THE UPGRADING OF ROADS IN THE CLERMONT/KWADABEKA AREA, DURBAN

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ABSTRACT

The Reconstruction and Development Programme [RDP] started by the South African Government some ten years ago has as its main ambition the provision of civil engineering infrastructure to communities that severely lacked and still lack these essential services.

As such, a major component of this programme is to provide the essential road network to the previously disadvantaged communities. However, this delivery programme has been somewhat set back with various problems and the provision of black top roads to appropriate standards in the Clermont and Kwadabeka area has in many cases proven to be a short term solution.

Many roads in this area have been upgraded from existing gravel to sealed blacktop standard roads rather hurriedly. In many cases, the critical design elements have been overlooked and the obvious results are roads with premature failure. Unfortunately a fair amount of roads in this area have not even lasted up to half of their expected design life. The existing design procedure adopted by the role players, or lack thereof, has in many cases resulted in the failure of a number of roads in the area under investigation. Various factors linked to the immediate road conditions ensure that a standard road design cannot be applied as a norm. Therefore, when designing to upgrade an existing gravel road, a thorough investigation of all local factors should be carried out.

This paper aims to investigate the current status and condition of the road network in the area and also do an investigative analysis of road layerworks that have failed. Alternative designs and proper maintenance plans will also be suggested for the area under investigation and other areas with similar constraints.

1. INTRODUCTION

It has to be acknowledged by all role players viz, government, politicians, provincial authorities, civic leaders, communities, service providers, engineers and the ordinary layman that roads in South Africa are necessary, but more importantly that they must be constructed and maintained in such a way that they are cost effective in the long term.

Premature failure of a road or a number of roads could be as a result of poor design, poor construction methods, which in many cases is due directly to poor or very little on site supervision, inferior materials used or a combination of all of the above.

The development of civil engineering infrastructure, especially roads, in many areas acts as a catalyst for economic growth leading gradually and ultimately to poverty alleviation. Road transport is definitely the dominant mode of freight and passenger transport in South Africa. An efficient and effective road network is therefore of paramount importance to the economic activities of the area and hence the sustainability of the residents as a whole. Therefore, to obtain and achieve sustainability, the road infrastructure project has to satisfy a variety of criteria.

Traditionally, roads in the Clermont / Kwadabeka area consisted of and in some cases still consist of pre-existing gravel wearing course which have been and will ultimately be upgraded to light pavement structures representing low volume roads.

The main purpose of this investigation therefore is to look at past failures and problems and recommend methods and mechanisms that will be effective in bettering the design life and serviceability of roads in the this area.

Further, it will aim to provide service providers, stakeholders and engineers with an overview with regard to low volume peri-urban roads and suggest viable options where alternative design and construction methods have proven to be satisfactory and economical. This investigation will also endeavor to provide references so that additional details can be obtained if necessary.

Hence, it will incorporate suggestions for better road designs and maintenance plans, identify problems and gain public support for road infrastructure activities.

2. BACKGROUND AND REVIEW OF CURRENT SITUATION

2.1 Geographical Location

Clermont is a township situated within the Durban Metropolitan area some 16km north west of the Durban CBD. To be more precise, Clermont is situated north of Pinetown and bounded by Westville, New Germany and the north western side of Reservoir Hills. Clermont is bounded by Kwadabeka on the northern side.

Together, Clermont and Kwadabeka form the bulk of the previously disadvantaged area within the Inner West City Council jurisdiction and it can be confidently stated that the existing population of Clermont and Kwadabeka combined is more dense than other disadvantaged area within the region.

Clermont is a formally laid out township with proper subdivided plots, initially constructed more than thirty years ago, whilst Kwadabeka, on the other hand is slightly more informal and has been in existence for about ten years now.

2.2 Existing Road Structure

Clermont has a formalized road system of which the main collector roads have hardened black top surfaces. However, over the past five years, a programme had been initiated by the then Pinetown Municipality which later became the Inner West City Council [IWCC] to upgrade the mainly gravel roads to low volume sealed blacktop roads. This programme was carried out initially as per normal priority ratings for provision of an engineering service, but as time progressed became very much politically slanted.

Each councillor of the different ward presented their needs and the more persuasive or persistent councillor in many instances got the road constructed overlooking the needs put forward in an engineering light. The townships in question have been built on steep hilly terrain and in some cases the topography cannot warrant any provision of the necessary road infrastructure.

An investigation report, commissioned by the Director General, Department of Development Aid and undertaken by consulting engineers Jeffares & Green Inc. in January 1993 outlined the problem statement as follows:

> *"The existing road system in the area under investigation viz, Clermont is rudimentary and of insufficient standard to meet the requirements for the general improvement programme in the development area. In order to raise the standard of life for the residents of Clermont, the upgrading of the road network is both justifiable and desirable."*

The report also stated that stormwater control in the secondary street system is virtually non-existent. This aggravates the poor condition of the roads and it is considered essential that where roads are upgraded, in order to protect the investment, a system of easily maintainable stormwater control is introduced.

It is very noticeable to the engineer with a keen eye that the natural ground slope in the area is very steep with gradients of approximately 30 % also with cross falls thus making it very difficult to install roadways of sufficient width while still maintaining usable access to residential properties on either side. This problem will be needed to be addressed at design stage when detailed survey information is available.

Finally the report summed up by pointing out that the existing road maintenance management and available expertise is entirely inadequate for the maintenance of the secondary road system and it is considered that this problem could best be overcome by designing facilities that require as little skilled maintenance as possible.

The approach to the problem solution covered under the same report was as follows:

> *"The recommendation is thus to provide a durable low maintenance road surface of suitable width to satisfy the traffic requirements as far as possible while maintaining residential access and providing for the efficient accommodation of stormwater."*

An alternative approach considered and rejected as impractical was the possibility of continuing with the use of high maintenance road surfaces, such as gravel, while making provision for the training and management of an efficient maintenance organisation to protect the facilities. The steepness of the grades and crossfalls in the area, coupled with the high rainfall experienced led to the conclusion that such an approach was not suitable in this case. The estimated costs at the end of the report arrived at R 6 640 527.23 for only eight streets in Clermont.

The current situation is that approximately 70% of roads have been upgraded in Clermont and only 40% in Kwadabeka. At present, a substantial proportion of the roads in Clermont and especially Kwadabeka are unpaved. These roads need to be continuously re-gravelled utilizing mostly imported gravel. This gravel is now becoming a scarce and non-renewable resource.

Based on a typical re-gravelling cycle of three to four years, the consumption of this resource is fast becoming scarce.

Most of the roads in Clermont /Kwadabeka carry a modest volume of traffic and it can be safely estimated at 50 - 100 vehicles per day. (Jeffaries and Green, 1993).

For any upgrading to take place, an investigation is required into the existing road or track conditions with the aim of trying to establish as accurately as possible its existing condition and the extent of the upgrading required. A visual assessment on site can reveal a lot to the experienced eye.

In the area under investigation, natural gravels have been extensively used as bases. The reason for this low cost road construction is simply that the cost of a natural gravel base is only approximately one third the cost of a crusher run base.

2.3 Case Study

Typical examples of road upgrading that have failed are 22nd Avenue, 19th Avenue and 17th Avenue in Clermont. The road under discussion is 22nd Avenue. The initial roadway was a formed track, approximately three hundred metres long and barely three metres wide. The base that had been in existence for almost ten years was gravel that was highly contaminated with in-situ material. Maintenance by means of grader was being done only after a heavy storm when the road was heavily eroded.

A vast number of the adjacent property owners did not connect their daily clothes washing effluent into the waterborne sewer system, either because of financial constraints or apathy.

Thus the western edge of the roadway was constantly moist with water flowing very slowly into the lower part of the road and eventually dissipating.

The service provider, viz IWCC decided to upgrade this road and other roads with similar defects in July 2000.

The existing roadway was surveyed and a road design allowing for an effective width of 4.8 metres was prepared with the specifications as follows:

- Supply and lay 110 mm diameter subsoil pipe along western edge.
- Rip and re-compact existing 150mm base to 93% MOD AASHTO.
- Supply and lay 150mm thick G2 crusher run compacted to 98% MOD AASHTO.
- Supply and lay 30mm thick asphalt wearing course.
- Supply and lay asphalt haunch to suit.

This was a typical road design that was almost standardized and used for almost every road in Clermont. The project was put out to tender and the successful tenderer completed the project as per specifications within the specified time.

By March 2001, serious failures were noticed in the roadway. Major crocodile cracking was taking place at certain parts of the roadway. The most outstanding failure was that of the sub-soil drain. The effluent was still coming from the washing areas onto the roadway. The new sub-soil did very little to eradicate this problem as it was more >overland flow= than sub-soil water.

Undercut of poor material was not allowed for as no soil profiles were taken prior to design.

Within, eight months of the road being newly constructed, maintenance was now becoming necessary. A re-evaluation of the roadway was done and problem areas were identified. Pothole repair work started and to date the road does not look like a newly constructed roadway.

The whole process of evaluation and design was not done as per sound engineering design criteria, thus resulting in a waste of valuable financial and human resources and adding further roads to the maintenance list.

The existing problems which are present are as follows:

- Unsuitable pavement type.
- Lack of stormwater control.
- Low geometric design standards.
- Infrequency of maintenance.

- Very little vehicular access to stands.
- Difficult topography.
- Rock outcrops very close to road surface.
- Inadequate sidewalks.

3. RECOMMENDATIONS

3.1 The Planning Process

Masterplans should be prepared for determining priorities for the future. These plans should be totally transport specific but should ideally relate to all associated sectors and thereby assist to identify priorities over a defined period. It is therefore at this critical stage that road projects should be identified and prioritized.(Keller, 2002).

The situation in Clermont and especially Kwadabeka is that a fair amount of roads still exist as unpaved gravel roads. A very small percentage of these gravel roads have given good performance under the prevailing traffic and climatic conditions. The major portion of these gravel roads have succumbed to stormwater erosion and in many cases have become unusable if not maintained and repaired timeously.

In order to provide an acceptable level of service, the service provider has to ensure that the roads should be constructed in such a way so that they:

- Are cost effective in the long run by preventing failures and eliminating repair needs and reducing maintenance.
- Have the best practical design.
- Meet the needs of the user.
- Improves the flow of goods and services and
- Helps promote development.

Further, to achieve sustainability, the role players involved in the complete planning of the road project should consider the following questions:

- Is the project politically supported ?
- Is it economically viable?
- Is it technically appropriate ?
- Is it environmentally suited?
- Is it socially accepatable?
- Is it afforded the proper resources for design and supervision?

3.2 Government and Local Authority Policy

The main framework of government policy with regard to road infrastructure development in previously disadvantaged areas is to assist in a significant way towards poverty alleviation and to facilitate the socio-economic growth of communities involved directly or indirectly in the infrastructure project (South African Roads Board, 1993).

Together with the technical planning of the project, the following factors need to be considered:

- The project should seek to encourage maximum local public involvement and participation in road projects. It is important that the above is done in an organized manner with some form of control being exercised by the development forum of the area so as to ensure equitable involvement of all stakeholders.
- The project should as far as possible encourage optimum utilization of local resources.
- The project should encourage the use of labour based construction rather than plant and machinery based methods, where feasible. Obviously the labour based method may in many cases not be the preferred type of construction to be employed by contractors, but a fair amount of local labour should be specified in the contract document.

- Promote local participation and resource mobilization by getting the people involved who will ultimately benefit from the road project.

More and more local authorities and service providers are promoting the use of labour based construction methods as an alternative to the traditional plant/ machinery based operations. This idea is being promoted to combat the high unemployment levels in the construction project area.

Hence, most road projects seek to maximize the surplus manpower that may exist in that community wherein the project is being undertaken.

The idea is to promote and inculcate a very positive attitude and outlook with regard to the maintenance of the future road projects by the very people it serves.

However, the reality is that negative perceptions still exist amongst the majority of the contractors involved in road projects. It is a common view amongst these contractors that labour based construction methods are uneconomic, time consuming and eventually leads to sub-standard work.

4. CONCLUSION

With the Clermont/ Kwadabeka area being developed at such a rapid pace, the planners need to give careful consideration to each and every respect of road design and construction.

Conventional and standard road designs should only be used as a guide, but each road should be individually assessed and designed accordingly. The pertinent factors with regard to adjacent property activities should be investigated thoroughly.

The overall indications from site visits indicate that there is a need for expertise to be applied carefully to get the desired results for the success of the road project.

5. REFERENCES

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BIOGRAPHY

M J Shaik

I was employed as an engineering technician at the City Engineer's Department, Durban City Council from 1982 to 1989. My primary responsibilities were design and implementation of road and stormwater projects and the related monitoring of contracts.

In 1989, I joined the Pinetown Municipality as a civil engineering technician also doing roads and stormwater design, contract monitoring and budgets.

In 1996, I joined the M L Sultan Technikon which merged with Natal Technikon to form the Durban Institute of Technology as a lecturer in civil engineering and surveying.

I am presently lecturing at DIT and also doing a fair amount of project management and mentoring of emerging contractors in the greater Durban area.