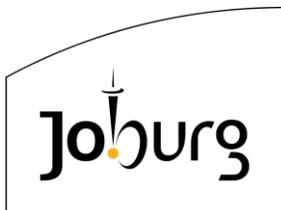


Johannesburg Roads Agency

A-Z Traffic Calming Guide



Mobility made easy

Table of Contents

The Role of a Traffic Engineer	2
JRA's Traffic Engineering Department's Responsibilities:	2
Traffic Engineering Enquiries	3
When Should a Traffic Signal be Installed?	3
How to request for the installation of a set of new traffic signals.....	3
What is Traffic Signal Coordination?.....	4
Do certain streets receive priority over others?.....	4
Why aren't more stop signs installed?	4
Unwarranted stop signs	5
Speed Humps Application Procedures	6
Application for traffic calming measures.	6
Disadvantages Associated with Speed Humps?.....	7
When Should a Roundabout be Installed?.....	8
Unsuitable Locations for Roundabouts:	8
Data Collected Prior to Installation of Intersection Control Measures.	8
Traffic Volumes.....	8
Crash Data.....	9
Existing Geometrics	9
Capacity and Warrant Analysis	9
What Necessitates Traffic Control at an Intersection	9

Johannesburg Roads Agency - Traffic Engineering Fact Sheet

Traffic engineering is that phase of engineering that deals with the planning, geometric design and traffic operations of roads, streets and freeways and their networks, terminals, abutting lands and relationships with other modes of transportation for the achievement of safe, efficient and convenient movement of people and goods. Traffic engineering applies engineering principles that help solve transportation problems by considering the psychology and habits of the transportation system users.

The Role of a Traffic Engineer

As trained professionals, traffic engineers look at the symptoms of general traffic conditions, and to make a competent diagnosis, they take traffic counts, analyse accident statistics, study speed data, examine roadway conditions, conduct research and study what other professionals are doing and the results they have achieved.

JRA's Traffic Engineering Department's Responsibilities:

- Investigate, plan and approve traffic calming measures
- Investigate, administer and plan security access restrictions
- Undertake traffic engineering investigations and analysis, evaluation of wayleave applications, evaluation of road closures and area wide network models
- Develop traffic engineering policies
- Investigate the impact of new developments on traffic flow. Over 250 traffic impact studies associated with development applications are analysed annually to ensure the network can accommodate new developments.
- Investigate, plan and approve the appropriate design and placement of advertising, direction, tourism, warning and regulatory road signs
- Undertake geometric surveys of intersections
- Prepare conceptual and detail design drawings for geometric upgrading at intersections
- Investigate, plan and design improvements to the traffic signal system including new phasing plans, right turn arrows, legal compliance, commissioning, and approval of external designs. Investigate, plan and design road and pedestrian safety projects including sidewalks, bicycle paths, guardrails, requests for road markings and signage, directional signage.
- Undertake regular traffic counts and prepare annual reports on traffic counts
- Undertake road safety audits

Traffic Engineering Enquiries:

Traffic signal design including new installations: E-mail: Johan Wilken via jwilken@jra.org.za

Stop signs, roundabouts, pedestrian crossings etc: E-mail: Esther Schmidt, Operations Manager: Traffic Information Services via eschmidt@jra.org.za

When Should a Traffic Signal be Installed?

1. Traffic signals should only be installed when they are warranted as determined by national guidelines, legislation and an engineering study. Warrants for traffic signals are based on the South African Road Traffic Signs Manual (SARTSM) and is measured in the delay experienced by the vehicles on the side road. It is not a warrant based on safety but rather a reduction in congestion and improvement in mobility.
2. When traffic volumes increase beyond the capacity of an all-way stop sign, it may be necessary to install a traffic signal. The established criteria for installing traffic signals is based on the total vehicle and pedestrian queue (delays) to side street motorists and pedestrians.
3. A warranted traffic signal that is properly located and operated may provide for more orderly movement of traffic, and may reduce the occurrence of certain types of crashes. On the other hand, an unwarranted traffic signal can result in increased delay, congestion, and crashes. Installations are based on engineering studies that consider the site geometry, number of pedestrians and queue lengths on the various approaches.

To request for the installation of a set of new traffic signals, the following process must be followed:

- The request must be submitted to JRA's Traffic Engineering Department.
- The request must be e-mail to Johan Wilken via: jwilken@jra.org.za
- The correct street and suburb names of the intersection must be provided.
- JRA's Traffic Engineering Department will conduct the necessary surveys to determine if the installation of traffic signals is warranted.
- If the installation is warranted, the intersection is placed on a priority list for funding.
- If not warranted the applicant is informed accordingly.

What is Traffic Signal Coordination?

Traffic signal coordination is a method of timing groups of adjacent traffic signals along a major roadway, to provide for a smooth flow of traffic with minimal stops. The goal of coordination is to get the greatest number of vehicles through a system - a group of coordinated traffic signals - with the fewest number of stops. While it would be ideal if every vehicle entering the system could proceed through without stopping, this is not possible even in a well-spaced and well-designed system.

Coordination along a roadway corridor takes into account the spacing of signals, the prevailing speed and traffic volume on the corridor, the amount of pedestrians at the intersection, the intersection size, and the traffic signal cycle length. Signal timings refer to the length of green and red time allocated to each approach / movement and include vehicle actuation and fixed time operation here.

Do certain streets receive priority over others?

Generally speaking, "majority rules" in traffic signal timing and coordination, and the busiest traffic movements are given priority. Depending on the route, the length of a traffic signal cycle (think "green-yellow-red") on a major roadway could vary from 60 to 120 seconds. This means that if you were exiting a side street, and you just missed the light, it is possible to wait between 60 and 120 seconds before receiving another green light. For the most part, the bigger the intersection the longer the required cycle length.

Why aren't more stop signs installed?

A stop sign is one of our most valuable and effective traffic control devices when used appropriately, at the right place and under the right conditions. It is intended to help drivers and pedestrians at an intersection decide who has the right-of-way.

One common misuse of stop signs is to arbitrarily interrupt through traffic by causing it to stop, creating such an inconvenience as to force the traffic to use other routes. Where stop signs are installed as "nuisances" or "speed reducers", there tends to be a high incidence of violation.

In residential areas where vehicles are required to stop the speed reduction is effective only in the immediate vicinity of the stop sign. Well-developed nationally recognized guidelines help to indicate when stop controls become necessary. These guidelines take into consideration, among other things, traffic volumes, the probability of vehicles arriving at an intersection at the same time, accident history, and the length of time traffic must wait to enter the main street,

and the availability of safe crossing opportunities for both motorized and non-motorized users. It is the responsibility of the traffic engineer to determine if there is in fact a traffic problem which needs to be addressed and to assure that one is not created by the installation of an unnecessary device.

In order for a road intersection to be appropriate for all-way stop control, the volumes entering the intersection from all roads should be relatively similar. This will result in the highest degree of driver respect and compliance. This means that for secondary streets, the combined volume of vehicles entering the intersection from the minor street over a seven-hour period must be at least 40% of the total volume for an intersection.

Unwarranted stop signs create problems at both the intersection and along the roadway by:

- Encouraging motorists to drive faster between intersections in-order to save time. Placing stop signs on every low-volume local street promotes speeding between the stop signs as drivers try to offset the delays caused by stopping at every intersection;
- Encouraging violation of traffic laws. As the number of stop signs increase so that nearly every intersection has one, the rate of stop sign violations tends to increase;
- Encouraging the use of alternate routes.
- Increasing the chance that drivers will disregard conflicting vehicle and pedestrian traffic, which raises the risk of collisions
- Unwarranted stop signs breed contempt in motorists who tend to ignore them or only slow down without stopping. This can sometimes lead to tragic consequences

When is a Pedestrian Crossing Installed?

The warrant for pedestrian crossing control is determined using factors that include:

- Vehicular volume at the crossing location
- Pedestrian volume
- Proximity to other traffic control devices
- Geometric conditions
- Class of road
- Accident stats

It should be noted that engineering judgement, knowledge and experience plays a role in the decision making (warrant) process given the existing constraints and unique characteristics of each situation and/or location.

Speed Humps Application Procedures

Due to the high demand for traffic calming, installation of traffic calming in the form of speed humps is undertaken by the Road Traffic Engineering Department on a strict priority basis.

Application for traffic calming measures.

It must be noted, that speed humps must be warranted as per South African Road Traffic Signs Manual (SARTSM) and City of Johannesburg Traffic Calming Policy: Requirement, Traffic Assessment/Study. The following documents must be e-mailed to JRA Traffic Engineering Department for assessment & approval via: eschmidt@jra.org.za

1. Letter of support from the Ward Councillor
2. Drawing depicting the location and position of proposed traffic calming measures
3. Letter of support from the City of Johannesburg's Regional Directors Office
4. A letter of support from the Johannesburg Metro Police Department (JMPD), which is responsible for speed law enforcement.

Engineers will generally implement traffic calming (speed humps, raised pedestrian crossings and mini-circles) only if none of the following is applicable:

- Not in front of entrances
- Not in shade of trees and other physical objects during the day
- Not where they are not illuminated by street lighting at night
- Not on gradients in excess of 6%
- Not on gravel roads (cannot be painted and there is usually no street lighting)
- Not on Class 4 or higher Class roads
- Not on designated public transport routes
- Not within a specified distance of other control mechanisms such as traffic signals

A structured analysis procedure enables the municipality to determine, as objectively as possible, whether it is appropriate to install traffic calming measures on a given street or in-a-given neighbourhood, and what types of measures should be used to achieve the desired objectives in terms of speed reduction and increased safety. The goal is to assess the problem and confirm that excessive speed is the issue.

Traffic and speed studies are conducted. The analysis also look at accidents as well as the geometric characteristics of the road and its function, which includes but is not limited to type of users, transit artery, bus route, residential local road, and commercial street. A public consultation is included in the analysis and allows residents to express their thoughts and concerns.

What are Some of the Disadvantages Associated with Speed Humps?

Speed humps are a major problem for emergency vehicles such as ambulances and fire engines. Apart from the major discomfort to ambulance passengers, they also delay response times substantially. This can be as much as 10 seconds per device. The longer wheel-base, stiff suspension, high vehicle weight, as well as the sensitive equipment and injured victims transported by these vehicles, requires drivers to slow almost to a stop to negotiate the devices safely.

Speed humps are a very blunt instrument. In fact, different vehicles respond very differently with heavy vehicles such as heavy goods vehicles (HGV), buses and other public service vehicles being particularly prone to discomfort unless humps are traversed at very low speeds. It is simply impossible to design a speed hump that is negotiable comfortably at a reasonable speed by all vehicles and which is not painful to the occupants. Depending upon the vehicle and the hump design, going over a hump at a higher speed may cause less discomfort than a lower speed.

Speed humps cause atmospheric pollution from the speeding up and slowing down of traffic between the humps as per the Transport Research Laboratory (TRL) Report No. 482. For example, TRL reports a 59% increase in CO, about 50% increase in HC and about 25% in CO₂ from petrol catalyst vehicles averaged over all types of traffic calming measures, with even higher numbers over more "severe" measures such as speed humps.

Speed bumps can create additional traffic noise, although this tends to depend on the type of vehicle. HGVs and other goods vehicles would typically generate substantially more noise than before, while cars will generate less noise, although the variability of the noise level as vehicles slow down before bumps and accelerate afterwards can mean that the noise is more noticeable than before.

Speed humps can result in the relocation of the problem to adjacent streets especially in areas where the road network is designed in a grid pattern. Each type of control measure is justified and based on international as well as local standards contained in the SA-DC Road Traffic Signs Manual.

The disadvantages and advantages associated with each measure have been documented extensively in research papers, all which are taken into account when a decision is taken on the most appropriate control measure from a traffic and road safety perspective.

When Should a Roundabout be Installed?

Roundabouts equalise the priority of all approach roads. No matter how minor the intersecting road may be, it is afforded the same priority on entry as any of the major routes. Furthermore, all vehicles must slow and take gaps on approaching the roundabout and priority cannot be given to any movement without violating the roundabout operational principles. Mini-circles in particular, must be avoided where the major road traffic is such that it will “force” priority. If heavy main road traffic makes the minor road or right turning traffic stop and give way, even though the circle theoretically gives the minor traffic priority, a dangerous situation arises.

Unsuitable Locations for Roundabouts:

- Where minor crossroads enter major routes.
- In signalised co-ordinated networks where they would break up the platoon flow.
- Where traffic signals will soon be required. As per the South African Road Traffic Signs Manual, 4-way stops must be used as an interim solution where traffic signals are warranted but funding is not yet available for the installation thereof.
- As is the case of all intersections, roundabouts should be avoided on roads with steep slopes or where the intersection is not visible. Longer ‘flat’ areas are required for roundabouts compared with other intersection types, making them less suitable on steep grades.

Various Data are Collected Prior to the Installation of any Intersection Control Measures. These Include:

Traffic Volumes

- Hourly intersection approach
- Turning movement counts for the AM and PM peak periods
- Future modelled intersection approach volumes (where new developments are expected)
- Future turning movement volumes for the AM and PM peak hours using pre- approved growth rates or future modeling parameters
- Pedestrian and bicycle volumes by approach, if applicable

Crash Data

- Crash data from the JMPD accident database

Existing Geometrics

- The existing geometrics of the intersection being considered including gradients, available road reserve, services, sight distance, lane widths, parking lanes, shoulders and/or curb treatments, medians, pedestrian and bicycle facilities, right of way limits and access driveways or adjacent roadways for all approaches.

Capacity and Warrant Analysis

- Analysis determining the delays for all movements, approaches and overall intersection for AM and PM peak hours, both existing and future conditions, for each alternative analysed.

What Necessitates Traffic Control at an Intersection

In-order for the engineer to determine if any traffic control is necessary at an intersection, data must be examined to determine if a “Warrant” is met for the particular intersection control alternative. Even if a “Warrant” is met, it may not be the correct action to take for a given situation. The engineer must determine if the treatment is “Justified.”

These factors could include, but are not limited to:

1. Existing safety and congestion issues,
2. Future road master plans for the roadway,
3. The spacing of nearby intersections or driveways
4. Future anticipated traffic volumes,
5. The distance to the nearest traffic controlled intersections,
6. The amount of turning traffic,
7. The breakdown and percentage of types of vehicles,
8. The amounts of non-motorized traffic,
9. Sight distance,
10. Available right of way
11. Available funds for construction
12. Support of the local users.