Behavior of a drainage geosynthetic and reinforced geomat for the remediation of a dismissed industrial site in Milano city area

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DESCRIPTION

The paper describes a case history of a factory site redeveloped for a new intended use. Particularly, the redevelopment of Pirelli Bicocca Area project in Milano transformed a very old and big industrial site into a mixed urban district with 10.000 inhabitants, many important structures and several Departments of Milano University.

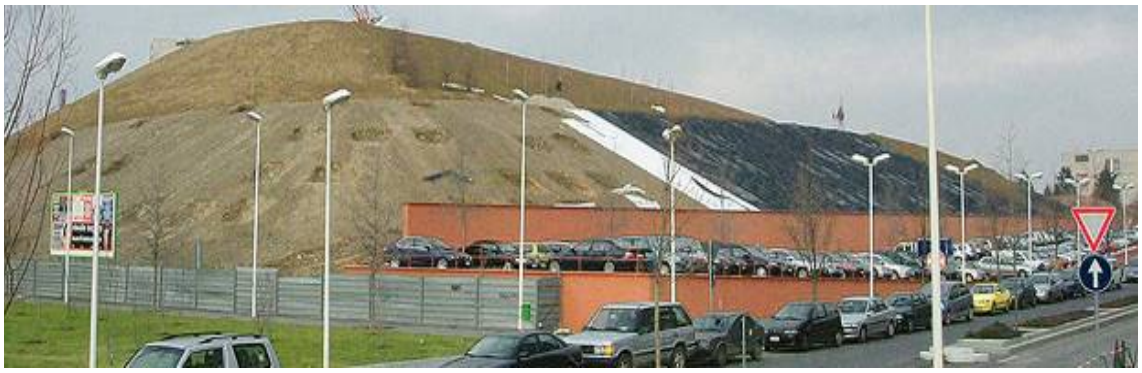
One of the problems encountered was the removal and stock of soil and debris coming from the demolition of the industrial plants, particularly taking into account the pollutant content of debris, deriving from a factory producing cars and trucks tires and plastic cables.

The proximity of the site with the center of Milano and the huge volume of material to be disposed made it impossible to transport it to any treatment plant. Therefore, it was decided to create an artificial hill, over 20 m high, incorporating the total quantity of debris (280.000 m3 volume) and covering an area of 15.000 m^2.

The limitation of the area available made the slopes of the hill extremely steep, and then the design and installation of the cover system was very challenging and interesting. The use of traditional solutions, including compacted clay as barrier and gravel as drainage was not possible, due to the steepness and length of the slopes. Therefore, a careful study has been carried out in order to select the type of geosynthetics that could solve the above engineering problems, giving to the cover system the required level of safety and durability vs. time. To guarantee the rainfall water discharge and the stability against sliding of 0.50 m soil over slopes with an inclination exceeding 30°, a drainage geocomposite and a reinforced geomat were proposed.

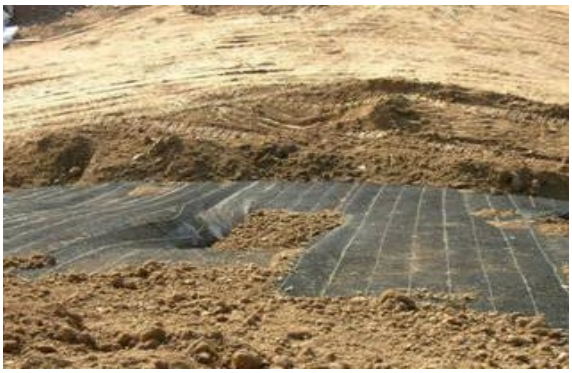
The final destination of the hill, called “Cherry Trees Hill” was public city park; for this reason, a detailed study was carried out in order to define also the type and quantity of vegetation and trees to be planted.

For landscape reasons, the architects that were involved in the project had foreseen the presence of trees on the cover layer. The geometry of the slopes and the reduced soil thickness could be a limitation in the growth of the trees. Therefore, the existing surface was prepared before laying down the cover layers, by excavating some holes on the slopes. Particular care was taken during this operation to have always a minimum inclination downward of the slope, not to risk water could remain in the holes after they were waterproofed. The holes were protected with one layer of nonwoven geotextile. The cover system, consisting in GCL, drainage geocomposite and reinforced geomat was then placed. Intermediate transversal draining trenches were added to reduce the water. Pictures of the construction phases and present conditions after 15 years in service are shown.

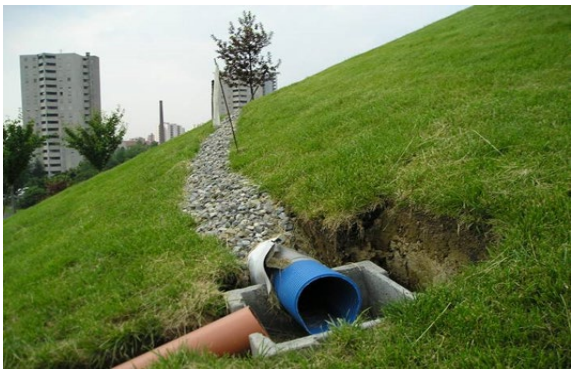


(a)

b)



c)



d)

e)

Figure – a) View of the landfill before the beginning of the works related to the capping system; b) laying down of the drainage geocomposite (white) on the GCL (black); c) laying down of the geogrid reinforced geomat over the drainage geocomposite; d) intermediate transversal draining trench; e) present conditions after 15 years with the established vegetation on the finished capping.