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R E P O R T No. 73/2007

For testing of physical-mechanical, chemical and mineral – petrography characteristics of building stone from locality "Radibus"- Rankovce

CONTRACTOR : DGP " TRGO- INZINERING " – JOVAN and others
D.O.O. - GOSTIVAR

Градежен институт МАКЕДОНИЈА АД Скопје

Skopje, March 2007

CIVIL ENGINEERING INSTITUTE
"M A K E D O N I J A" - Skopje

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CIVIL ENGINEERING INSTITUTE
" MAKEDONIJA " - SKOPJE

CONTRACTOR	DGP " TRGO- INZINERING " – JOVAN and others - D.O.O. - GOSTIVAR
MATERIAL	BUILDING STONE
TOWN	LOCALITY " RADIBUS"- RANKOVCE
SUBJECT	For testing of physical-mechanical, chemical and mineral – petrography characteristics of building stone from locality "Radibus"- Rankovce
CHIEF ENGINEER	V. PROKOPIEVA b.s.c
ASSISTANTS	G. STEFANOVSKA b.s.c. Lj. JANEV,civ.tehn. B.DUROVSKA, typist
CORDINATOR	
DEPARTMENT FOR MATERIALS TEH. No	SKOPJE **73/2007**

MANAGER OF DEPARTMENT

MARJAN LEVAJKOVSKI b.s.c.

Градежен институт МАКЕДОНИЈА АД Скопје

Skopje March 2007

CIVIL ENGENEIRING INSTITUTE "MACEDONIA -Skopje, as specified institution for testing building materials and determination of its quality, on request by DGP"TRGO-INZINERING" JOVAN and others DOO GOSTIVAR made testings of building stone of locality "Radibus " – Rankovce to apply in practice as decorative stone and other application in civil engineering .

Samples for testing were with dimensions 5.0 x 5.0 x 5.0 and 7.0 x 7.0 x 7.0 cm and were delivered by the Contractor.

Program for testing

a) PHYSICAL – MECHANICAL PROPERTIES

COMPRESSIVE STRENGHT-in dry condition
COMPRESSIVE STRENGHT-in water saturated condition
COMPRESSIVE STRENGHT-after freezing
RESSISTANCE TO WEAR (Bohme)
DENSITY WITH PORES AND VOIDS
DENSITY WITHOUT PORES AND VOIDS
DENSITY COEFFICIENT
POROSITY

b) CHEMICAL ANALYSIS

c) MINERALOGICAL – PETROGRAFIC COMPOSITION

RESULTS OF STONE TESTING

a) PHYSICAL – MECHANICAL PROPERTIES

COMRESSIVE STRENGTH-in dry conditoion

βpm = 166.40 MPa

βp max. = 180.75 MPa
βp min. = 150.70 MPa

COMRESSIVE STRENGTH-in water satured conditoion

βpm. = 157.85 MPa

βp max. = 177.50 MPa
βp min. = 132.00 MPa

COMRESSIVE STRENGTH-after freezing

After 25 cycles of freezing and thawing on the examined samples there were no cracks and disintegration.

βpm. = 135.90 MPa

βp max. = 153.20 MPa
βp min. = 115.40 MPa

RESSISTANSE TO WEAR (Bohme)

Ha = 10.20 $cm^3/50cm^2$

DENSITY WITH PORES AND VOIDS

γ_B = 2630 kg/m^3

DENSITY WITHOUT PORES AND VOIDS

γ_{cn} = 2640 kg/m^3

DENSITY COEFFICIENT

D = 99.62%

POROSITY

P = 0.38 %

b) MINERAL-PETROGRAPHY COMPOSITION

- **Macroscopic profile**

  The rock has gray – pink color in transversal cut and by foliation gray color with high pearly luster from the muscovite. The rock has fine grain structure, plate schistose habit and unclear striped texture. Along foliation weakly pigmented by limonite oxides and transversal to the foliation by cross planes is covered with light and dark brown films from limonitization .

- **Microscopic profile**

  By microscope it has granolepidoblastic structure and tiny striped texture. Main minerals which the rock consists are: quartz, microcline, albite and mica, and secondary minerals are: epidote, zoisite, orthite, secondary sericite and apatite. Tiny strips from quartz and feldspar alternating change with mica rows.

  Feldspar is mostly albite – plagioclase, then microcline,orthoclase concentration is very low. Albite – plagioclase appears as allotriomorphic crystals, rare hypodiomorphic forms by uniform size of grains. Albite is weakly to significantly alteration by sericite crystals which have chaotic arrangement in albite.In places in central parts of albite crystals there is fine grain epidotization which point to more basic plagioclases.

  Microcline appears as allotriomorphic crystals, some of them larger with latticed structure of crystals.

  Quartz is allotriomorphic with clear undulation tarnishing by mechanical pressures.

  Mica makes tiny discordance rows with muscovite and biotite.

  Macro- microscopic examination and modal analysis show following minerals composition of gneiss:

Minerals composition

Quartz	31.0 %
Microcline and orthoclase	11.5 %
Albite - plagioclase	34.7 %
Muscovite	9.5 %
Biotite	5..0 %
Epidote, Zoisite,Orthite	4.0 %
Sericite	3.5 %
Fe – oxides	0.8 %
Apatite	traces

Structure: Fine – grain, granolepidoblastic depending of mineral composition. Quartz and feldspars have uniform ize of crystals, so the averge size of grains is 300 microns. Quatrz and albite have grain size from 30-500 microns and microcline has rare grains up to 600 microns. The length of muscovite leafs are 2 mm and biotites leafs are long 350 microns.

Texture: Plate schistose habit and unclear striped texture as result of alternately changing of tiny strips of salite minerals (quartz and feldspar) by rows of mica (muscovite, biotite associated with epidote).

- **Petrographic determination**

  Tiny striped double mica gneiss.

c) **Chemical analysis** (if building stone is used for production of fractionated aggregate for concrete production)

Content of chlorides . . . . . No content
Content of sulfates . . . . . No content
Content of sulfur . . . . . .No content

COMMENT

Obtained results from the physical – mechanical, chemical and minerological – petrigraphic properties of the examined stone from locality "Radibus"-Rankovce show that the stone is characterizing with very good compression properties (compression strength, resistance to wear) and the stone can find wide application in the civil engineering.

We should emphasize that the stone will be excellent decorative material for external and internal wall and façade tiles and tiles for squares, sidewalks or every where is expected high frequency of movement.
Waste material from production of tiles can find application as grushed aggregate for production of concrete na d reinforced concrete, in road constructions for bitimenous bearing layers and asphalt-concrete.

We recommend: Regularly control of composition of stone because there is possible change of the stone composition during exploitation.

Laboratory examination:

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