

A CASE FOR THE PREFERENTIAL USE OF CONCRETE BLOCK PAVING IN RESIDENTIAL STREETS

John Cairns, Director

Concrete Manufacturers Association

P O Box 168 Halfway House, 1685, South Africa

Phone +27-11-805-6742 Fax +27-11-315- 4683 email: cma@mweb.co.za

Garth Gregory, Managing Director

Cast Industries, P O Box 418 Midrand, 1685 South Africa

Phone +27-11- 316-2375 Fax +27-11-316-2394 email: castind@mweb.co.za

SUMMARY

This paper discusses the various advantages of using concrete block paving (CBP) in township road development, which previously had unsurfaced roads, including technical, environmental and socio-economic benefits in developing countries. Research documentation available has focussed on the initial construction costs involved, and those differences have been the basis for most decision-making for the application of concrete block paving. However, some studies have highlighted the positive impact that CBP has on the socio-economic level, because of its highly labour-intensive nature, when used as a vehicle for community based residential road construction.

Two aspects of this are evident:

A Multiplier Effect of the revenue retained in a community has extreme value when considering the impact on the socio-economic circumstances of previously disadvantaged communities. A decision-making tool incorporating this Multiplier Effect should be adopted at feasibility stage to demonstrate the advantages to communities.

When different construction methods and materials are being considered for a project it is important that systems and methods being adopted should aim to create employment opportunities within a community and facilitate the involvement of the community in a project. The Multiplier Effect means that money paid to community residents is spent and re-spent within the community, thus providing increased growth of small enterprise and so substantially improving the quality of life for those residents.

1. PAVEMENT DESIGN

The road layer design for CBP depends, like all other types of pavements, on the insitu ground conditions, class of road etc. In many instances when comparing costs of CBP against asphalt only the cost of the surface layer is compared, i.e. blocks and sand against premix.

It has been shown that even when using a catalogue design method at least one layer of earthworks can be saved when using CBP as opposed to asphalt and if a mechanistic design, e.g. Lockpave, is used then the saving can be even greater.

2. COST COMPARISON

In most studies only the initial cost of construction is considered and decisions on road surface material are determined on this basis. However with the ever increasing price of crude oil the “gap”

between CBP and asphalt is reducing and in many instances, dependent on availability of raw materials, CBP is cheaper on initial cost.

When life costing is included in the decision making process then CBP, which is virtually maintenance free, is by far the most cost-effective road surfacing material.

3. SAFETY

Studies have proven that CBP has several safety benefits over asphalt namely.

- High skid resistance
- High luminance
- Rapid shedding of rainwater
- Change in noise levels.

Several towns in South Africa, which have heavy industrial through traffic, have installed CBP in all their intersections. This has reduced accidents in these intersections and also reduced maintenance to almost nil.

Similarly on toll roads, which are ever increasing in number, CBP is the preferred surface material at either side of the toll plaza for approximately 300m, which has proven to reduce the number of accidents through driver awareness and also reduce maintenance costs.

4. LABOUR INTENSIVE CONSTRUCTION

When considering alternative surface materials for township street development the major consideration should be the effect on the community of the material. There are several factors that show how CBP benefits the community.

4.1 Job and skills creation

The laying of concrete block paving is a highly labour intensive process in which the local community can easily be trained to do the construction as very little specialised skills and equipment are required.

Many of the skills developed during construction are marketable and it requires only a small additional amount of training to convert many of the employees into employers. Small contractors, using CBP and other cement based products and technologies do not require large amounts of capital to set up their businesses. Therefore sustainable employment can easily be created.

4.2 Ownership and Pride

When the community is involved in the construction of their streets, which have helped to improve the living conditions of their areas, then there is immediately a community pride in the area and there is a general upliftment to the environment. Trees, flowers and lawns are planted and cared for, paths and driveways are paved and garbage and litter are removed.

4.3 The Multiplier Effect

One of the most important factors for the success of using CBP for township roads is that the amount of money retained in the community has a Multiplier Effect in the community. In other words, each Rand that is retained by a construction worker in the community, is spent again in the same community for food, security, education etc. and they in turn are again spent on other services. Thus a multiplier effect of spending is generated within that community, stimulating

growth, and generating a positive socio-economic impact. Usually the positive result of this factor is totally underestimated when the installation of engineering services are planned for a township.

Dr Andre Jordaan of the Department of Economics at the Faculty of Economics and Business Management, University of Pretoria, has established that this Multiplier Effect ranges from 1,52 to 2,35.

To explain the advantages of using CBP in township roads, a typical 5m and 1 km long township road will be taken as an example. The figures are derived from actual projects and published research done on the subject.

The following two types of road surfaces will be compared in this report namely:

- 25mm thick asphalt surfacing
Top layers of the road comprises: 25mm AG; 150mm G3; 150mmG6.
- 80mm thick concrete block paving
Top layers of the road comprises: 80mm CBP; 20mm sand; 150mm G6.

Table 1 gives the estimated costs for the construction of a typical residential road.

4.4 The Project Index

Another important decision-making tool called the Project Index (PI) has been developed, based on extensive labour intensive projects.

Changes have been made to the formula to make provision for escalation in labour costs.

The approach followed by developing the project index examines and evaluates the following:

- The multiplier in employment opportunities
- Expenditure per unit of employment generated
- The amount of construction cost retained by the community
- The cost of the construction compared with that of conventional construction practices
- The quality of the end product compared with that produced using conventional construction techniques.

With this index one can evaluate whether it is worthwhile regarding a project to be labour intensive, where factors other than only the conventional “lowest tender amount for the most cost effective construction method”, are taken into consideration. In such cases, one of the important factors is “Percentage of the construction cost retained in the community” and what is the effect of that percentage retained in the community.

$$PI = 60/AxF + 1.75xB/100 + C/D$$

where:

- PI = Project Index
- A = Estimated unskilled labour daily rate with base month January 2002
- F = Escalation factor = $(1 - x) [(C_t - 1)/C_o]$,
- x = Portion of the value of the work which is not subject to escalation, normally a figure of 0.15
- C_t, C_o = Consumer price index in town closest to the project. The subscripts (t and o refer to the price index at the time of construction and at the time of the base month respectively)

- B = Percentage of construction cost retained by the community
- C = Estimated cost for conventional construction methods
- D = Estimated project construction costs by using labour intensive methods

and

$$C/D > 1.0$$

This index is in essence a combination of three ratios which relate to expenditure per unit of employment generated, construction cost retained by the community and cost of construction, respectively. Each of these ratios in their own right index employment opportunities, community opportunities and cost premiums i.e. job creation, economic empowerment and cost efficiency.

The PI, therefore, may be used to evaluate a project’s contribution in respect of employment opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction.

Projects which have a high Project Index present more development opportunities to a targeted community than those having low ones. It was found that if the PI is found to be above approximately 2.3, the project should be considered as a project for the targeted community. On the other hand – projects having a PI below 2.3 should be regarded as failing to comply with the Government’s reconstruction and development programmes and in such cases conventional methods might be implemented.

Examples of labour intensive CBP projects have produced a Project Index of 2.7 which substantiates the benefits to the community of the labour-intensive method of construction.

Table 1. Estimate of costs of a typical road and labour content

<u>Description</u>	<u>Asphalt road- 500m² (plant based construction)</u>	<u>Concrete block paving – 500m² (Labour based construction)</u>
Total cost of road (labour and material)	R677,850	R735,565
Labour cost retained in community	R26,410	R117,910
Multiplier factor (average)	1.94	1.94
Multiplied effect of labour cost	R51,235	R228,750

Significantly, using the multiplier effect, the benefits to the overall community, not only those people used on the road construction, is staggering.

5. THE NEGATIVE PERCEPTIONS

The “traditional” township roads in South Africa are surfaced with asphalt. The emerging community see these roads in their every day life style and therefore when CBP was offered to them for their roads they suspected that it was an inferior product. However in all new “upmarket” township developments, e.g. clusters and golf estates, the roads are being paved with CBP.

There was a concern that the paving blocks would be stolen both during construction and after completion of the road and resold. It should be noted that it is common for electrical and telephone cables, although either buried or high up on a pole, to be stolen and sold as scrap in emerging townships.

However it has been proven that because of the community involvement in the construction of the road, the community have taken ownership and ensure that not a single paving block is taken away even those left open on site overnight during construction.

6. CONCLUSIONS

Concrete block paving of townships roads should always be considered as a viable alternative to asphalt and all the “added” benefits should be considered. In addition not only the town planners and engineers should be involved in the decision making process but the community themselves should be included.

The well established and documented benefits of CBP such as maintenance, life cycle costing, safety should be included in the decision making process.

However the most significant benefit should be the job and skills creation within the community that CBP provides and the significance of the Multiplier Effect to the entire community. The Multiplier Effect, of the money paid to community residents, means that the positive socio-economic impact and growth within communities, which is effected by retaining revenue wherever practicable, should be the deciding factor in the methods adopted. Because of this Multiplier Effect, the use of Concrete Block Paving should always be the preferred choice for the wearing course of residential roads where the use of community labour is involved.

Client bodies and other decision makers should be encouraged to consider the evaluation of each project in terms of the considerations mentioned in this report, with special reference to the calculation of the PI (Project Index). By doing this, mistakes will be limited and a better choice of construction methods and materials should result in each individual project.

7. REFERENCES

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