ECONOMIC COMPARISON BETWEEN DWELLINGS IN ONE STOREY HOUSES AND THREE STOREY BLOCKS OF FLATS

By

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DAR ES SALAAM.

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It is a general belief that it is cheaper to build dwellings in blocks of flats than as one storey houses.

This belief can only be based on the fact that the same foundations and the same wall thickness have been used for one storey and three storey buildings.

However it is possible to build one storey houses so much lighter that they end up with being much cheaper than dwellings in blocks of flats.

In this investigation the cost of the site is the price not considered. The difference in favour of one storey houses is however so big that they under nearly all circumstances must be cheapest type of dwelling.

To this must be added that the consumption of scarce resources is much bigger for dwellings in blocks of flats.

September 1976

Øivind Birkeland
Director
NATIONAL HOUSING & BUILDING RESEARCH UNIT.
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INTRODUCTION

It has been discussed what is the cheapest dwelling to build one storey houses or three storey flats. In this report an attempt has been made to arrive at the truth.

The following institutions and individuals have greatly assisted us in giving information on prices etc.

Mr. Pribay (Design Partnerships)
Quantity Surveyor, Registrar of Buildings
Tanzania Housing Bank
Numerous carpenters and masons.

We wish to thank them for their assistance without which this investigation would not have been possible.

GENERAL ASSUMPTIONS MADE

As a basis for comparison has been chosen Tanzania Housing Bank type house M3-4h, with four rooms and kitchen. The area of the dwelling is $75m^2$ with a terrace of $5m^2$. This type can also be placed two beside each other and three on top of each other with a staircase in between. The one storey house is presented in fig. 1 and the block of flats in fig. 2. The site on which both the houses and the flats is supposed to be built is assumed to be relatively flat and the ground condition is supposed to be of good quality easy to build on (common in Tanzania).

The differences in cost for the water supply and drainage system is supposed to be small. If the one storey houses are planned in a reasonable way, several dwellings can use the same sptic tank (as for a block of flats).

Also for water supply a main pipeline can be used for the houses. Digging of ditches, pipes and roads will be a little more expensive for one storey houses than for block of flats. But the corresponding work inside the dwellings will cost more for dwellings in a three storey block of flats than for houses.

The price differences will be in the buildings and in the roads,
COMPARISON OF THE BUILDINGS

Assumptions

Labour for external plastering and painting will be higher for three storey block of flats than for one storey houses.

Internal plastering, painting, doors, windows and electric installations will be near to the same for both alternatives.

The following parts of the construction will be different for the two alternatives:

- Foundation
- Floors on the ground
- Walls
- Floors between stories
- Roof and ceiling
- Staircase

In the comparison the price for the above mentioned parts of the construction has been calculated for the two alternatives.

A cement price of 24$ a bag, (50kg.) and a labour cost of 15$ a day have been used in the calculations. For cost calculation is used net labour and material price without any overhead.

One storey houses (Alt.1).

The foundations and floors on the ground are made of soil cement.

The floor on the ground consist of a 10cm layer of sand and 5cm soil cement.

In foundation walls and in walls are used soil cement blocks 29 x 14 x 14cm. (Wall thickness 14cm) and non loadbearing walls 29 x 14 x 9cm (wall thickness 9cm). Labour cost includes making of blocks. For the soil cement is used soil from the site.

Roof and ceiling are made of timber with corrugated iron sheets as roofing.

Based on this the cost of the parts of the dwellings compared, will for one dwelling in one storey house be as indicated in Table 1.
Table 1. Price of compared parts for one
dwelling in a three storey building

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material cost shs.</th>
<th>Labour cost shs.</th>
<th>Total cost shs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Digging and footing for walls</td>
<td>260</td>
<td>400</td>
<td>660</td>
</tr>
<tr>
<td>2.</td>
<td>Foundation Walls</td>
<td>120</td>
<td>310</td>
<td>430</td>
</tr>
<tr>
<td>3.</td>
<td>Floor on ground</td>
<td>650</td>
<td>350</td>
<td>1000</td>
</tr>
<tr>
<td>4.</td>
<td>Loadbearing Walls up to ceiling. (Wall thickness 14cm)</td>
<td>840</td>
<td>1850</td>
<td>2690</td>
</tr>
<tr>
<td>5.</td>
<td>Non loadbearing walls (wall thickness 9cm)</td>
<td>170</td>
<td>560</td>
<td>730</td>
</tr>
<tr>
<td>6.</td>
<td>Walls above ceiling</td>
<td>100</td>
<td>230</td>
<td>430</td>
</tr>
<tr>
<td>7.</td>
<td>Ceiling and roof</td>
<td>6500</td>
<td>1000</td>
<td>7500</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>8640</td>
<td>4700</td>
<td>13340</td>
</tr>
</tbody>
</table>

Three storey block of flats (*Alt. 2.*)

Floor on the ground and roof + 1 ceiling is made as for the one storey houses and same prices are used. The foundation and walls have to be stronger for a three storey building than for a one storey, and the materials will be concrete and concrete blocks.

Between the storeys the floors will have to be made of reinforced concrete. The same is the case for the stairs.

Based on this the cost of the parts to be compared will for one dwelling in a three storey block of flats be as indicated in table 2.
Table 2 Price of compared parts for one dwelling in three storey block of flats.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material cost sh.</th>
<th>Labour cost sh.</th>
<th>Total cost sh.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>¼ of digging and footing for walls</td>
<td>400</td>
<td>130</td>
<td>530</td>
</tr>
<tr>
<td>2.</td>
<td>¼ of foundation walls</td>
<td>180</td>
<td>100</td>
<td>280</td>
</tr>
<tr>
<td>3.</td>
<td>⅕ of floor on ground</td>
<td>215</td>
<td>115</td>
<td>330</td>
</tr>
<tr>
<td>4.</td>
<td>Loadbearing walls</td>
<td>3375</td>
<td>2005</td>
<td>5380</td>
</tr>
<tr>
<td>5.</td>
<td>Non loadbearing walls</td>
<td>1025</td>
<td>615</td>
<td>1640</td>
</tr>
<tr>
<td>6.</td>
<td>⅕ of walls above ceiling</td>
<td>135</td>
<td>85</td>
<td>220</td>
</tr>
<tr>
<td>7.</td>
<td>⅕ of ceiling and roof</td>
<td>2035</td>
<td>650</td>
<td>2685</td>
</tr>
<tr>
<td>8.</td>
<td>⅔ of reinforced concrete with formwork</td>
<td>5330</td>
<td>3200</td>
<td>8530</td>
</tr>
<tr>
<td>9.</td>
<td>⅙ of staircase</td>
<td>600</td>
<td>400</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>13295</td>
<td>7300</td>
<td>20595</td>
</tr>
</tbody>
</table>

Comparison

We can make a comparison for each item for the two alternatives

1. Material cost will be little higher in alt. 2 because we have to use concrete instead of soil cement, while labour-cost will be be lower. Total alt. 1 is the most expensive one.

2. In Alt. 2 material cost will be higher for foundation walls, because concrete blocks are used instead of soil cement blocks. Labour-cost will be lower in alt. 2. Total alt. 1 is the most expensive one.

3. Floor on ground will be cheaper in alt. with regard to both material - labour-and total cost. The reason is that here we use the same materials as in alt. 1.
4. and 5 The walls are more expensive in alt. 2 because it is used concrete blocks and the labour costs are bigger because the work is done far from the ground. In addition there is a need for two more walls for the staircase than in alt. 1.

The cost for each item in table 1 and 2 is not the costs you get from a tender. However the difference ought to be almost correct.

COMPARISON OF THE ROADS

Assumptions made

The connection roads to the housing area will be the same for both one storey houses and three storey block of flats. In this comparisons the roads are constructed for 12 dwellings in both alternatives.

In the one storey alternative 6 dwellings are built on each side of the road, with 5 meters between the houses.

In the three storey alternative one block of flats with 6 dwellings in each are built one each side of the road.

The roads calculated consist of hardcore with a toplayer of gravel. The width of the roads are 5 meters. The roads is assumed to cost shs. 40/- pr. m².

For 1 lin. m road the price will be:

\[ \text{shs.} 40/- \times 5 = \text{shs.} 200/- \]

One storey houses (Alt. 1)

The length of the road is calculated from the end of the first house to the opposite end of the sixth house.

The length of one house \( 12.5 \text{ m} \)

The space between the houses \( 5.0 \text{ m} \)

The length of the road:

\[
\begin{array}{ll}
12.5 \text{ m} \times 6 & = 75 \text{ m} \\
5.0 \text{ m} \times 5 & = 25 \text{ m} \\
\hline
\text{Total length} & = 100 \text{ m}
\end{array}
\]

Price for constructing the road for 12 dwellings:

\[ \text{shs.} 200/- \times 100 = 20,000/- \]
Price for one dwelling:

\[ \text{Shs.20,000} \times 12 = \text{Shs.1,666/=} \]

Another and cheaper solution is to construct row-houses, putting three and three houses together.

The length of the road: 71 m

Price for constructing road for 12 dwellings:

\[ \text{Shs.200/-} \times 71 = \text{Shs.14,200/=} \]

Price for one dwelling:

\[ \text{Shs.14,200/=} \div 12 = \text{Shs.1,183/-} \]

Three storey block of flats Alt. 2).

The length of the road calculated from one end to the opposite end of a block.

The length of one block of flats: 24 meters.
The length of road: 24 meters.
Price for constructing road for 12 dwellings:

\[ \text{Shs.200/-} \times 24 = \text{Shs.4,800/=} \]

Price for one dwelling:

\[ \text{Shs.4,800/=} \div 12 = \text{Shs.400/-} \]

Comparison

The calculation indicates that roads for the one storey alternative cost Shs.1,266/= more than for the three storey alternative.

If one storey houses are built as row-houses the difference in price will be Shs.783/=.

CONCLUSION

The comparison indicates that a dwelling in a one storey house is Shs.289/= Shs.1,266/= = Shs.598/= cheaper than a corresponding dwelling in a three storey block of flats.

If the one storey house is one in a row of houses the difference is Shs.6,472/=
The roof for a three storey block of flats is as the rule made of reinforced concrete and not of the cheaper design used in the comparison.

As mentioned before the exterior plastering and painting will require more work for the dwelling in the three storey block of flats than in the one storey house. In the price for stair, price for a railing is not included and that will increase the price for the stair.

All the conditions mentioned above will increase the price of the dwelling in the three storey block of flats will counteract the influence of pipes etc. if any.

The National Housing and Building Research Unit has based on the comparison made above arrived at the conclusion that it is safe to state:

The same dwelling built as a one storey house is considerably cheaper as than if built as a flat in a three storey block of flats.

To this must be added the very important consideration that the consumption of critical resources - cement - for the one storey alternative is only a fraction of that for the three storey alternative, and that there are used steel-reinforcement (which are important from abroad) in the three storey alternative. In the one storey alternative steel-reinforcement is not used at all.
TYPE DESIGN M3-4h
TANZANIA HOUSING BANK
Based on
THREE-STORY BLOCK.

SCALE: 1:100

FIG. 2b. ELEVATION