Quality Control Tests on Commonly Used Clay Bricks

Bricks are undoubtedly amongst the most commonly used construction materials anywhere. Incidentally, concrete is regarded as the most used construction material in the world in terms of weight or volume according to some estimates.

Knowing a few simple yet important quality related details as well as about few quality tests on this widely used construction material (ie brick) can be beneficial not only to civil engineers or construction personnel but also to any individual planning to build a house that would consume bricks galore. The quality related tests, to be discussed herein, are based on Indian standards. That may exude a bit of technical flavour but, in actuality, these are quite simple tests.

Years back, this author had inspected these quality tests at quality control laboratories in project sites a number of times and can tell from his experience that these are quite simple to understand or carry out and anyone, with or without technical knowledge in this domain, can conduct or get them done with ease in order to have a good idea about the quality of bricks to be used.

Bricks of different varieties are available in the market such as clay bricks, cement bricks, fly ash bricks and so on. However, the most commonly used and readily available type is the clay brick. The details and quality tests to be discussed in this submit are on clay bricks.

Two quite common and sticky issues concerning clay bricks are dampness & efflorescence. Once these problems begin showing up in an already completed structure or in any brickwork it is quite difficult to shake them off and they could prove to be quite a headache in the years to come. The easy way out is to go for quality bricks that are capable of withstanding these problems which can be seen in many buildings in many places. Discussed below are few general details that should come in handy for anyone and four commonly conducted quality tests on clay bricks.

First, the details:

Bricks to be used for any quality construction work such as residential, office, commercial or industrial buildings, etc should have smooth and good appearance. They should be of uniform sizes and shapes and should appear reddish in colour.
They should be well burnt. That is, they should neither be over-burnt nor under-burnt. Over-cooked and under-cooked ones won't appear uniformly reddish. They would show shades of blue and sometimes even black or so. Usually, they won't be of uniform shape as well.

When dropped from a height of about one meter on a dry firm ground (not on a concrete, plastered, etc surface) the brick should not show any damage.

When two randomly picked up bricks are struck mildly with each other they should produce a ringing sound.

When touching the surface of a brick the same should feel smooth (not silky though) and hard. Bricks with too rough, soft or dusty texture are usually of medium or low quality. This particular point is based on the very own observation of the author – so, one may accept it or ignore it.

For best results, bricks should be kept immersed in water for one to two hours prior to their use.

While it is quite common to have joint (mortar) thickness of 6 to 10 mm, care should be taken to ensure that maximum thickness of the joints don't exceed half an inch.

Now, about the quality tests: Four simple tests usually performed on common clay bricks in quality control laboratories at construction sites are a) water absorption test b) efflorescence test c) test of compressive strength d) test of dimensions.

a) Water absorption test: Five bricks are picked at random from a stack of bricks intended to be used. They are then dried thoroughly in a laboratory oven at a temperature between 105°C to 110°C. Thereafter they are cooled and weighed separately. Then they are kept immersed in cold water (27°C or ~2°C). After 24 hours the bricks are taken out of water and excess surface water is wiped off using a damp fabric. Immediately after, they are weighed again separately. Supposing that the dry weight of a brick is Wd and the wet weight of the same brick is Ww, the water absorption capacity of the brick expressed in percentage of it’s dry wt. is = (Ww – Wd)/Wd X 100.

Upon calculating the same for each of the 5 bricks the average is found out which is considered as the water absorption capacity for the bricks. The water absorption capacity of first class bricks should not exceed 20% when calculated as described above. The same for 2nd and 3rd class bricks are not to exceed 22% and 25% respectively. For any superior quality brickwork, first class bricks only are recommended while 2nd & 3rd class clay bricks are advised for moderate to low quality work.

b) Efflorescence test: Conventional clay bricks may contain some amount of alkaline substance in them. However, the greater the presence of such content the greater the risk of efflorescence which appear in the surfaces of bricks...
as fine whitish layers (deposits). These are hard to control and can lead to other perpetual problems, especially esthetic ones, in a structure.

It is always better to ascertain the quality of bricks beforehand with regard to the efflorescence matter. A simple test as described below can serve the purpose easily.

Five randomly picked clean bricks are placed together on their ends in a pan so that there are gaps among the bricks as well as between the bricks and the outer edges of the pan. Cold distilled water is then poured in the pan such that the depth of water is at least one inch. That is, at least one inch of the bricks must be under water. The pan is then kept under observation in an well-ventilated room at room temperature (27°C or so). As soon as the entire water in the pan gets exhausted distilled water is poured again exactly as described above and kept as it was until the whole water disappears again due to evaporation and suction by the bricks. The bricks are then examined for efflorescence and appraised as described below:

If no or negligible whitish salty formation is observed, efflorescence is considered as "nil". Similarly, efflorescence is considered as "slight" if 10% or less of the brick surface only is covered with the salty substance. The same is regarded as "moderate" if 50% of the surface is affected by the whitish salty diposit but without formation of flakes. Efflorescence is considered as "heavy" in case 50% of the surface is affected by whitish powdery diposit simultaneously with flaking of the surface.

For any quality brickwork bricks of “nil” or, at the most, “slight” efflorescence only are advised. Anything more than that may be used only in low quality work where efflorescence won’t pose as a major issue.

c) Test of compressive strength : Five randomly picked clean & smooth bricks are kept immersed in water for 24 hours at room temp. Thereafter these saturated bricks are taken out and any excess surface water is wiped off. The frogs are then filled with 1 : 1 mortar and smoothened flat with trowel. The frogless bricks are now kept under wet fabric for 24 hrs. Thereafter, they are kept immersed in water for 72 hrs. These are then taken out of water. A thin ply-board is placed on the lower plate of a compressive strength testing machine. One brick is placed on the ply-board with it’s filled frog upwards. Another similar sheet is placed on the top of the brick. Load is now applied on the brick at an uniform rate of 1.4 kg/sq.m per minute. When the brick fails the reading shown by the needle in the dial is noted down. This is repeated for all of the five bricks. The average of the five readings is calculated and is considered as the compressive strength for the bricks. For any brickwork of good quality the compressive strength should not be less than 50 kg/sq.cm.

d) Dimension test : Detail like tolerances in the dimensions of bricks for this test will depend on the type of brick to be used in a particular work. There are conventional (commonly used) bricks and modular bricks in use for various work.
Both have different dimensions. The conventional clay bricks too come in several sizes. Hence, corresponding (specific) requirements may be referred to while conducting dimension test for a particular variety of brick. This is the simplest and the quickest of all the four tests mentioned above.

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