The key role of geostructural characterization for a sustainable exploitation of the resource: the case of the dimensional stone of Botticino

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Geological surveys are fundamental part to set up a strategy for sustainable exploitation of the natural resources, defining the geological setting of the area and assessing feasibility and potential production of the quarrying site. Mechanical characterization of the discontinuities network (including stratifications, foliations and fractures) is crucial for estimating the available volume of the resource and its giacimentological framework. Detailed geo-structural analyses of the rock mass are decisive in the exploitation of dimensional stones for which high mechanical and esthetical standards of quarried material are required. Thus, geological-based planning and management of quarry activity is the only feasible way to ensure sustainability of exploitation, reduce mining wastes and mitigate the environmental impact of the quarry.

This contribution aims to define structural setting, spatial relationships of mechanical discontinuities and quality of rock mass in the quarries site of the Botticino village (BS), one of the most famous and appreciated Italian ornamental stone. The “Botticino marble” (commercial term) is a micritic limestone, beige in color, quarried from the upper part of the Corna Formation (Rhaetian-early Sinemurian) of the Southern Alps. The open pit quarries are located on an open anticline with axis NE-SW trending and plunging to SW at low angle due to the evolution of the south-verging Southern Alps. Natural discontinuities in the ore body represent both preferential surfaces for cutting as well as potential failure surfaces. Analysis of mechanical features and relationship of discontinuities is therefore necessary to properly organize the pit and correctly plan the geometry and orientation of the exploitation faces.

Fracture network of rock mass was defined by linear scanline and window sampling and the results were also used for a geological modeling of the quarry site. This approach facilitates the understanding of the giacimentological framework of the resource and represents a useful tool for planning the mining project in order to facilitate extraction and at the same time protect the resource.