes, some of which exceed 120m in height.

##### Solution:

Engineers with the City of Montréal designed the rockfall drapery system and anchorage. As the side walls of the quarry were very high and access very difficult to the narrow, mid-face benches, the City wanted a drapery system that could be installed in one single piece that would drape the entire slope. No mid-face rock pinning would be done and a regular maintenance program that included cleaning up the rock debris was to be implemented.

The Steelgrid® HR is typically manufactured in standard lengths, but custom lengths can be accommodated. As part of some of the phases, single rolls of up to 110m in length were manufactured and installed. The large 8mm diameter wire ropes woven into the mesh help to carry the self-weight of the larger rolls.

According to research done in 2005 by the Washington State Department of Transportation, in cooperation with U.S. Department of Transportation (Analysis and Design of wire mesh/cable net slope protection; Muhunthan et al., 2005), it is possible to reduce the stress concentration on the mesh by including longitudinal ropes along the mesh. These ropes must be woven into the mesh during the manufacturing process, and not applied and fixed to the mesh on the job site.

The reduction of the stress on the mesh can increase the total load capacity of the mesh and consequently improve the life span.



General overview rock slopes protected with Steelgrid® HR



Installation of Steelgrid® HR



Detail of the 8 mm longitudinal cable of Steelgrid® HR

Main contractor:

CIMOTA

Designer:

VILLE DE MONTREAL

Products used:

70,000m<sup>2</sup> of Steelgrid® HR (Rockmesh M4000)

Date of construction

Multiphase 2006-2012

Steelgrid® HR was chosen to protect the slope. Steelgrid® HR is a woven composite product made of steel ropes and a double twist wire mesh woven together during the manufacturing process. The metallic cables are used in place of the conventional selvedge wire to increase the connection strength and to transmit the load of the debris directly to the top-anchors in order to reduce the stress and the deformations of the mesh. The hexagonal double twist woven mesh provides high resistance to the impacts of rocks and avoid the unraveling of the mesh in the event of wire breakage.

Over the course of 4 phases of installation between 2006 and 2012, approximately 70,000m<sup>2</sup> of Steelgrid® HR has been installed on site.

Steelgrid® HR is a geocomposite comprising of double twisted woven mesh with high-tensile steel cables incorporated vertically into the mesh twists during the manufacturing process. The cables provide effective strength transfer to the upper anchors during a rockfall event, or when retaining rock debris.

Compared to high tensile strength single twist “chain link” style meshes, Steelgrid® HR is available in strengths up to 184kN/m and offers high strength with low strain. It conforms to the rock slope more easily and if wires within the mesh are broken due to rock impact or damage, the Steelgrid® HR double twist mesh does not unravel like a single twist “chain link” style mesh. Thus, in the unlikely event that the woven mesh is damaged, it continues to offer rockfall mitigation. A further advantage over single twist ‘chain link’ high tensile steel wire meshes, is that Steelgrid® HR does not strain as much to offer its useful load, and moreover no-overlap is required.

In North America, Steelgrid® HR is known as Rockmesh.



General view of the rock cut draped by the Steelgrid® HR

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