

## Stone in Historical Architecture in Slovakia

Martin Bednarik<sup>a\*</sup>, Rudolf Holzer, Rudolf Tornyai

Comenius University in Bratislava, Faculty of Natural Sciences, Dept. of Engineering Geology,  
Mlynská dolina; 842 15, Bratislava; SK

<sup>a</sup>mbednarik@fns.uniba.sk

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**Abstract:** Most of the historical monuments and buildings in Slovakia are built of natural, generous stone. The use of natural rock material in the area of the Western Carpathians is always bound on specifics of the regional - geological development of Slovakia. Different rock formation conditions and subsequent geological evolution caused considerable regional differentiation of rock masses. Major faulting of rocks during the folded-fault tectonics caused rather poor deposits on building and decorative stone in Slovakia. The rock masses of Western Carpathians provide stones which are of different natural and technical characteristics and different manner of utilization.

### Introduction

The aim of this paper is to give an overview of most used rocks with the examples of their application on historical monuments of Slovakia. Another part of the contribution is to demonstrate petrophysical and material-technical characteristics of selected types of mentioned rocks.

Rocks used in various forms of building and decoration stone can be divided into 5 basic groups:

- A. Consolidated clastic (granular) sediments – sandstone, conglomerate, breccia, quartzite, arkose, graywacke.
- B. Carbonate rocks - travertine, limestone, marble.
- C. Effusive volcanic rocks – rhyolite, andesite, basalt, quartz porphyre, melaphyre, diabase and their tuffs.
- D. Intrusive rocks - granites, granodiorites, diorites, syenites, gabbros.
- E. Metamorphic rocks – slate, serpentinite, ophicalcite, gneiss, migmatite, amphibolite.

### Rocks as a building and decoration stone

Each rock group is characterised by basic properties (strength, porosity and water absorption) which are determining for the stone behaviour and resistance at its building utilization.

**A. Consolidated clastic sediments.** From this rock group the most used as building and decoration stone were the Carpathian Cretaceous and Paleogene sandstones, and the Neogene sandstones from Vienna basin, as well.

*A.1 Porous Cretaceous, Eocene and Neogene sandstones and conglomerates* served as ashlar for the building of churches and palaces in Banská Bystrica and in Sádok, in monastery on Kláštorisko, etc. Worked stone blocks of sandstone were found in the historic site of Myšia hôrka from the Bronze Age near to Spišský Štvrtok. Sandstone and conglomerate from the Dobrá Voda quarry were used in the city of Trnava in the interior and on the portal of the St. Nicolaus basilica. The plates from Dobrá Voda or Chtelnica-Trianova rocks served by the renovation of the portal of Klarissa church, pedestal of the St. Trinity statue and entrance stairs into the Trnava archdiocese. Stone from Chtelnica-Trianova replaced the old entrance of the St. Jacob church and used for the renovation of the statue of St. Joseph on the St. Nicolaus square. The lithotype from Dobrá Voda has been in Bratislava used for staircases and basal window parapets of the former Erdödy palace, from the same material was laid the pavement in the entrance hall of the former Mindszenty atelier.

The Leitha limestone („Leithakalk“) - petrographically calcareous sandstone, conglomerate or biotrititic or algae limestone (Badenian) were exploited since the Roman Empire. Leitha limestone ashlar from Mannersdorf were with a high probability used in the Bratislava town hall. On the slopes of Devínska Kobyla (Small Carpathians) was exploited the Badenian calcareous sandstone and used in structures of Bratislava town hall, St. Martin's basilica and Gothic church in the village Devín.

**A.2 Compact sandstones of Paleogene and Neogene.** In the Váh region, in Kysuca, Orava and Liptov regions these sandstones were used (parish churches in Žilina, Liptovský Mikuláš and in Gothic churches of the Spiš and Šariš regions). Tertiary sandstones create ashlar in the Great Moravian church in Kopčany. The quarry in Oravský Biely Potok provided a good-class sandstone for the Orava castle. Siliceous sandstone (Sarmatian) from the quarry in Sokolovce was exploited for the restoration of the St. Martin's Cathedral in Bratislava in 60-ties and 70-ties of the last century. The same stone was found on the St. Emeram church in the Nitra castle. Roman churches in Bernolákovo, Boldog and Štvrtok n/Ostrove are built from the Neogene sandstone (Pannonian/Pontian).

**B. Carbonate rocks.** The Spiš travertine (quarry Drevení) served since the medieval Ages material for structures of the Spiš castle and churches. The white or white-gray travertine represents the most significant decoration stone. It was used as facing and decoration stone in Bratislava and in several buildings in Prague and whole Czechoslovakia. The most importance belongs to the travertine from the Liptov basin, first of all from Bešeňová quarry, Ludrová and Lúčky. This material was for its particular texture and soft yellow-brown colour and good properties used on many significant historic objects (in Budapest, Comenius University in Bratislava, Palace of Nations in Geneva). The exploitation site of the most original decorative travertine („onyx d'or“) was the hill Šikláš near Levice, which was used for decorations, mostly for interiors and stone bijouterie. Tuhár marble quarry served facing stones, pavements, window parapets, stairs, etc. Beside it, in many manor-houses occur decorations and products (since 18th century) of varicoloured marbles from Germany, Poland, Dalmatia, Italy, France, Belgium.

### C. Effusive volcanic rocks.

**C.1 Solid volcanites.** To the most attractive building and decorative stone belongs the pink-red and porous rhyolite from Hliník n/Hronom. Since medieval Ages the rock has been used for individual decorative or building elements or as building ashlar on several buildings in Banská Štiavnica and Kremnica Mts., the tunnel below the Bratislava castle. From andesites were prevalingly used pyroxene and pyroxene-amphibolite andesites, and considering the appearance, extremely fair amphibole-biotite (AB) andesite, brownish-red or dark gray coloured. The AB andesite was historically exploited in underground gallery near Banská Štiavnica. This stone was used on significant buildings as Kammerhof, Old castle, Rubigall house, town hall and many other buildings on St. Trinity square in Banská Štiavnica, and on bridge piers in Budapest. Basalt was as building stone less used, a special disposal of it show sacred buildings of Calvary hill in Banská Štiavnica.

**C.2 Semi solid volcanic rocks.** The easy workable pyroclastic and epiclastic rocks were largely used as building stone in Central and Eastern Slovakia since the medieval Ages. Ashlar of easy workable material were used on medieval churches in Kalinčiakovo, Hronský Beňadik, on castles in Zvolen, Bojnice and Banská Štiavnica. Many rural buildings in villages near to Banská Štiavnica (eg. Prenčov) were built from this beautiful stone. So called “Obyce tuff” (Pohronský Inovec Mts., quarry Obyce served an appropriate building material since medieval Ages in buildings in Zlaté Moravce, Topoľčianky, Kostofany p/Tríbečom, Nitra, Sádok and Klížske Hradište.

Rocks of the groups D. and E. are for the utilization as a building stone of no functional importance, occasionally were from granite and granodiorite manufactured cobble-stones and edge-stones. In case of suitable blockiness there were produced ashlar as for example a monument and gates in Devín, in Bratislava granite ashlar constitute the piers of the Červený most and the Calvinist church, as well. Granite from Mauthausen (Austria) was imported too. Piers of the Old Bridge over Danube and the Blumental church walls consist of this granite.