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CITY OF TSHWANE

"We are the same"

THE CITY OF TSHWANE METROPOLITAN MUNICIPALITY ROADS AND STORMWATER DIVISION

MINIMUM STANDARDS APPLICABLE TO ROAD CONSTRUCTION AND STORMWATER DRAINAGE SYSTEMS FOR ALL *LOW-COST HOUSING PROJECTS* IN TSHWANE

REVISION 1

5 APRIL 2004

*APPROVED:*_____

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1 INTRODUCTION

During the year 2002, the Gauteng Provincial Government made the decision that the only developer of low cost (subsidized) housing in Gauteng would be the Government, and the Gauteng Department of Housing was tasked with implementing this decision. Furthermore. the new procurement policy of the Government resulted in tenders being requested from professional teams to assist the Department of Housing with this implementation. The Phumelela Africa Consortium was awarded the tender for the implementation of projects in the City of Tshwane area.

The Tshwane Land Invasion Management Study indicates that some sixty thousand low-cost residential stands will have to be provided over the next few years.

The implementation process involves a partnership between the Gauteng Department of Housing, the RPT and the City of Tshwane, and can be described as follows:

- City of Tshwane provide the land, and identify communities to be relocated;
- Gauteng Department of Housing provide the funding via a housing subsidy, and appoint contractors to construct the works;
- The RPT provide all professional input necessary to implement the project, including beneficiary administration and conveyancing.

The subsidy amount is broken up as follows:

Water and Sewerage	R 4 500 per stand
Roads and Stormwater	R 1 000 per stand
Professional fees and land cost	R 2 400 per stand
Toilet Structure	R 3 500 per stand
Total	R11 400 per stand

Subsequent to the above being set, other costs have now been legislated, including

Environmental Control Officer

Health and Safety Officers

These two items amount to R250 per stand, and these amounts can only be taken from the roads and stormwater budget.

The balance of R750 per stand is insufficient to construct roads and stormwater to the current minimum standard set by the City of Tshwane Roads and Stormwater Division.

This report proposes minimum standards for the construction of Roads and Stormwater drainage systems for all low-cost housing projects in Tshwane.

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2 ROAD CONSTRUCTION

2.1 ROAD NETWORK

The development of the road hierarchy has been guided by the need to separate traffic movement by destination and journey length. The class of road does not depend on its initial traffic volume. In other words, while a freeway (Class 2) will always be a primary distributor in an urban area, a primary distributor need not be a freeway – or even a dual carriageway, for that matter. There are many urban roads whose volumes do not justify such expensive facilities.

The function of the urban road network is to distribute traffic between urban activities. Activities are linked in a physical hierarchy of urban districts, communities and neighborhoods, which are usually demarcated by the road network.

Table 2.1: below describes the different classes of roads.

CLASS	1	2	3	4	5
	Rural	Urban	Urban	Urban	Residential
	Cities / towns	Urban districts	Communities	Neigh-borhoods	–
	Regional distribution	Primary Urban distribution	District distribution (Major bus routes)	Local distribution (Minor bus routes)	Access to dwelling units
	Freeway or Dual or Single Carriage-way	Freeway or Dual or Single Carriage-way	Dual or Single Carriage-way	Two lane Single Carriage-way	Two lane Single Carriage-way or Variable width Car way
	N/A	N/A	N/A	Up to 2400	Up to 1200
	40 m, 60 m, 100 m	40 m, 60 m, 100 m	40 m, 25 m	25 m	20 m,16 m, 13 m, 10 m

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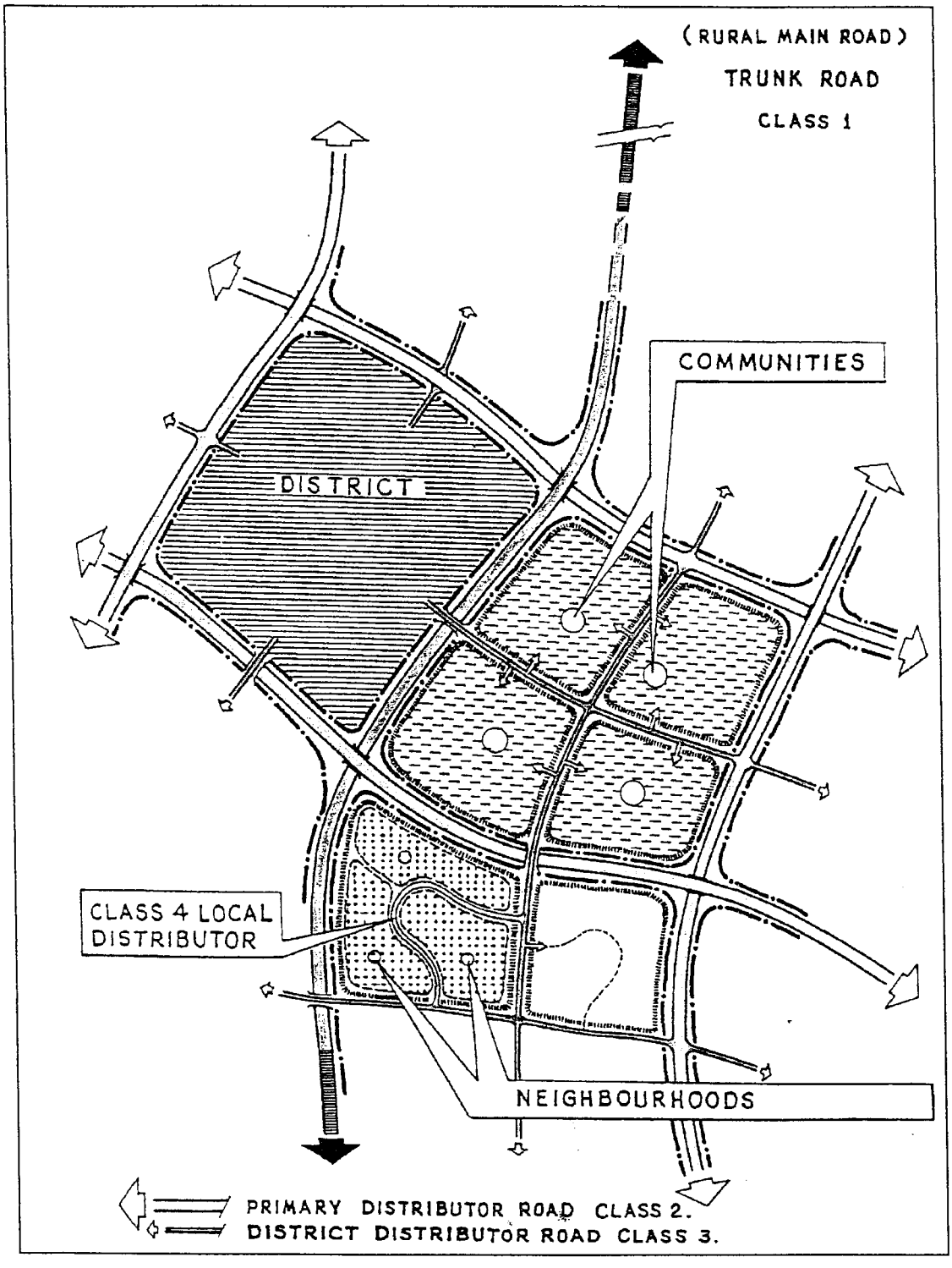
Figure 2.1: below describes a typical road network.



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2.2 ROAD DETAIL DESIGN

All detail design shall be according to the "Red Book", except as stated in Table 2.2.

Table 2.2. below indicates specific standards adopted for the RPT projects.

CLASS	4	5A	5(B-D)
	7,4 m	6,0 m	4,5 m
	25 mm Continuously Graded Medium Asphalt	Seal: 1st Layer: Bituminous binder 65% cationic emulsion prayed on prepared sub-base @ 1,9 l/m2 and covered with aggregate (not to be pre-coated) @ 0,01 m3/m2 2nd Layer: Bitumen Slurry seal placed by hand @ 0,6 l/m2	Seal: 1st Layer: Bituminous binder 65% cationic emulsion prayed on prepared sub-base @ 1,9 l/m2 and covered with aggregate (not to be pre-coated) @ 0,01 m3/m2 2nd Layer: Bitumen Slurry seal placed by hand @ 0,6 l/m2
	Base: G1,125mm THK @ 86% App Density Sub-base: G5, 150mm THK @ 95% Mod AASHTO, CBR>45 Roadbed/selected fill: CBR>15 @ 93% Mod AASHTO	Sub-base: G5, 150mm THK @ 95% Mod AASHTO, CBR>45 Roadbed/selected fill: CBR>15 @ 93% Mod AASHTO	Sub-base: G5, 150mm THK @ 95% Mod AASHTO, CBR>45 Roadbed/selected fill: CBR>15 @ 93% Mod AASHTO
	Single cross fall (3%)	Single cross fall (3%)	Single cross fall (3%)
	Min: 0,67% Max: 10% for a maximum length of 100m	Min: 0,67% Max: 12,5% for a maximum length of 70m	Min: 0,67% Max: 20% for a maximum length of 50m
	Semi-mountable kerb with 150 mm insitu cast gutter	150 mm wide edge beam	150 mm wide edge beam
	Semi-mountable kerb Fig 7. with 150 mm insitu cast gutter or side drain	300 mm wide insitu cast mountable kerb or side drain	300 mm wide insitu cast mountable kerb or side drain
	Bus bays shall be design according to the "RED BOOK" with fig. 3 barrier kerbs	No Bus bays	No Bus bays
	Speed humps at intersections	Speed humps at intersections with bus routes only	No traffic calming, road width acts as traffic calming measure

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3 STORMWATER MANAGEMENT PLAN

3.1 PRINCIPLES OF STORMWATER MANAGEMENT

The objectives of a stormwater management plan may be summarized as follows:

- To provide a stormwater drainage system for the convenience of the community and the protection of property from damage by the run-off from frequent storms;
- To prevent loss of life and reduce damage to property by the run-off from severe storms;
- To prevent land and watercourse erosion;
- To protect water resources from pollution;
- To preserve natural watercourses and their ecosystems; and
- To achieve the foregoing objectives at optimal total cost.

Traditionally runoff from frequent (minor) storms has been carried in a formal drainage system. Typically this is achieved by draining runoff from properties into the streets and then via conduits to the natural watercourses. Recently dual systems incorporating a minor system for the frequent storms and a major system for the less frequent but severe storm events are being utilized. The major system may include conduits and natural or artificial channels, but would commonly also make use of the road system to convey runoff overland to suitable points of discharge.

Further, runoff can also be stored in constructed dams, however, to be effective, such dams usually demand much space. Successful detention may therefore have to rely on several technologies involving:

- Detention ponds (detention facilities);
- A preference for overland flow as opposed to hydraulically efficient engineering conduits;
- Maintaining pervious surfaces and reducing impervious structures; and,
- Maintaining vegetation cover to increase interception and evapotranspiration.

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3.2 ROADS TO CONTROL RUN-OFF

The roadways will form part of the stormwater management system as surface flow will be utilised as far as possible. A channel and road combination system will carry the minor and major storms and will discharge directly into parks or the natural watercourses.

3.2.1 Encroachment On Roads By Run-Off

The following design criteria will be used:

Design flood frequency for minor storms	1 in 2 year
Design flood frequency for major storms	1 in 25 year
Maximum encroachment of runoff during *minor storms* on class 5b to 5f roads (Residential and lower order roads)	No kerb over-topping Depth of flow not to exceed 10mm at crown
Maximum encroachment of runoff during *minor storms* on class 5a roads (Residential access collectors)	No kerb over-topping Flow spread must leave at least 20% of total road width free of water
Maximum encroachment of runoff during *minor storms* on class 4 roads (Local distributors)	No kerb over-topping Flow spread must leave at least 40% of total road width free of water
Maximum encroachment of runoff during *major storms* on class 4 roads (Local distributors)	Depth of flow not to exceed 150mm at crown

3.2.2 Encroachment On Properties By Run-Off

The level of the major flood on roads should not encroach on adjacent properties by exceeding the level of the back of the road reserve verge.

3.2.3 Road and Roadside Channel Gradients

The following design criteria will be used:

Longitudinal slopes on roads and channels for minor and mayor storms	Minimum road gradient for cross fall roads = 0.67%
	Minimum road gradient for cambered roads = 0.67%
	Maximum road gradient should be such that flow velocities do not exceed 3.5 m/s Also refer to Table 2.2
	Minimum roadside channel gradient = 0.67% (to limit sedimentation)
	Maximum roadside channel gradient should be such that flow velocities do not exceed 3.5 m/s
Cross fall	Minimum crossfall on any road shall not be less than 3%

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3.2.4 Open Channel Geometry

No roadside channel shall have a depth of greater than 500 mm and velocities shall not exceed 3,5 m/s during the minor event.

3.2.5 Class 5b to 5f

All class 5b to 5f roads will be constructed with a stormwater channel, unlined channels will be allowed where the velocity under the 2 year condition is less than 1,5 m/s.

3.2.6 Detention Storage facilities

In all developments a certain percentage of the area is required to be dedicated for open spaces such as parks and greenbelts, and storage facilities may be located in these where practical.

Sport fields will also be utilized where possible.

Maximum water depth at any point in pond	1,5 m
Side slopes of the wall	1:5 (vertical : horizontal)
Width at the top of the wall	1,0 m
Discharge velocities from outlet structure and spillway	To be less than 1,5 m/s

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