



## TECHNICAL INFORMATION

## SUGGESTIONS OF USE

The firm MICROART SRL was born in 1968 in place FABBRECE, in the territory of the town of CIVITA CASTELLANA and the material of which it is manufacturing it is the volcanic tuff. its employment has been going up again for a long time; the tuff has been used for the realization of stately and imposing works that challenge the centuries: the amphitheatres, the temples, the boundaries, the bridges and the residences, the towers and the medieval castles , the villas and the Renaissance fortifications, the Baroque churches of the Puglia, the palaces of Palermo and Caserta.

Today the tuff not only sustains its full validity for the undisputed aesthetical and component value, but it is subsequently valued in these last years for the vast range of the available products that are employed for floorings, coverings for outside and insides, to decorate gardens and others numerous employments.

It immediately realizes a finished and pleasant environmental insertion and for the elevated and favourable characteristics physics and mechanics that synthetically come following described.

The reference is to one of the best caves selected of the known mining basin of Civita Castellana, to the border of the province of Rome, to offer an excellent product but above all with characteristics constants, reliable and with a new level of service to the clientele

## PHYSICS AND MECHANICAL CHARACTERISTICS OF THE TUFF

The tuff is a volcanic material originated from a gaseous emulsion (ardent cloud) of crystals, cinders, pumices and lapillus to the seed-fused state, that is deposited self-cementing in a pasta leading of elements cinereous of volcanic glass.

In dependence of his formation, the tuff maintains trapped to its inside a great deal of vacuums and beads of air in the 40-50 order% of its volume and it determines those characteristics of it physics and mechanics that make such particularly rich material of merits and appreciated in the building field.



The numerous tests of laboratory performed, by the faculty of engineering of Roma and by the laboratories of the Railroads of the State, have given a middle load of break up at lateral compression, free of:

47 kg / cm to the dry state  
38 kg / cm to the state inhibited  
39 kg / cm after cycles of cold / thaw

In dependence of his nature of pyroclastic rock and of his physical and mechanics ownerships, the blocks of tuff result a material of construction for excellence, for its lower part weight of volume of 1,6 ts / m<sup>3</sup>, for its lightness facility the transports, the movement and the laying in work.

The characteristics mechanics make the particularly proper product for the constructions in carrying masonry. specifically for the residential house building also in the seismic zones. His compression resistance of 50 kg/mqs allows to realize buildings tall 4-5 plans, also allowed low seismic index in the zones (5 - 6) without forcing the sizing of the building sections while for the zones of average it is possible to build anymore up to 3-4 plans a basement.

The tuff thanks to the characteristics glassy pomices of the material that composes it and some presence of the voids decidedly has sound -absorbent heat-insulating ownership and resistance to the fire important and unattainable from other materials construction dispositions.

His thermal conductivity in virtue of the structure alveolar disposition is inferior to 040 W/m<sup>0</sup> C and a heat specific similar at that of the wool and therefore a low thermal trasmission of the walls.

Such ownership allows a notable economy the management of the system of the heating and cooling in the constructions and achieves a small environmental pollution of it in the inhabited centers, for the small installed power and for the small time of use of the fittings of heating. it is not often necessary to resort to the realization of air space of the external walls in the residences to face the effects of particular climatic conditions.

The low transmission of the tuff makes it material fit for construction without adopting particular shrewdness to prevent phenomenons of it condenses. to the goals of his power sound-absorbent tests of laboratory have furnished for a wall from 27 cm a sound-absorbent power of 55 dB to the frequency of 500 1w



Tests to the resistance to the fire performed near the official laboratory of the Department of the Interior to the goals of the norms fireproof they have attributed to a wall of tuff of 15 of thickness a resistance to the fire of 180 this exceptionally required by the norms fireproof for the separation from places to risk.

Concluding the use of the notepads of tuff in the house building for his favorable characteristics physics and mechanics they allow to optimize "the general economy" of the work and his external aspect, especially in the external masonries and of perimeter worked to does it approves.

## **TECHNIQUES OF MASS IN WORK OF THE MASONRIES**

With the litoid tuff is also performed masonries without binder setting in work the varied elements with the alone juxtaposition of the same. Usually the notepads of tuff, preferably dampened or sprinkled with water so that to remove particles thin presents in the pore, they are put in work with mortar constituted by a binder, sand and water.

To build a masonry in tuff the types of mortar they can almost all be employed. in general they can be very proper those manufactured with chalk and aerial mortar, hydraulic mortar, with agglomerations in cement or with cement;

The mortars manufactured with chalk and aerial mortar are proper for all the types of masonry situated not to the outside and submitted not to loads or submitted to very weak loads (for instance non superior buildings to two plans, partitions, etc).

The mortars manufactured with other binters can be used for subject structures to loads. in this case, in to proportion the structures, it is necessary to keep track of the resistance that is wanted to reach, in operation of which hydraulic kicks will be used (average resistance) agglomerated cements or cements (good and elevated resistance).

The manufactured articles realized in masonry are able to absorb with small damages yeldings of the foundations you also hurl thermal with daily frequency, variations of loads agents.



It is enough important in the masonry to use not mortars too much resistant of the used blocks , the mortar so in degree to get deformed avoiding or reducing the danger of fissures in the resistant elements.

## CHARACTERISTICS OF THE MATERIAL EXTRACT AND USE

The formation geologic ignimbrite III Vicana to be cultivated in it gets by in examination it already appears on the surface in surface in his faces more characteristic that is that to consistence of headstone to vacuolar aspect.

Tests of compression free side break up they have made to record a resistance middle  $q_0$  of (you see Enclosure Tests of Laboratory):

$q_0 = 47 \text{ kg/cm}^2$  to the dry state  
 $q_0 = 38 \text{ kg/cm}^2$  to the state of imbibition  
 $q_0 = 39 \text{ kg/cm}^2$  after cycles I freeze / thaw

From the point of view geo-mechanic they are classified therefore as " weak rock ".

In the enclosure the certificate is brought released by the experimental institute of the railroads of the state, on the champions of rock withdrawn by the writers in the panel of it extracts in progress of exhaustion. particularly n 30 dice of dimensions (30x15x15)cm and n 14 tiles of dimensions (10x10x10)cm have been withdrawn. the dice have been used for determining: mass of apparent volume. Coefficient of imbibition; compression uniaxial to the state dry, imbibitionand, after cycles freeze you; elastic form. The tiles are served to the alone determination of the bending resistance.

The compactness of the materials is essentially tied to the different degree of cementation happened through mechanisms of alteration of the glassy matrix that have constituted a cement formed from mineral.

An important role is also developed by the content of water. in fact it results that a saturated champion of water decreases of 23% around its own value of resistance compression uniaxial in relationship to the correspondent dry.



It is enough amazing also the verification that, despite the elevated porosity of this litology, it is not at all geliva maintaining the same break up resistance both for the saturated champions of water and for those subdued to the cycles I freeze / thaw. this is probably due to the fact that the tuff enjoys of a certain elasticity that allows him to absorb the stresses of deformation owed to the increase of volume by the passage liquid phase / solid phase.

The mass of apparent volume ,+, it is of +=1,78 gr/cm<sup>3</sup>s that is decidedly raised considering the aspect rich in beads of the tuff. despite the elevated coefficient of imbibition that is around 23 % the rock it has a very low primary permeability because of inter-communication of the meati missed it.

These particular characteristics physical-mechanics make the particularly versatile product in the house-building really for:

- -the tall relationship among resistance break up mechanics and weight of volume
- -the facility with which is allowed to work and to model

the high insulating power (so much more it is tall as the rock is porous anymore) that it makes the isolated constructions both in thermal way and acoustically.

The characteristics heat-dynamics, that have noticed an exceptional insulating behavior of the walls built with notepads of tuff, are been calculated with methods of proper laboratory on champions withdrawn in these places. they are:

-thickness	S=0,375 m	
-unitary conductance		C= 0,96 Kcal/hm <sup>2</sup> °C
-unitary thermal ability		Cp= 108 Kcla/m <sup>2</sup> °C
-middle diffusivity		a= 0,00125 m <sup>2</sup> /h
-attenuation		v=50,34
-bewilderment		n=3,38 rad
-time of delay		R= 12,9 h
-index thermal inactivity		G=170
-thermal impedance		Z= 7,19 hm <sup>2</sup> °C/Kcal