ABSTRACT

The common building brick is not only one of the oldest but also the most extensively used building material in construction work. It is essentially a local building material and consequently there exist considerable variations in the quality of raw material, the process of manufacture and the quality of finished product. Earlier the term brick was used for building units made of clay. However, now a days brick can be considered as a regular prism of suitable size that can be handled conveniently. Hence the terms such as kutchha brick, burnt brick, stabilised soil bricks(blocks), concrete brick (block), lime-flyash brick, clay-flyash bricks, flyash bricks, etc. are also applicable.

Quality of soil used plays an important role in the manufacture of bricks. Usual tests to determine the suitability of soil for manufacture of burnt bricks are really qualitative and hence of trial and error nature only. These tests are even not carried out by the manufacturers of bricks and they rely on the experience and judge the suitability by the feel test. Ultimately, sometimes the bricks get completely fused, cracked or warped after those are burnt in the kiln. So, very often, it is left to one's luck to obtain good bricks after firing in the kiln. It is considered that good bricks can be produced from alluvial soils only, whereas it is possible to produce good quality bricks from other inferior soils also, by some modification in the basic ingredients. Sufficient research work has been carried out at CBRI, HUDCO and other research centres regarding improvement in quality of bricks from inferior soils. Even, it is possible to produce good quality bricks from black cotton and coarse red soils.

The properties of bricks are dependent on type of soil, its seasoning, blending and manufacturing process, the temperature of burning, etc. As brick industry is un-organised business sector, it is difficult to get good quality bricks throughout the year from different
sources. The importance and competence of brick and brick masonry through proper choice of bricks and other building materials and adoption of correct design method are being increasingly realised among researchers and practising professions. However, there is a wide scope of research regarding modification of local soil, for manufacture of burnt and stabilised soil bricks. The effect of size on properties of bricks and behaviour of brick masonry in compression has also got importance, to decide the type of material to be used for masonry construction. With this aim an experimental programme is undertaken for this research work.

The complete work has been divided into six chapters, each chapter dealing with the particular aspect, however chapter 5 deals with the original contribution of this work. Chapter 1 i.e. Introduction deals with the use of the brick, brick industry in India, problems faced by brick industry. The chapter illustrates the need for the modification of the soil for manufacture of good quality bricks. This chapter also explains the objectives, scope and importance of the present work in today’s context. Chapter 2 deals with the literature review carried out in four parts. The first part deals with the changes in shape and size of the bricks over years and statistical experimentation of properties of bricks. The second part deals with the research work carried out so far on burnt brick and third part covers research work carried out on stabilised soil bricks. The fourth part deals with the behaviour of brick masonry in compression.

Chapter 3 deals with the soil for brick making in India, with special reference to Maharashtra and Marathwada in Particular. It deals with the geology of soils of Maharashtra and mineralogy of clay. It also deals with the laboratory and field tests to be conducted for deciding the suitability of soils for brick making. Chapter 4 deals with the scope of
experimental study and is divided into five stages based on the type of studies to be conducted.

The chapter 5, which is the main contribution to the science deals in detail, stage wise studies carried out. The experimental work and the findings have been divided in five stages. Each stage covers a specific aspect of the work. Each stage has been dealt in detail under heads such as: 1. Experimental work, 2. Observation, Results, and Discussion, and 3. Points emerging from the study. This work comprises mostly of experimental findings, as sufficient theoretical analysis is not available. Therefore, theoretical analysis has been dealt only where it is available. Experimental work is undertaken with a view that it gives realistic picture of state of affairs than the analytical methods.

The first stage of chapter 5 deals with the statistical analysis of different parameters such as dimensional and strength properties of bricks made from soils of Marathwada region. The data of test results of test conducted at laboratories of different technical institutions of Marathwada region and some samples of bricks of the region are tested to generate the data for study. The statistical analysis of properties of bricks of 100 samples collected from different parts of Marathwada region is carried out.

Brick is a very important and highly used construction material. There have been numerous efforts to find the substitute for the brick, but these attempts have limited popularity amongst the users. In second stage of this work twenty soil samples from different locations of Marathwada, which are used for manufacture of bricks are collected. The bricks are prepared using soil and different modifications are tried to manufacture good burnt bricks. Thus for different soils of the Marathwada region, attempts have been made to give practicable solution for the manufacture of good quality burnt bricks by using locally available soils and modifying agents.
In the third stage of the work experimentation has been carried out on five different soils for manufacture of stabilised soil blocks. Methods to improve the natural durability and strength of soil commonly referred to as "stabilisation of soil" have been practised in many countries. For manufacture of stabilised soil blocks different stabilisers such as cement, lime, flyash have been studied. The effect of different admixtures on properties of blocks of stabilised soil have been studied and discussed in details. The efforts have also been made to give optimum solution based on the location from where soil is obtained and availability of admixtures.

The fourth stage of experimental work is aimed to study the effect of size on properties of bricks. For this moulds of different sizes are chosen and both stabilised soil and burnt bricks are prepared by using these moulds. The burnt bricks are fired in the clamp, whereas stabilised soil bricks are cured for a period of 28 days. The effect of size on properties of bricks have been illustrated in detail in this stage of the work.

In the fifth stage results of compressive strength tests on bricks from various parts of Marathwada are reported. They are grouped under eight heads on the basis of wet compressive strength. Brick masonry prisms of these bricks are cast, cured for 28 days and are tested in compression. Various mortar ratios, 1:3, 1:4, 1:6, 1:8 and 1:10 are used to cast the brick masonry prisms. The mortar of various proportion is also tested.

In chapter 5 the complete details of this study programme based on experimental investigations have been covered.

In chapter 6, various conclusions drawn in chapter 5 have been summarised. At the end a list of references in connection with this research work is given. In all, 153 references including 24 IS codes are referred.