

Finding out the quality of the mineral

1. Sampling method

Samples have been taken from the building-stone field »Sveta Ana« in order to determine the material's physical and mechanical characteristics as well as to submit the stone to a petrographic analysis and find out its mineral content. On the basis of these procedures and regarding the intention of putting the stone to a specific use, an expert opinion has been issued certifying its architectural, construction and technical properties.

The analysis of the architectonic-construction stone was carried out in compliance with relevant standards on the samples tagged B-1211/AG/10 from the very core of the borings analysed from the site. On the grinding and classification plant, the sample for analysing the quality of technical-construction stone

B-1211/gt/10 was broken down to fit the class -5 cm. The quality of the architectonic and technical-construction stone from the field »Sveta Ana« was determined by the Association (ILI: by an association etc., zavisi) for control and ecological protection CEMTRA Ltd. from Zagreb (cf. Supplements 3a and 3b).

The analysis of the mineral was carried out in compliance with relevant standards, all the reports required have been made.

2. Results of the laboratory analysis

- architectonic-construction stone -

From the report on the analysis of the architectonic-construction stone from the field »Sveta Ana«, nr. 28/agk/10, dated 18th June 2010, it can be concluded, on the basis of the results obtained regarding its mineral-petrographic content, physical and mechanical characteristics as well as its consistency, that:

- **Macroscopically** the stone is of pinkish-grey colour (5 YR 8/1 by the »Rock-color Chart«). A blow will break it sharp, in an irregular way, its surface remaining harsh and uneven. Its texture is homogenous. Its structure, granulated, is partly crystal. Different cuts of the remains of mineral deposits were observed. A lense will help us observe a lot of small fragments of fossil origin, rare pores, crystal base and small romboidlike cuts. In contact with dilluted chlorid acid (HCl), the stone will react with medium intensity and very weak sound. Determination by location: Limestone – recrystallised wackstone.

- **Microscopically**, a homogenous texture, microcrystal structure which is the aggregate of rare detritus and calcite and many romboedric as well as poligonal cuts into the dolomite (approx. 50%) were observed. The sample which was painted with »Alizarin – red S« partly coloured red. The mineral content consists of calcite, dolomite and dedolomite, which compose the detritus as well as the base.

They appear as small granules of poligonal, romboid and irregular, isometric and prolonged cuts of sparite, rarely microsparite dimensions. The former has between 0,27mm and 0,76mm x 0,43mm in diameter. Several romboid and poligonal cuts into dolomite contain microscopically undefinable (trunje – ne razumijem). Does not contain harmful minerals like calcedon, pyrite, markasit or clay minerals. The structure is crystallike with very little detritus, mostly from remaining fossil shellfish of the dimension of very small Rudite. The fossils mainly consist of mosaic calcite. The share of biodetritus reaches approximately 5-10%. The results of a chemical analysis show that the stone contains 43,76 % CaO and 10,65% MgO, i.e. 49,72% calcite and 48,71% dolomite. According to this finding, the stone has been classified into very much dolomitic limestone (J. Tišljar, 2001).

- **Certification**: by the composition, quantity and dimensions of detritus, by its texture, structure, mineral composition, the chemical analysis of the stone determined the latter as recrystallised, very dolomitic limestone of organic origin, dolobiosparit by R. L. Folk and dolomitic phosiliferous wackstone by R. J. Durham.

- **Physical-mechanical characteristics of the stone** are as follows:

Nr.	What is investigated	Ref.	Results
1.	Pressure firmness:		
1.1.	-when dry		max.=115,4 MPa min.=86,8 MPa middle=98,8 MPa
1.2.	-when saturated with water	HRN EN 1926	max.=113,3 MPa min.=89,5 MPa middle=97,5 MPa
1.3.	-when frozen		max.=107,0 MPa min.=73,5 Mpa middle=85,5 MPa
2.	Folding firmness	HRN B.B8.017	max.=13,0 MPH min.=8,2 MPH middle=10,7 MPH
3.	Resistance of the stone at the boring	HRN EN 13 364	max.=4,4 kN min.=1,7 kN middle=3,3 kN
4.	Water absorption at atmospheric pressure	HRN EN 13755	0,88 %(mas.)
5.	Volume	HRN EN 1936	2 605 kg/m ³
6.	Density	HRN EN 1936	2 665 kg/m ³
7.	Degree of density	HRN EN 1936	0,977
8.	Absolute porosity	HRN EN 1936	2,25 %(vol.)
9.	Freezing resistance	HRN EN 12371 (25 cicli)	0,37%(mas.) stable
10.	Resistance to crystallisation of the salt (using the method of Na2SO4 solution)	HRN EN 12370 (5 cicli)	0,75%(mas.) stable
11.	Damage resistance (Böhme)	HRN EN 1097-2	24,0 cm ³ /50cm ²
12.	Share of total sulphure as SO3 Share of total chloride as Cl	HRN EN 1926	=0,17% (mas.) =0,0030%(mas.)

	Share of sulphide sulphure		None
--	----------------------------	--	------

www.brackikamen.hr

-Chemical components of the sample stone were found out by chemical analysis. Mineral content was calculated on the basis of this analysis. The results were as follows:

Chemical parametre (determined by HRN B.B8070)	Share (mas.%)
Glowing loss at 1000 °C	45,11
Silica, SiO ₂ + insoluble rest	0,18
Iron oxide, Fe ₂ O ₃	0,00
Aluminum oxide, Al ₂ O ₃	0,06
Calcium oxide, CaO	43,76
Magnesium oxide, MgO	10,65
Sulfur trioxide, SO ₃	0,17
Sodium oxide, Na ₂ O	0,06
Potassium oxid, K ₂ O	0,00
TOTAL:	99,99
Total chlorides figuring as Cl	0,0030
Pyrite content	0,00
Chemical-anaylisis based calculation	
Mineral content of the stone:	
Calcite, CaCO ₃	49,72
Dolomite, CaCO ₃ MgCO ₃	48,71

- Expert opinion on usability – the laboratory results of its physical-mechanical properties, chemical purity and mineral-petrographic content make the stone from the field „Sveta Ana“ ideal as quality architectonic-construction material for:

- exterior vertical veneer
- interior vertical veneer
- int. and ext. horizontal veneers
- fabrication of window sills and frames
- fabrication of wall-claddings and other elements of stone masonry

www.brackikamen.hr