Selection of Materials for Burnt Clay Brick Manufacture Technical Bulletin No. 7

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SELECTION OF MATERIALS FOR BURNT CLAY BRICK MANUFACTURE

TERRITORY OF PAPUA & NEW GUINEA
DEPARTMENT OF PUBLIC WORKS
BUILDING RESEARCH STATION . ...

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The Building Research Station has an active research programme aimed at the development of burnt clay products within the Territory of Papua and New Guinea.

The purpose of this Bulletin is to provide instruction in the preliminary identification of suitable materials for burnt clay products.

If a material appears suitable from the field tests described herein further tests to determine suitability are warranted.

This Bulletin has been prepared from information provided by W. Buchanan; Technical Officer.

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SELECTION OF SAMPLES

The best place to look for clay is in road cuttings, ditches and river banks. If none of these are close by then a hole should be dug so that the varying layers of subsoil material can be seen.

There are many varieties of clay ranging from soft clays to mud/clay stones and shales; they may be found on the surface or at great depths. The clay bed could be anything from 1" in thickness to many hundred of feet thick, depending on the nature of the deposit and how it was formed. It is therefore necessary to know the depth from which samples are taken.

For the purposes of small scale brickmaking in the Territory of Papua and New Guinea clay should be looked for which is a soft material and which when mixed with water becomes plastic and sticky and hard when dry.

Clays to avoid when choosing material for burnt clay bricks are:-

1. Those types that have a large stone content or contain large quantities of vegetable matter such as tree roots, these would have to be removed before the clay could be used.

2. Rock hard clays and shales which would require crushing before use.

3. Those clays containing so much silt or sand that they are weak and friable when dry.

Many clays are wet and soft when dug, others become soft in a very short time after having water added to them.

FIELD TESTS

1. Slaking Test

Use material for this test that has passed through ½" copra wire mesh screen. Put 1" of the material in the bottom of a clean glass bottle and fill with clean water. Shake for 3 minutes and let stand for 3 hours. Repeat shaking action 3 times at 3 hour intervals. Let the material stand in the water overnight. If in the morning hard lumps which show no sign of breaking down are present the material would not be suited for hand moulded burnt clay bricks.

2. Wet-Dry Shrinkage

When left to dry wet clay shrinks, the amount of shrinkage depends on the nature of the clay and the amount of water it contained. To determine the shrinkage characteristics of a clay a simple shrinkage test should be carried out.

The clay should be worked to a standard condition by the addition of water or allowing it to dry so that the clay is soft enough to give a clear fingerprint when gently squeezed in the hand but yet not so wet that it will stick to the dry hand.

When the clay base has been worked to the standard condition form it into a bar 1" x 1" x 6" long. This can be done using a mould similar to that shown in photograph 1. Lightly cut two marks on one face 5" apart, and leave to dry slowly in the shade for a day then place in the sun until thoroughly dry. During the first day the bar should be turned over every two hours to avoid twisting which would result from uneven drying.

If an electric oven is available place the sun-dried bar in it for 1½ hours at 220°F, remove and allow to cool.

The marks on the face of the bar are then measured and the percentage shrinkage worked out.

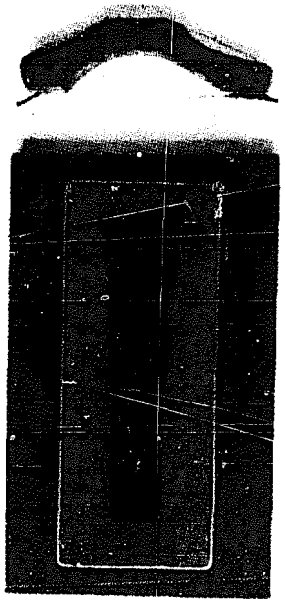
$$\% \text{ shrinkage} = \frac{(\text{wet measurement (5")} - \text{dry measurement}) \times 100\%}{\text{wet measurement (5")}}$$

Clay with a shrinkage of more than 12% is to be avoided for brickmaking with the following exceptions:-

1. Where the addition of a non-plastic material such as sand or gravel reduces the shrinkage, the amount of sand or gravel required can be determined by the Building Research Station if samples of the sand or gravel are made available to them.

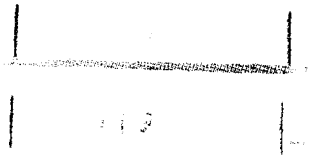
2. Where the high shrinkage clay can be used in a mixture to improve on strengthen a weak poorly plastic material.

Limestone must not be used as an additive to clay with a high shrinkage.

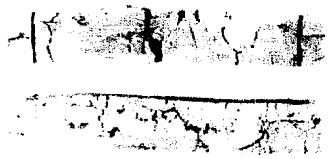


Mould For Making
1x1x6 Clay Test Bars.

1



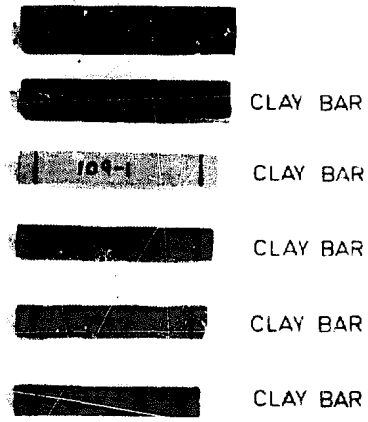
Satisfactory
Shrinkage
Test



Unsatisfactory
Shrinkage
Test
Sample Breaking Up

2

TIMBER BAR original size of clay bars



sample bars of different clays showing measured marks and sample numbers.
note different shrinkage.

3

3. Fire Test

Place a dried test bar into a fire and burn for several hours. Increase the heat of the fire slowly, if suitable for brick manufacture the bar should not develop cracks or fall apart.

It is important to record all details of any test. For example, whether the bar was oven dried or sun dried, what clay was used and its location, if it was crushed or sieved before use or used as it was obtained from the ground.

LABORATORY TESTS

Clay to be used in burnt clay brick manufacture should be subjected to more controlled testing at the Building Research Station, if field tests indicate that it could be suitable.

Samples should be sent in a bag with two labels - one inside the bag and the other attached to the bag. Different types of clay should be placed in different bags. Samples should weigh about 5lb.

Each label should contain the following information:-

1. Senders name and address.
2. Reference number of which the sender has a record.
3. Location of sample - depth etc.
4. Estimate of size of deposit.
5. Any other information that may be considered relevant.