

## ESTIMATION OF POROSITY VALUES IN CLAY BRICKS

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### ABSTRACT

The measurement of the porosity values by the method of water absorption reveals the quality of the brick used in building construction. The percentage of porosity values is used to identify the class of brick samples. An attempt is made to correlate the percentage of water absorption with the density of the building bricks

**Keywords:** Bricks, Density, Water absorption and Porosity.

## 1. INTRODUCTION

For the most part brick products manufactured in these countries have been produced on the basis of empirical data or using traditional techniques. The quality of such product both fired and unfired and more particular their mechanical behavior is often Very poor. The present study aims to evaluate the mechanical properties of the clay brick used. This will help to give a better understanding of the clay brick and should lead to a subsequent increase the value of the product of clay bricks. Several methods were used to carry out the study in order to correlate data with their mechanical parameters (Tibo simeon kabra et al.,).

The five brick samples collected from Cuddalore District of Tamil Nadu in the Vellaru riverbed area was studied to correlate the percentage of the porosity values. The sites are different locations topographically. In Vellaru riverbed the sample location KOB, CIB, KAB, ALB and KOMB are taken for this present study. Bricks are made out of clay particles of different types and sizes. The space between particles is called pore space. Pore space is used to determine the amount of water absorption that gives volume of brick sample can hold. Porosity is the percentage of the total volume of brick samples that consist of pore space. The present study reveals

the measurements of percentage of porosity of the different brick samples using standard water absorption methods in the as received state. The observed data are listed in Table 1.

## 2. MATERIALS AND METHODS

The brick samples were collected and cut into a small pieces. A small piece is enough to find out the porosity. The water absorption and the percentage of porosity of the samples were calculated by using the formula given by various author (Maniatis et al., 1947); Sankaran and Ramasamy (1993); Sajeev (1996), Palanivel and Velraj (2003).

### Mechanical properties

#### Water absorption test

Water absorption is a key factor affecting durability of brick samples. The less water infiltration into a brick samples, the more durable is the brick samples and the better is its resistance to the natural environment. The test specimens brick samples in the form of bars. The fired brick samples were weighted and then submerged in water at a temperature between 55 ° C and 30 ° C. After 24 hours, the specimens were taken out of water. Then, the surface water of each specimen was wiped off with damp cloths and the specimens were weighed again.

% of water absorption =  $(W_2 - W_1 / W_2) \times 100$  ----- (3)  
Where  $W_1$  - weight of the fired specimen and  $W_2$  - weight of the specimen after 24 hours of immersion in water.

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**Porosity**

**Role of porosity**

The density or porosity affects a number of the properties of the brick samples but probably the most important effect is its Strength (Norsker, 1987). Highly porous clay brick samples are mechanically weak. A clay brick with the highest porosity has the lowest strength. The water absorption method adopted to measure the porosity values of the ceramic body is described below. The samples were heated continuously in boiling water for about six hours and left to cool over night which enables the pores to get filled up with water to saturation. The saturated specimens were then weighed by immersing in water as (W<sub>1</sub>) and in air as (W<sub>2</sub>). The samples were then placed in hot air oven at 200 °C and dried for about six hours to remove the water contents completely and then weighed as (W<sub>3</sub>). To standardize the values of the results the percentage of porosity was calculated using the relation  

$$\% \text{ of porosity} = \frac{(W_2 - W_3)}{(W_2 - W_1)} \times 100 \quad \text{----- (4)}$$
 The stated procedure was repeated a number of times until consistency in the values were obtained and the average value was taken.

**3.RESULTS AND DISCUSSION**

The five brick samples taken from Vellaru riverbed different locations are described with their name, Density, Water absorption and porosity values along with their classification and quality assessment of bricks are given in Table 1.

**Table1.The Density, Water absorption and porosity values along with their classification Quality assessment Of Bricks are presented**

Brick specimens	Density Kg/cm2	Water absorption (%)	Porosity (%)	Classifications of bricks	Quality assessment
KOB	1.89	13.81	21.74	I class	Good
CIB	1.95	12.89	19.13	I class	Good
KAB	1.75	14.87	23.14	II class	Medium
ALB	1.72	15.67	25.06	II class	Medium
KOMB	1.90	11.87	20.61	I class	Good

The measurements of porosity values of brick samples are used to identify the quality of brick we have reported that the porosity values for bricks generally lie in the range between 19.13% and 25.06%. It is stated the range of porosity values can also reveal the particle size and the composition of the clay minerals of the bricks. The five samples viz. KOB, CIB, KAB, ALB and KOMB from Vellaru riverbed are having

porosity values 21.74, 19.13, 23.14, 25.06 and 20.61 respectively. The differences in the porosity values indicate the presence of larger void space and the particle size of the clay in the samples. The low values of porosity for the samples indicate that they are made up of fine particles. This variation is clearly indicates, that there is a good correlation between them ( Viruthagiri and Sathiyapriya. 2014) .When the water absorption increases, porosity is also increases. The value of density play an important role on the strength of the building bricks and recent studies made by structural clay and manufactures have shown that uniform shaped high strength brick can be constructed at least porosity value bricks( Viruthagiri,.( 2004).

**4.CONCLUSION**

Of the five samples investigated, CIB carries the lowest percentage of porosity 19.13% which of course has the maximum strength as confirmed by manufacturer. It may be pointed out that the water absorption and porosity parameter is easily to access the classification and quality assessment of bricks. Porosity measurement alone normally cannot indicate the strength of the brick. Since other factors such as compressive strength, flexural strength, shrinkage, firing temperature etc., have also to be taken in to consideration.

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