



Mineralogical, petrographical and mechanical characterization of second century blocks from a Roman latomia: a building stone of the ancient Rome.

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Buildings, squares and monuments of Rome recall the exploits of Ancient Roman people. Even after more than twenty centuries, tourists may still admire the distinguishing features of Romans' constructional skills which faced and solved aesthetic and practical issues. This work deals with the mineralogical, petrographical and mechanical characterization of some broken blocks from a Roman Latomia of the second century incidentally discovered during underground car park construction works in Rome. The blocks [1 (width) x 2 (height) x 3 (length) roman feet equivalent to about 30x59x89 cm] were piled on each other, some of them show still the original signs of hammer and chisel and some others were abandoned in advanced cutting stages; the feeling was that our visit took place during the pause between two working day-shifts.

The aim consists of improving the knowledge about this material by X-ray diffraction and fluorescence, inductively coupled plasma mass spectrometry, thin sections optical microscopy analysis and by a series of modern laboratory standardized testing techniques (UNI-EN, ASTM) for mechanical characterization, restoration purposes and for evaluating the Romans' choice in quarrying these rocks. The results on tested blocks have been related to those obtained from similar material collected from several and best outcrops within and around Rome. All data allow us to classify the investigated rocks as belonging to the Palatino Tuff Unit, a pyroclastic deposit of the Alban Hills volcano.

The Roman Latomia blocks, aged for 19 centuries and analyzed following modern standard procedures, show a compressive strength of 10.45 N/mm², a poor frost resistance, a water absorption coefficient of 26.68%, Young and Poisson modules of 2168 N/mm² and 0.6488 respectively, an index of PLT resistance of 0.32 N/mm², an anisotropy index of 2, a flexure strength of 0.88 N/mm² and a P-waves velocity of 1335 m/s. On the basis of volume weight (1.40 g/cm³) and specific weight (2.55 g/cm³) the Palatino tuff may be classified as a light and soft rock sensitive to atmospheric weathering and easy to work.

As far as we know, even without any experimental knowledge about the technical properties of this rock, the Romans used this material properly. The Palatino Tuff has been one of the earlier building material used in Rome. Evidences of that are shown in the first royal palace foundation (7th century b.C.), in the foundations and hydraulic structure of the Vaglieri water tank on the Palatine Hill (6th century b.C.), in the podiums of Dioscures and Capitoline Jupiter temples and in some parts of the Servian Walls during the 5th century b.C.. The rock has been used massively until materials with better mechanical properties, such as the "yellow tuff of Tiberina Road" became available after the conquest of Veii (396 b.C.). Subsequently, albeit in a minor key, the rock has been continuously used for many other applications during the Republican and early imperial age. Most likely the latomia discovered and dated to the second century A.D. is one of the last underground quarries opened in the Palatino Tuff Unit.