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Building stones used at the Buda castle (Budapest, Hungary), lithologies and weathering

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Buda Castle is located on the top of a small hill in the city centre of Budapest. It belongs to the World Heritage. In the 13^{th} century the first walls of the Buda castle were constructed from rocks of local quarries, although the present walls exhibit latest phases of reconstruction and restoration, mostly dating back to the 19^{th} to early 20^{th} century. The walls display great varieties of lithologies including different varieties of carbonates such as travertine, Miocene oolitic limestone, Eocene marl, Eocene and Triassic limestone. Additionally Oligocene local sandstones, conglomerates, and Miocene volcanic rocks such as andesites and andesite tuffs occur. Travertine is the most frequently used building stone and has a contribution of about 40% while the oolitic limestone and sandstone covers at about 20% of the wall surface. Minor amount of calcareous marl (around 10%) were also found. All other lithotypes including bricks are of less importance.

Most of the historic quarries do not exist any more; nevertheless it is possible to locate the source materials by knowing local geology.

A detailed mapping of several wall sections reveals that the there exist different weathering features, which are associated with the exposition, building physics and the mineralogical composition of the lithotypes. The weathering features were classified and

the physical properties of ashlars showing various weathering forms have been measured.

Schmidt hammer, Duroscope, temperature measurements or humidity measurements have been performed on the on wind/rain exposed and sheltered walls. Non-destructive tests such as micro-drilling resistance tests have been applied to detect subsurface micro-cracks and weak zones in the marl, sandstone or tuffs. To summarize, it has been found that marl, tuff and oolitic limestone are highly deteriorated, whereas travertine and sandstone are less affected by weathering. The non-destructive tests prove that valuable data can be provide on the weathering stage of various lithotypes, which helps in the planning of restoration work.