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Note on
BUILDING BLOCKS MADE OF STABILISED LATERITE

A cost analysis to evaluate the applicability of a
production of low-cost lime-laterite building blocks
in Kenya.

Nairobi
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The cost figures shown in the table on page 1. refer to the cost of lime only. It seems a fair assumption that the actual cost of the blocks will be 120 - 130 % of the cost of the lime only. Blocks in stabilised laterite will then range in cost from approximately 110 to 180 shs per m², or from 10 to 80 % higher in cost than 'ordinary' concrete blocks made from crushed stone aggregate and Portland cement.

The above sketched state of affairs will , of course , be more favourable in countries where the cost of powdered lime is only a fraction of the cost of Portland cement.

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BUILDING BLOCKS MADE OF STABILISED LATERITE

Reference : Paper on production of building stone in developing countries by Ole Kiillerich and others , published by the National Union of Danish Students , Kaabrestraede 3 , 1210 København K , Denmark.

The process described in the above paper may lead to the production of low-cost lime-laterite building blocks in some developing countries. However , a simple cost analysis shows that the process , when applied in Kenya , would produce blocks which cannot , economically , compete with concrete blocks.

The price for concrete blocks in the Nairobi area is approximately 100.- shs. per m². Price of Portland cement (locally produced) is app. 280.- shs. per ton , whereas the cost of cement represents app. 60 % of the cost of the blocks.

The retail price of powdered lime (locally produced in Mombasa) *) is 375.- shs. per ton, or about 33 % above the price of Portland cement. It can be assumed that this price could be lowered by about 20 % in case of large scale demand.

Proper experiments would be required to ascertain the actual volume of blocks which could be produced out of a certain weight of laterite with a certain weight of lime and water added, but it seems a fair assumption that the density of the blocks produced will be in the range of 1800 to 2000 kg/m³ (light to medium compaction).

Based on these assumed densities the calculations given in detail in the Appendix show the following results of quantities and cost of lime only per m³ of blocks :

Quantity and cost of lime - Ca(OH) ₂ - per m ³ of stabilised laterite blocks		
	Block density in kg/m ³	
	1800	2000
Percentage (weight) of lime added to laterite		
16 %	240 kg 90 shs	270 kg 102 shs
24 %	332 kg 124 shs	370 kg 138 shs

Obviously the density of the blocks will depend on the rate of compaction. The density of 1800 kg/m³ can be expected for lightly compacted blocks , whereas heavy compacting (heavier pressing of the blocks) will probably result in densities well above 2000 kg/m³. When the density goes up the weight of lime per unit of volume increases and the cost goes up proportionately.

*) Mombasa No. 1 lime
retail price in Nairobi : Shs 6/- per bag of 16 kgs.

Calculations of weights and costs (lime only)

Specific gravities : powdered lime 1,4 - 1,66
 most earth types
 (including laterite ?) 2,65

Density of dry earth 1,60

I. Minimum mix 16 % (weight) powdered lime added to laterite

laterite + lime + water → blocks
 1000 kg + 160 kg → app. 1200 kg

- a. density of compacted blocks : 1800 kg/m^3 (light compacting)
 $1000 \text{ kg laterite} + 160 \text{ kg lime} \rightarrow \frac{1200}{1800} = 0,666 \text{ m}^3 \text{ blocks}$
 weight of lime per m^3 of blocks $\frac{160}{0,666} = 240 \text{ kg}$

cost of lime per m^3 of blocks $0,240 \times 375 = 90 \text{ shs.}$

- b. density of compacted blocks : 2000 kg/m^3 (medium compacting)
 $1000 \text{ kg laterite} + 160 \text{ kg lime} \rightarrow \frac{1200}{2000} = 0,600 \text{ m}^3 \text{ blocks}$
 weight of lime per m^3 of blocks $\frac{160}{0,600} = 270 \text{ kg}$

cost of lime per m^3 of blocks $0,270 \times 375 = 102 \text{ shs.}$

II. Maximum mix 24 % (weight) powdered lime added to laterite

laterite + lime + water → blocks
 1000 kg + 240 kg → app. 1300 kg

- a. density of compacted blocks : 1800 kg/m^3 (light compacting)
 $1000 \text{ kg laterite} + 240 \text{ kg lime} \rightarrow \frac{1300}{1800} = 0,724 \text{ m}^3 \text{ blocks}$
 weight of lime per m^3 of blocks $0, \frac{240}{,724} = 332 \text{ kg}$

cost of lime per m^3 of blocks $0,332 \times 375 = 124 \text{ shs.}$

- b. density of compacted blocks : 2000 kg/m^3 (medium compacting)
 $1000 \text{ kg laterite} + 240 \text{ kg lime} \rightarrow \frac{1300}{2000} = 0,650 \text{ m}^3 \text{ of blocks}$
 weight of lime per m^3 of blocks $\frac{240}{0,650} = 370 \text{ kg}$

cost of lime per m^3 of blocks $0,370 \times 375 = 138 \text{ shs.}$