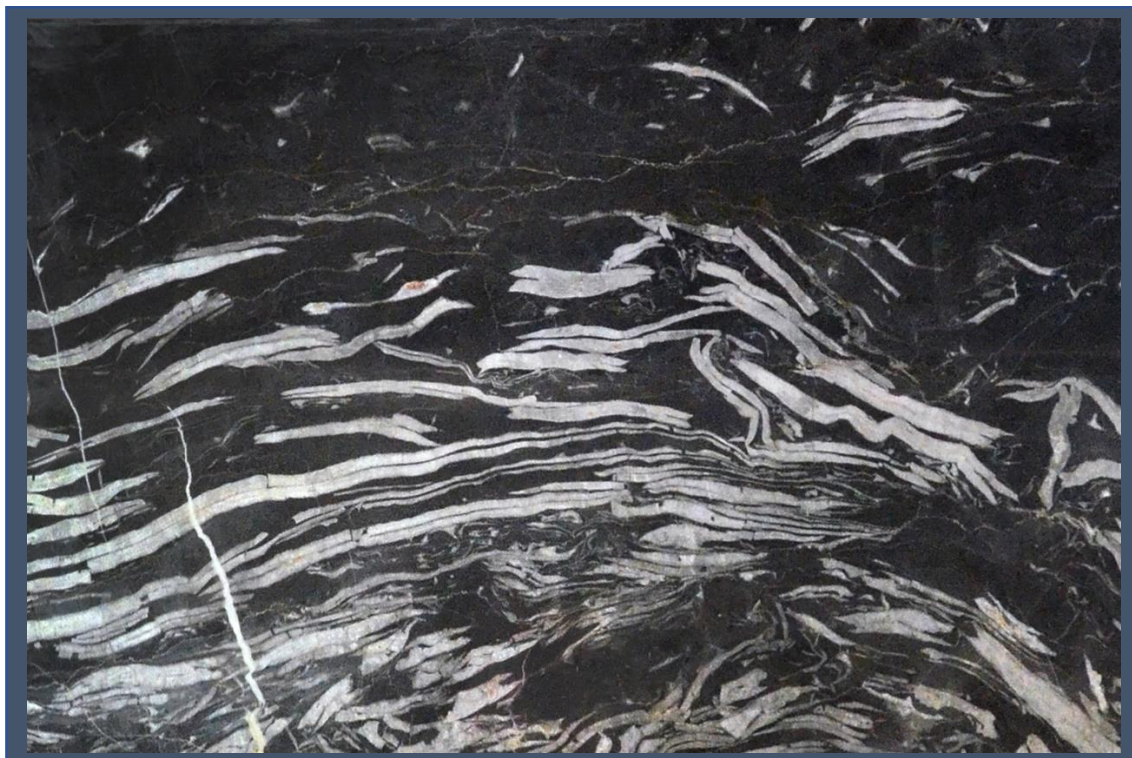


Podpeški apnenec

Podpeč limestone

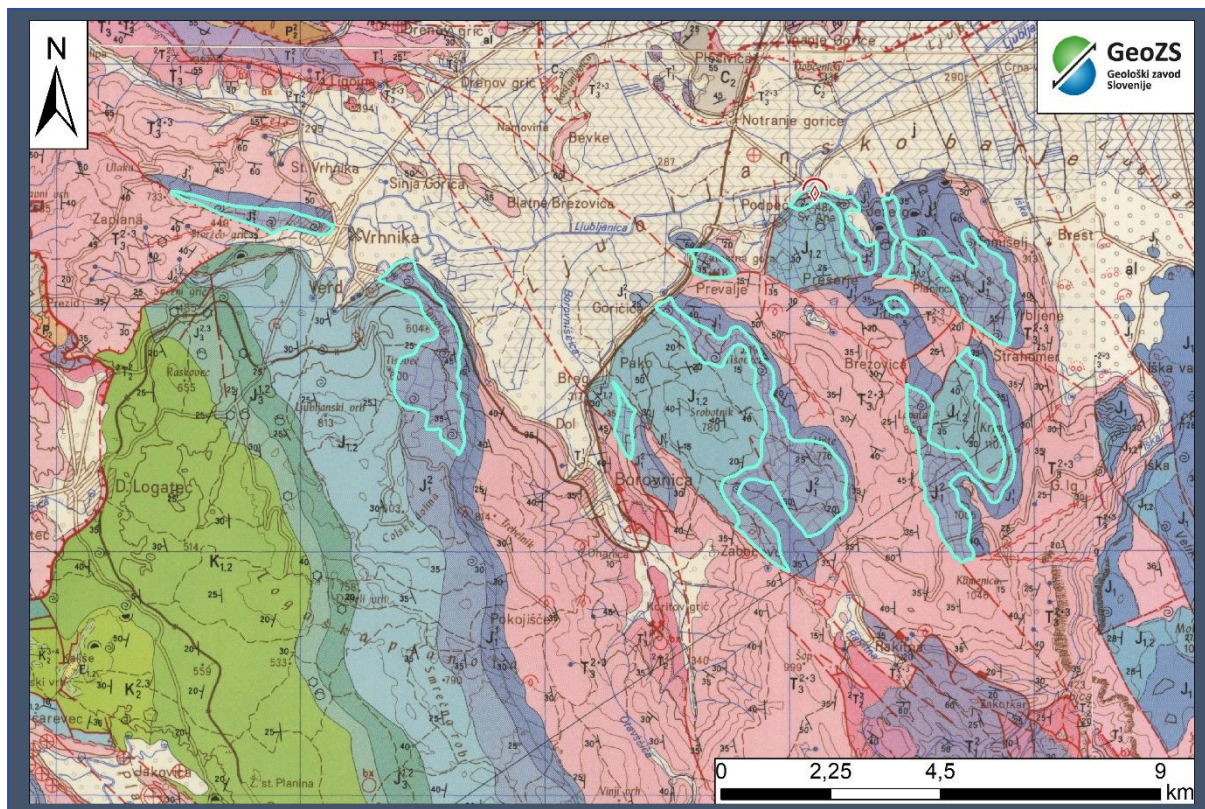


20 cm

Short description: Dark grey or black limestone of high decorative appearance due to the contrasting white colour of its fossil remains of large lithotid shells. The image displays a polished surface.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
limestone	limestone	dark-grey	Slovenia	Notranjska (traditional province)	Brezovica	Podpeč

Geological setting



Geology: Palaeogeographically the Lithiotis Horizon is situated within the shallow-water lagoonal facies of the Dinaric Carbonate Platform. The Podpeč limestone is interstratified within ooidal limestones.

Production: No. Abandoned quarry at northern foothill of Mount Krim (Sv. Ana).

Geological age: Lower Jurassic (Pliensbachian) (190-180 million years)

Geological unit: Outer Dinarides – middle Lower Jurassic limestone and dolomite, Lithiotis Horizon

Application, use and heritage

Description: Designated GHSR in 2017 (Kramar et al., 2015), natural monument since 1991, geological monument of national importance since 2004. Historic use is more than 50 years, with quarrying during the Roman time, as well as in 17th and 20th centuries.

Podpeč limestone has been utilized as cut building blocks, slabs for interior use, sculpting stone and for monuments.

The internationally renowned Slovenian architect Jože Plečnik (1872-1957) used Podpeč limestone in various buildings – some of them are the Central Stadium in Ljubljana, the faculty of Natural Sciences and Technology of the University of Ljubljana, the National and University Library (1937-1941), many altars and churches...



Podpeč limestone with fossil shells in remains of ancient Roman Emona (present-day Ljubljana).



Podpeč limestone blocks in the Plečnik's National and University Library in Ljubljana



Colonnade staircase of the National and University Library in Ljubljana.

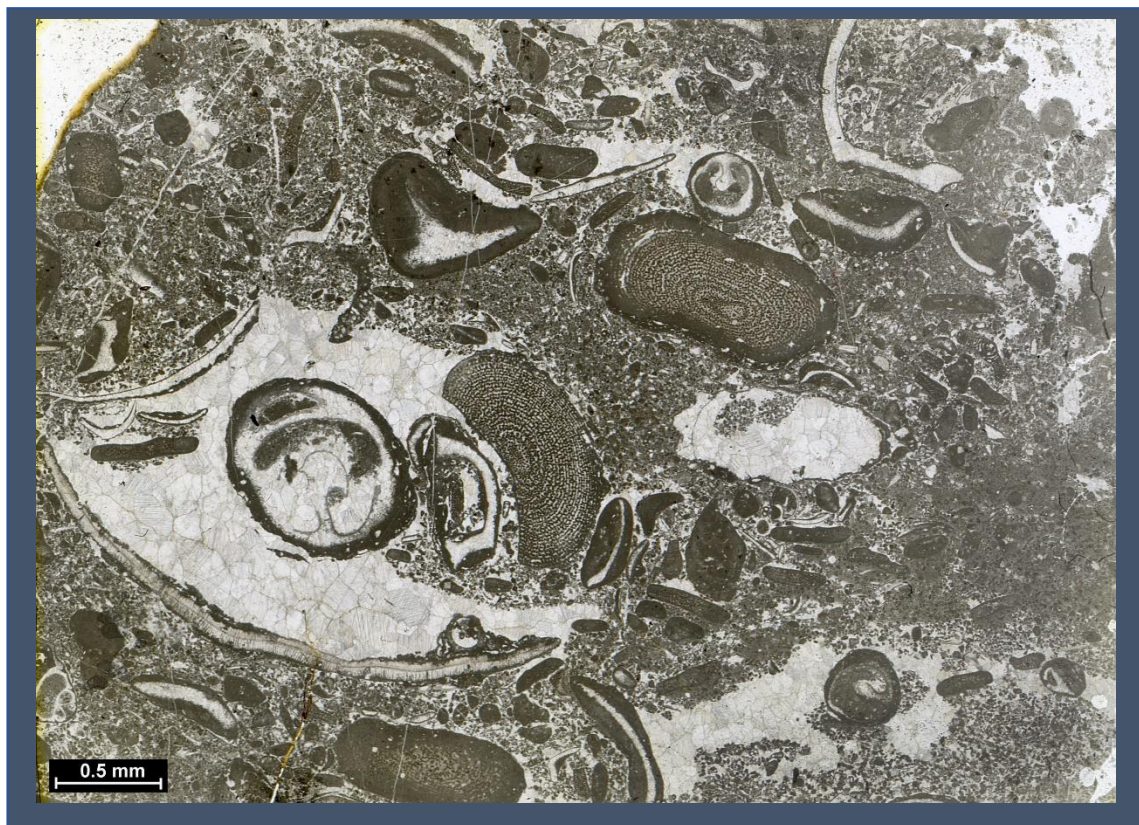


Ursuline Church of the Holy Trinity in Ljubljana.



Plečnik's Church St. Michael (1940) in Črna vas.

Petrography



Description: Calcite, with the limestone being black in colour due to the presence of organic matter, and white in colour due to the pure low-Mg-calcite (sparite) fossil bivalves (*Lithiotis*, *Cochlearites* and *Lithioperla* are characteristic). Some shells are dolomitized. Quartz also occurs as terrigenous grains.

Podpeč limestone occurs in many varieties. Besides the most typical micrite limestone with lithiotids, dark grey micrite with brachiopods, and brownish oncolite and oolite with gastropods and foraminifer *Orbitopsella* are most common. Upper images display a polished surface.

Source of information: Geological Survey of Slovenia, Buser & Debeljak, 1996; Kramar et al., 2015.

Mineral composition

If no accurate number, use MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

Calcite (%)	Dolomite (%)	Organic matter (%)	Quartz (%)
pure low-Mg-calcite (sparite)	some shells are dolomitized		terrigenous grains of quartz

Source of information: Kramar et al., 2015.

Physical properties

Apparent density (EN 1936) kg/m ³	Open porosity (EN 1936) % vol	Water absorption at atmospheric pressure (EN 13755) % wt	Uniaxial Compressive strength (EN 1926) MPa	Flexural strength under concentrated load (EN 12372) MPa
2.71-2.73	0.9-1.2	0.13-0.30	Dry: 160-190	-

Real density (EN 1936) kg/m ³	Total porosity (EN 1936) % vol	Water absorption coefficient by capillary (EN 1925) (g/m ² x s ^{0,5})	Flexural strength under constant moment (EN 13161) MPa
	-	-	Dry: 14-18

Frost resistance (EN 12371)				
Technological Test (Test A)				Identification Test (Test B): Number of cycles completed prior to stone failure
Flexural strength (EN 12372) after freeze-thaw cycling, MPa	Number of cycles	Uniaxial compressive strength (EN 1926) after freeze-thaw cycling, MPa	Number of cycles	
-	-	-	-	

Resistance to ageing by thermal shock (EN 14066)			
Change in dynamic modulus of elasticity (increase: +; decrease: -) %	Change in open porosity (increase: +; decrease: -) %	Change in ultrasound pulse velocity (increase: +; decrease: -) %	Change in flexural strength under conc. load (increase: +; decrease: -) %
	-	-	-

Abrasion resistance (EN 14157)			Resistance to salt crystallisation (EN 12370)	Breaking load at dowel hole (EN 13364)	
Method A - Wide Wheel Abrasion Test, mm	Method B - Böhme Abrasion Test, cm ³ / 50cm ²	Method C - Amsler Abrasion Test, mm	Change in mass (increase: +; decrease: -), %	Breaking load, N	Thickness of the test specimens, mm
-	-	-	0.01-0.1 % by mass	-	-

Slip resistance by means of the pendulum tester (EN 14231 / CEN/TS 16165)			Rupture energy (EN 14158), Joule	Thermal Conductivity (EN 1745), W/m·K
Tested surface finish	Slip Resistance Value — SRV			
	Dry test condition	Wet test condition		
-	-	-	-	-

Source of information: Kramar et al., 2015.

Chemical properties

Main elements

SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	TiO ₂ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	MnO (%)	P ₂ O ₅ (%)	SO ₃ (%)	LOI (%)
-	-	-	-	-	-	-	-	-	-	-	43

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
Sc (ppm)	Y (ppm)	Th (ppm)	Sb (ppm)	Ta (ppm)	Nb (ppm)	Zr (ppm)	Sn (ppm)
Ag (ppm)	B (ppm)	Mo (ppm)	W (ppm)	Ga (ppm)	Ge (ppm)	Se (ppm)	Cs (ppm)
Tl (ppm)							

REE

La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)
Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)		

Methods applied and source of information: Kramar et al., 2015.

Sources of more information

Type of information	Name of provider	URL
This data sheet		
Non-commercial directory	Geological Survey of Slovenia: Mining Registry Book	https://www.ms.geo-zs.si/en-GB
Commercial directory		
Scientific publication	BUSER, S. & DEBELJAK, I. 1996. Lower Jurassic beds with bivalves in south Slovenia. <i>Geologija</i>, 37-38. 23-62. http://www.geologija-revija.si/dokument.aspx?id=835 MIRTIČ, B., MLADENOVIC, A., RAMOVŠ, A., SENEGAČNIK, A., VESEL, J., & VIŽINTIN, N. 1999. Slovenski naravni kamen. Ljubljana, Geological Survey of Slovenia, Slovenian National Building and Civil Engineering Institute, University of Ljubljana Geology department. 131 pg. RAMOVŠ, A. 2000. Podpeški in črni ter pisani lesnobrski apnenec skozi čas. <i>Mineral</i>, Ljubljana. 1-115. KRAMAR, S., BEDJANIČ, M., MIRTIČ, B., MLADENOVIC, A., ROŽIČ, B., SKABERNE, D., GUTMAN LEVSTIK, M., ZUPANCIC, N. & COOPER, B. 2015. Podpeč limestone: A heritage stone from Slovenia. <i>Geological Society Special Publication</i>. 407. 219-231. 10.1144/SP407.2.	
Other publication		

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		 GeoZS Geološki zavod Slovenije