CHALMERS

The Suitability of the Method *Right Speed in the City* for Residential Areas in Gothenburg

A Basis for the Traffic and Public Transport Authority's Work with Overhaul of Speed Levels

Master of Science Thesis in the Master's Programme Geo and Water Engineering

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CHALMERS UNIVERSITY OF TECHNOLOGY
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The residential area "Kvarteret Mars 1" in Täby, Stockholm. Illustration made by White Arkitekter. Täby Centrum, Sweden. Published with permission.

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ABSTRACT

From May 2008, it is in Sweden possible to use speed limits of 10 km/h interval, from 30 km/h up to 120 km/h. The Traffic and Public Transport Authority in Gothenburg, has discussed that they might in the next few years introduce the new speed limits. As an aid to the overhaul of speed levels, the method *Right Speed in the City* and an appurtenant Excel-program have been developed by the Swedish Association of Local Authorities and Regions and the Road Administration, now called the Transport Administration. The aim of this work is that it will be a basis for Traffic and Public Transport Authority's overhaul of the speed levels. The thesis will analyze the suitability of *Right Speed in the City* for six representative streets, which are based on residential areas in Gothenburg with different characters. The representative streets are Newer Residential Streets, Older Residential Streets, Wide Street Space with Narrow Roadway, Apartment Blocks on One Side, City Centre Streets and Million Programme Streets. For each studied street, information about accidents was collected from STRADA to get an idea if there are more accidents on a particular representative street and where on the street the accidents occur. For each studied street, the speed level was measured by using a laser camera. The results are presented in 85-percentiles. Thereafter, each street got a recommended speed level by using the manual *Right Speed in the City* and its Excel-program. The majority of the streets got a recommended speed level of 30 km/h.

To find out the *Right Speed in the City's* suitability for residential areas in Gothenburg, it needs to ascertain what conflicts of interest that may occur on the representative streets. The conflicts of interest occur because the road users have different speed claims, function claims and requirements of accessibility. Conflicts of interest may occur on the representative streets Million Programme Streets and City Centre Streets. Based on potential conflicts of interest and observance of the recommended speed level, it is considered that the *Right Speed in the City's* method is suitable for residential streets. However, the suitability for streets with apartment blocks is more uncertain. The appearances among the streets with apartment blocks is in general more different, compared to the residential streets. This makes it more difficult to create representative streets for streets with apartment blocks in Gothenburg.

Key words: The Right Speed in the City, speed level, representative street, conflict of interest, street space, standard design cross section, urban planning quality

Metoden *Rätt fart i stadens* lämplighet för bostadsområden i Göteborg
- Ett underlag till Trafikkontorets arbete med översyn av hastighetsnivåer

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SAMMANFATTNING

Från och med maj 2008 är det i Sverige möjligt att använda hastighetsgränser i steg om 10 km/h, från 30 km/h upp till 120 km/h. Trafikkontoret Göteborgs Stad har diskuterat att inom de närmsta åren eventuellt använda sig av de nya hastighetsgränserna i Göteborg. Som ett hjälpmedel till översynen av hastighetsnivåerna har handboken *Rätt fart i staden* samt ett tillhörande Excel-program tagits fram av Sveriges Kommuner och Landsting samt Vägverket, numera Trafikverket. Syftet med arbetet är att det ska vara ett underlag till Trafikkontorets arbete med översyn av hastighetsnivåer. Arbetet ska analysera handbokens lämplighet för sex typgator, vilka baseras på bostadsområden med olika karaktärer i Göteborg. Typgatorna är Nyare villagator, Äldre villagator, Flerbostadshus på ena sidan, Brett gaturum med smal körbana, Miljonprogram och Centrumgator med högt fordonsflöde. För varje gata har olycksstatistik från STRADA studerats för att få en uppfattning om huruvida det sker fler olyckor på en viss typgata och var på gatan olyckorna inträffar. På varje studerad gata mättes även den verkliga hastighetsnivån in med hjälp av en laserkamera. Mätvärdena presenteras i form av 85-percentiler. För varje gata tilldelades sedan en rekommenderad hastighetsnivå med hjälp av *Rätt fart i staden* och tillhörande Excel-program. Majoriteten av gatorna fick en rekommenderad hastighetsnivå på 30 km/h.

En del i utvärderingen av *Rätt fart i staden*s lämplighet för bostadsområden i Göteborg är att ta reda på vilka eventuella intressekonflikter som kan uppstå på typgatorna. Konflikterna uppstår på grund av att de som nyttjar gatorna har olika hastighetsanspråk, anspråk på funktion och krav på framkomlighet. Eventuella intressekonflikter kan uppstå på typgatorna Miljonprogram och Centrumgator med högt fordonsflöde. Utifrån eventuella intressekonflikter och efterlevnaden av den rekommenderade hastighetsnivån, anses det att *Rätt fart i stadens* metod är lämplig för villagator. Däremot är lämpligheten för gator med flerbostadshus mer osäker. Utseendet på gator med flerbostadshus skiljer sig generellt mer åt sinsemellan än för villagator. Detta gör det svårare att skapa representativa typgator för gator med flerbostadshus i Göteborg.

Nyckelord: Rätt fart i staden, hastighetsnivå, typgata, livsrum, intressekonflikt, gaturum, typsektion, stadsbyggnadskvalité

Preface

In the beginning of 2011, we started with our Master Thesis within the Master's programme Geo and Water Engineering on Chalmers. It was performed at the division of GeoEngineering in the department Civil and Environmental Engineering, commitment by the Traffic and Public Transport Authority in Gothenburg.

First we would like to thank COWI for the lending of office space and the friendly hospitality we have received from the personnel at the department Infrastructure. A big thanks goes to our external supervisor Pär Sköld, COWI, for all the good comments and all the help we received during the work. We also want to thank Gunnar Lannér, Chalmers, who has been our supervisor and examiner for the Master's Thesis.

During the work, there was a reference group to support our work. In addition to Gunnar and Pär were also the following people in the group: Suzanne Andersson, Anna Boberg and Daniel Sjölund from the Traffic and Public Transport Authority of Gothenburg and Anders Svensson from the City Planning Authority in Gothenburg. We want to thank the reference group for all the inspiration and all the ideas they have contributed with.

Göteborg, June 2011

Terese Salomonsson
Sandra Wegén

Glossary

Availability	The part of accessibility that describes how much time that is used for movement for various road users in the traffic network. How much time that is used depends on the movement's length and speed.
Claim	Requirement, demand.
Confidence Interval	An interval that encloses the true value with a specific probability. The report uses a 95 % confidence interval.
MapInfo	GIS database with maps and traffic information for Gothenburg. GIS stands for Geographic Information Systems.
Speed Level	The speed at which you are travelling in. The speed level in the report is referred to the 85th percentile of the measured speed levels.
Speed Limit	The signposted speed that shows the maximum speed level that is allowed to use.
Speed Overhaul	An overhaul of the speed levels that develop on the studied street and what speed levels that should be strived after on the street.
Standard Deviation	A measurement of the dispersion of the measured values and of their distribution.
STRADA	Database with traffic accidents reported by police and health care. STRADA stands for Swedish Traffic Accident Data Acquisition.
Example of Street	An example of a street that belongs to a certain type of representative street.
Street Space	A visual space around the street where the floor of the space consists of the street and the walls consist of the streets environment, such as buildings or green areas.
Traffic Network	A network consisting of all the streets in an area. The traffic network is divided into main traffic network and local traffic network.
Traffic Regulation	A regulation that describes the traffic laws on the traffic network in the municipality.
Trunk Bus	A kind of express bus in urban areas with very frequent departures.
Representative Street	A street that represent a certain type of street and that has been created to simplify the traffic network and to be able to work transparent.

Table of Contents

1 Introduction

1.1 Background

From May 2008, it is in Sweden possible to use speed limits of 10 km/h interval, from 30 km/h up to 120 km/h. The Swedish Transport Administration has widely applied the new speed limits on the state's roads and there is an opportunity for municipalities to make a similar adjustment to the new system. Some municipalities have already implemented a change in speed limits. The first step to adjust the speed limits is to do an overhaul of the city's speed levels on the whole or parts of the traffic network.

The Traffic and Public Transport Authority in Gothenburg, has discussed that they might in the next few years introduce the new speed limits. If a decision is made to introduce the new speed limits, a speed overhaul needs to be done to see which speed levels that are most appropriate for the streets in the city.

As an aid to the overhaul of speed levels, the manual *Right Speed in the City* and an appurtenant Excel-program has been developed by the Swedish Association of Local Authorities and Regions and the Road Administration, now called the Transport Administration. In this report, the *Right Speed in the City* is henceforth called the method. The aim for the method is to recommend speed levels for the traffic network with respect to the streets surrounding and physical design.

1.2 Aim

The aim for this thesis is that it will be a basis for the Traffic and Public Transport Authority's work with the overhaul of speed levels. The work will analyze the *Right Speed in the City's* suitability for a number of representative streets which are based on residential areas in Gothenburg with different character. This is made by studying the observance of the recommended speed levels from the method and by discussing potential conflicts of interest that may occur. These conflicts occur because road users have different speed claims, function claims and requirement of accessibility.

1.3 Limits

The recommended speed level for the different representative streets does not account traffic emissions and traffic noise. To do a complete speed overhaul with the *Right Speed in the City,* those factors need to be included. Ten examples of streets are studied and are located in different residential areas in Gothenburg.

2 Method

In the beginning of the project, a reference group with members from the Traffic and Public Transport Authority and The City Planning Authority in City of Gothenburg was formed. During the project, a series of meeting took place to provide skills and knowledge to the work.

Literatures studies were conducted to obtain background information about the introduction of the new speed limits. An interview was made with Lars-Göran Wallin from the Traffic and Public Transport Authority, City of Gothenburg. The interview was made to get an insight into the Traffic and Public Transport Authority's work with establishment of speed levels and how to secure the desired speed levels.

To find representative streets with different characters, a number of residential areas with different construction years were studied. From the different residential areas, examples of streets were chosen considering the type of development, the area's building structure, geographic location, the street's appearance in plan and the amount of traffic and people in motion. Together with the reference group, ten of these streets were selected as streets to work with. These ten streets were then divided into groups which created six different representative streets.

For each example of street, the actual speed level was measured by using a laser camera. For more information about the measurement, see Chapter 2.1. In connection with the speed measurement, information needed for the method concerning the design and surroundings of the street was gathered. The needed information about public transport for the method was collected from MapInfo at the Traffic and Public Transport Authority. The traffic flow for each street was gathered from the Traffic and Public Transport Authority's database with former measurements. For the streets where no traffic flow were found, the flow was measured at the same time as the speed levels.

For each example of street, a speed level was recommended with the *Right Speed in the City* and its appurtenant Excel-program. More information about the method is to be found in Chapter 2.2.

A part of the evaluation of the *Right Speed in the City*'s suitability for Gothenburg was to find out what potential conflicts of interest that may occur on the representative streets. The conflicts occur because the users of the streets have different speed claims, function claims and requirements of availability. In MapInfo, there are maps of the public transport and the emergency network, which was used to find out how the streets are used. The information about each example of street became the basis for the creating of the representative streets. A comparison between the measured speed level and the recommended speed level was made for each representative street to see how well they correspond with each other.

For each representative street, a standard design cross section was illustrated based on information about the appearance of the examples of streets. The illustrations were drawn in AutoCAD and the colors were added in Photoshop.

2.1 Measurement of Speed Levels

A laser camera was used for the speed measurements. The model is called Pro Laser II and is from Palmenco AB, see Figure 1.

Figure 1. The laser camera used for speed measurements.

The laser camera calculates the speed level by measuring the distance to the object three times per second and then comparing the different distances. It can measure objects that are located between a distance of 10 meter and 1400 meters from the camera. The precision of the distance is ± 0.1 meter and the precision of the speed level is ± 0.8 km/h. (Palmenco, probably 1990-1995)

The speed measurements were made inside a civilian car in order to avoid that the drivers in the studied vehicles would be aware that they were watched. The car was parked so that the availability of the studied vehicles were affected as little as possible, see Figure 2.

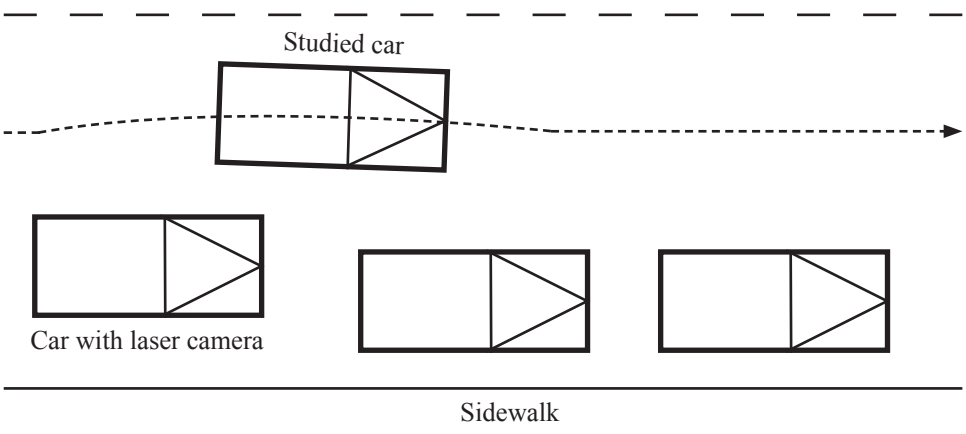


Figure 2. An example of the car's location at the measurement to get a god angle and affect the studied vehicle as little as possible.

If the measurement of the speed level is not done just right behind or in front of the studied vehicle, an angle is formed between the laser beam and the studied car's direction of travel. This type of situation may arise when measurement is done from the side of the street. To see how much impact on the result this can contribute to, an example with calculations is given below.

When a vehicle is driving four meters abroad the laser camera and 10 respective 11 meters ahead, the length of the laser beam becomes 10.77 respectively 11.70 meters, see Figure 3. When the vehicle is driving in 30 km/h, it takes 0.12 seconds to travel 1 meter, but because of the angle, the laser camera register that the vehicle has traveled the difference between 11.70 and 10.77 meters, which is 0.93 meters. The laser camera indicates therefore a speed level of 28 km/h. This means, in order to get the correct speed level, the measured speed level should be increased with 2 km/h. Since the laser camera cannot be used closer than 10 meters, there is in generall no greater error than 2 km/h. For example, if the measurement is done 50 meters from the laser camera, the error is not more than 0.5 km/h. (Karlgren, 2001)

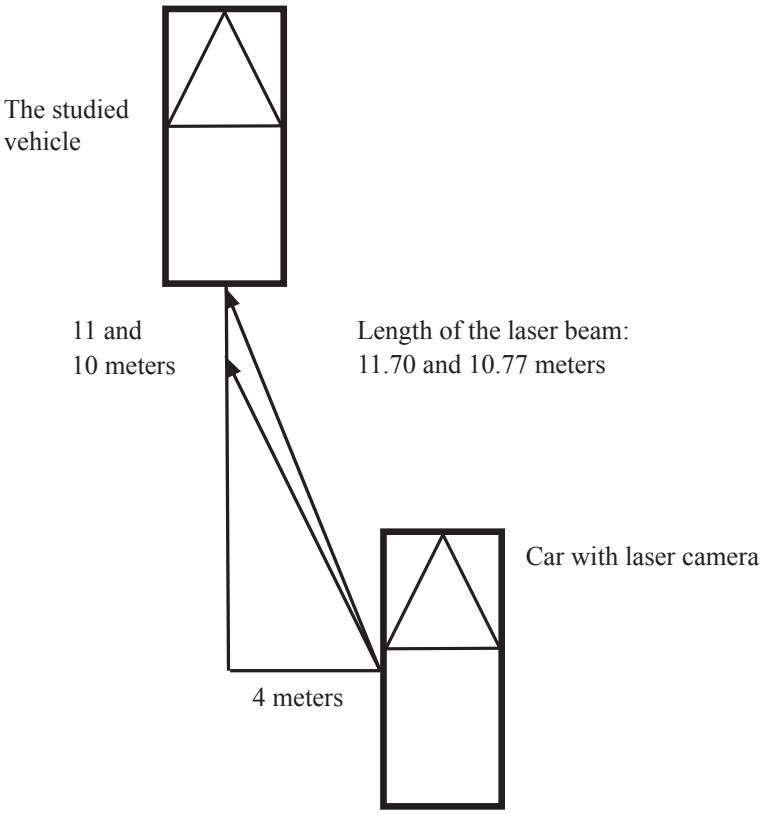


Figure 3. Example of how the car's position affects the length of the laser beam.

In order to measure the speed level at the same location for all vehicles, a fixed object was chosen on the side of the street where the measurement took place. The measurements were performed by point the laser camera at the vehicle's license plate and then register the speed level at the moment when the vehicle passes the fixed object. The vehicles, which speed levels were measured, were car, truck and bus.

The vehicles maximum speed level on the street is expected to arise after 60.7 % of the length of the distance (Karlgren, 2001). Distance means the part of the street which is located between two crossings or speed bumps. The traffic flow on the studied streets are relatively low and therefor the measurements of speed levels were made in both directions of travel at the same time. Since no account were taken to the vehicles' direction, the measurements were made between two crossings to get the maximum average speed for the street. When speed bumps occurred, the measurements were made between the bumps.

In order to make the conditions of the street more similar, the measurement did not take place when the vehicles' speed level were affected. The measurement were performed when the following conditions were fulfilled:

- The vehicle was traveling the entire distance
- No traffic queues occurred
- Green light when traffic light occurred
- No temporary obstacle on the street

Speed levels were not measured where there was temporary obstacles along the street which affected the vehicle's speed level. Exeptionis made for the example of street Vegagatan, where maintenance of building facades next to the street was going on. The work would continue for a long time and could therefore not be avoided. On the sidewalk and a bit out in the traffic lane, a skylift was standing which affected the traffic flow in one lane during a part of the street. To reduce the obstacle's effect, the measurement was made as far away from the obstacle as possible. Vehicles that clearly slowed down due to the obstacle were excluded from the result. There is still a risk that some vehicles were affected by keeping a lower speed level along the entire distance where the obstacle was visible to the motorists.

Berzeliigatan is the only example of street with traffic signals. The measurements were made only when the traffic signal was showing green signal and when the traffic had a steady flow. The measurements were made from a location where the traffic signal was not possible to observe, see Figure 4. In most cases, it was clear if the traffic signal showed yellow or red light since the vehicles clearly slowed down or stopped. When the traffic flow was lower, it was not as clear if the traffic signal showed green, yellow or red. Thereby measurements could have been done on vehicles that travelled in a lower speed level along the entire street, due to that they observed the yellow or red light from a long distance.

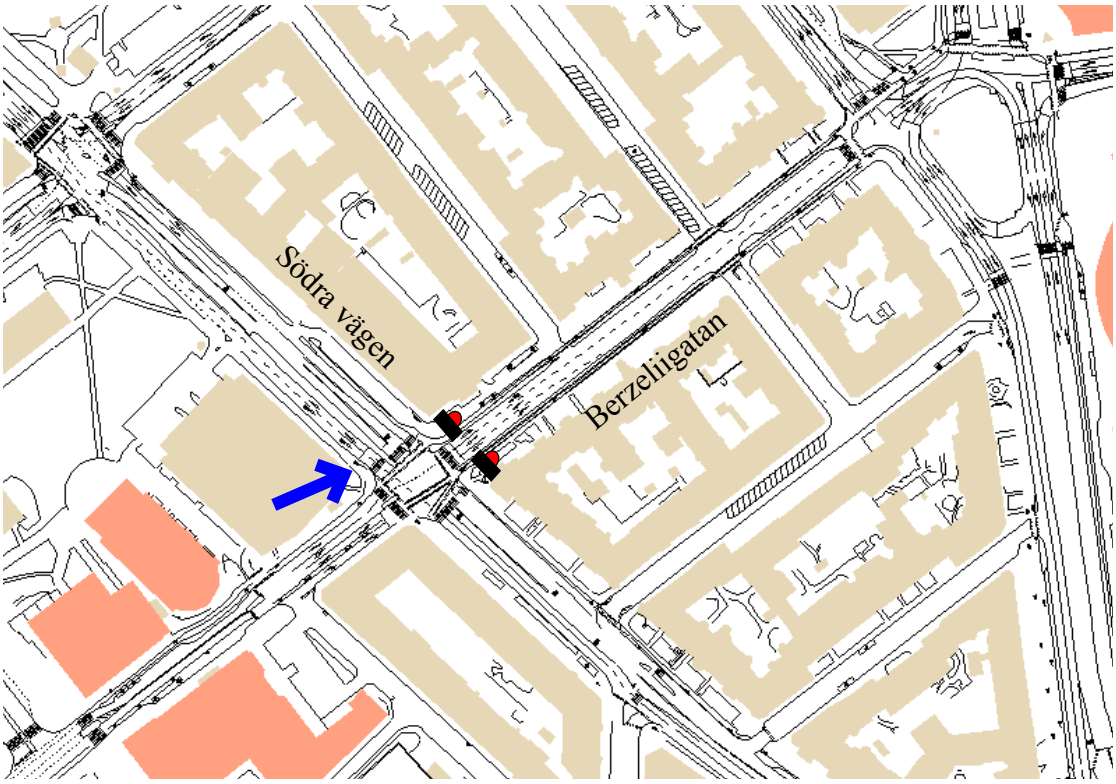


Figure 4. A map of the part of the example of street Berzeliigatan that was studied. The traffic light are marked with rectangles with circles on the side where the lights are located. The arrow shows where the laser camera was placed and in which direction.

2.2 The Right Speed in the City

Figure 5. The manual Right Speed in the City. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

The *Right Speed in the City* was developed on behalf of the Swedish Associations of Local Authorities and Regions and the Road Administration, now called the Transport Administration. It is a manual, see Figure 5, with an appurtenant Excel-program in version 1.4, which aim is to give street owners a methodology to decide appropiatie speed levels in urban areas. Because of this, the speed levels are based on the same method and therefore can they be motivated similarly by the street owner. In this way the speed levels are created in the same way. This creates recognition for the road users at a possible change of speed limits. The method is built on research, experience and qualified assessments (Swedish Associations of Local Authorities and Regions, Road Administration, 2008).

The method takes into account the qualities that residents and visitors appreciate in the city, so called urban planning qualities. These qualities are character, security, accessibility, traffic safety and environmental and health impacts, and are originally from the publication Traffic in an Attractive City.

Character
Character is a collective term for factors that affect the picture of the city and its various qualities. There are many different characters that affects the city's attractivity, such as parks, urban structure, cultural traditions, tourism, building structures, etc.

Security
Security is people's perception that it is a small risk of accidents while staying in traffic areas or when being a road user. Security is very individual because individuals have different risk sensitivity. The perceived security does not need to be the same as the actual security.

Accessibility
Accessibility can be defined as how ”easy” it is for various categories of road users to reach the city's activitiess, services and other supplies. It depends partly due to waiting time, travel time, frequency, comfort, travel cost etc.

Traffic Safety
Traffic safety can be defined as ”low risk of injuries in the traffic”. The consequences of a collision is depending on the speed level. Therefore, the traffic safety is based on the crash force curve, see Figure 8.

Environmental and Health Impacts
The environmental and health impacts are the traffic's impact on the environment, such as air pollution, noise and climate changes.

(Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

The method adjusts the speed levels based on the street's environment, design and function. The street's environment affects the interaction between pedestrians, cyclists and motor vehicles. Depending on how the interactions look like, the streets are divided into different street spaces, so-called living-spaces, as described in Chapter 2.2.1. The street's design contributes to which road users that interact with each other on the street and which traffic situations that may occur on the street. The speed level should be adjusted based on these situations and it takes form with the design traffic safety situation on the street, which is explained further in Chapter 2.2.2. The street's function describes which traffic network the street belongs to and whether any public transport uses the street.

The urban planning qualities are affected by the street's environment, design and function by their speed claims. The method contextures these speed claims and generates appropriate speed levels for the streets. For more information about how the *Right Speed in the City*'s Excel-program works, see Chapter 2.2.3.

2.2.1 Living-Spaces

The traffic network can be divided into different living-spaces depending on the streets appearances and environments. According to the *Right Speed in the City* it is the street space's walls, which are the street's environment, that claim which speed level the street should have. The floor in the street space does not affect the recommended speed level.

In the different living-spaces, the possibilities to use the space varies for pedestrians, cyclists and motor vehicles, see Figure 6.

Free Space	**Integrated Free Space**	**Common Space**	**Integrated Traffic Space**	**Traffic Space**
Pedestrians and cyclists				Absence
			Attendance	Own it
		Interaction	Prioritise	
	Prioritise	Interaction		
Own it	Attendance			
Absence				**Motor vehicles**

Figure 6. The different living-spaces can be described by how large part of them that is "own" by the pedestrians, cyclists and motor vehicles. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008. Edited by Terese Salomonsson)

According to the *Right Speed in the City*, the traffic network can be divided into five living-spaces which are free space, integrated free space, common space, integrated traffic space and traffic space. For an illustration of the free space, common space and traffic space, see Figure 7. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

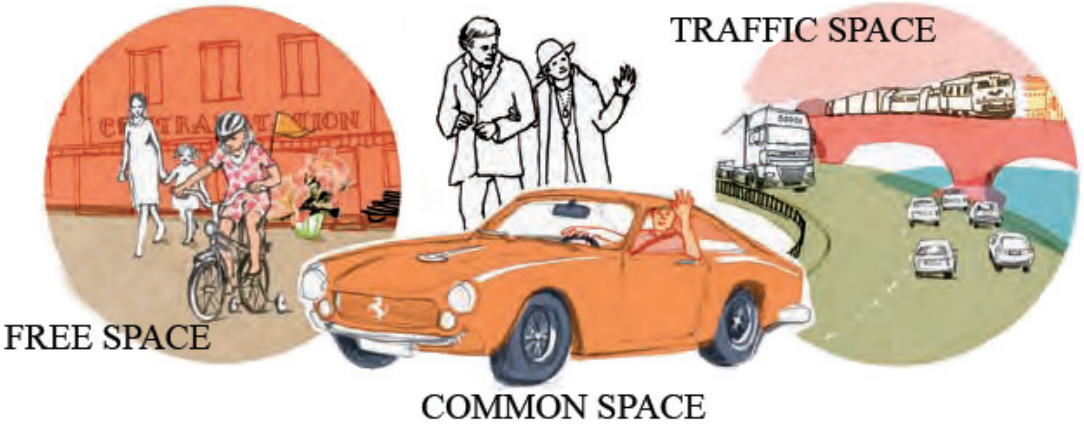


Figure 7. Illustration of the living-spaces free space, common space and traffic space. Illustration made by Caroline Andersson. Published with permission. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

Free Space
In the free space, both pedestrians and cyclists are able to stay without having to worry about motor vehicles. Examples on free spaces are playgrounds, squares and parks.

Integrated Free Space
An integrated free space is a place where the pedestrians and cyclists are prioritised. There is a limited possibility for motor vehicles to stay in the space and if they occur they have to keep a low speed level. In an integrated free space, there are often buildings with entrances facing the street, such as commercial streets.

Common Space
Most of the streets in the city are common space. Here it is an interaction between pedestrians, cyclists and motor vehicles. With respect to the function of the street, the motor vehicles' area are limited as much as possible so that pedestrians and cyclists can move easily in both longitudinal and transverse direction.

Integrated Traffic Space
In this space, pedestrians and cyclists can stay but they have low need to cross the street. The need to cross the street does not occur along the entire street, only at the intersections. The walls in the street space have small claims to the space and it is far between the entrances.

Traffic Space
In the traffic space, pedestrians and cyclists stay at a safe distance from the motor vehicles and they are vacantly in the street space. The environment in the traffic space does not give the road users any demand to cross the street.

2.2.2 Design Traffic Safety Situation

Various collision situations between road users may occur in the streets. It is mainly the speed levels of the involved motor vehicles that are crucial to the safety and the consequences of a collision. How big the risk is of being killed in a collision with a motor vehicle, that keeps a certain speed level, is shown in a crash force curve, see Figure 8.

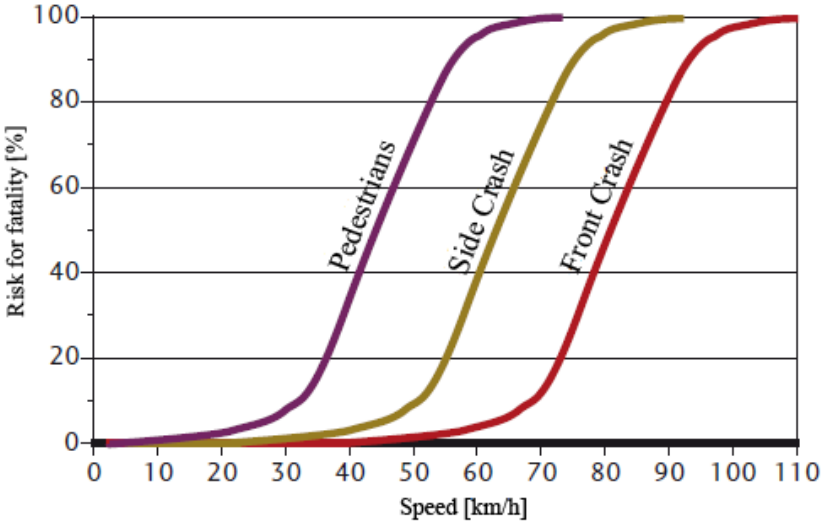


Figure 8. The risk of being killed in a collision with motor vehicles is showed in a crash force curve. Published with permission. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

The different collision situations have been assigned a crash speed which is the speed level at which 90 % of the hit survives according to the crash force curve. The situation with the lowest crash speed that may occur on the street becomes dimensioning, and is the design traffic safety situation DTSS. The different situations are:

- Pedestrians and cyclists on the roadway, or crossings for pedestrians and cyclists with a distance less than 50 meters.
- Intersections at a distance less than 150 meters.
- Rigid obstacles along the street.
- Oncoming motor vehicles.

(Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

2.2.3 The Excel-Program's Structure

In the method's Excel-program there are information that needs to be added for each studied street. The information that determines the final speed level is which living-space the street belongs to, the street's design traffic safety situation, which traffic network the street belongs to, what kind of public transport that use the street, the street air quality and noise levels along the street. The air quality and noise are limited in this report and therefore their impacts on the speed level are not described. If the information, that determines the final speed level, are different in different parts of the street, the street is divided into parts. This allows different parts of the street to have different speed levels.

The Excel-program evaluates five different urban planning qualities to find which speed level that is the most appropriate on the street. These five urban planning qualities are described in the beginning of Chapter 2.2. For each urban planning quality, there is a speed claim, either a maximum speed level or a minimum speed level, see Table 1. These speed levels are added in the program and the user cannot change the values.

The urban planning qualities character, traffic safety and security have a maximum speed claim, which means that they want as low speed as possible. The urban planning qualites accessibility for cars and public transports want as high speed level as possible and therefore they have a minimum speed claim.

In order to enable a consideration, each urban planning quality is graded in three levels, which describes how the speed level meets the current speed claim.

GOOD QUALITY: Green quality means that the speed claim is satisfied.

LESS GOOD QUALITY: Yellow quality means that the speed claim is partially satisfied. The quality level is acceptable if other essential qualities thereby obtain good quality.

LOW QUALITY: Red quality means that the speed claim is not met. Measures should be planned to eventually improve the quality.

(Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

Table 1. The table presents the urban planning qualities speed claim for good, less good and low quality. The abbreviations F, IF, C, IT and T denote free space, integrated free space, common space, integrated traffic space and traffic space. The unit for the speed levels are km/h. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

Character	**F**	**IF**	**C**	**IT**	**T**
Good	0	5	30	50	-
Less good		20	40	60	
Low		30	50	70	
Accessibility, Car-Traffic	**Local Network**	**Main Network**	**Superior Network**		
Good	30	50	60		
Less good	5	30	40		
Low	0	20	30		
Accessibility, Public Transport	**Town Bus**	**Trunk Bus**	**Region Bus**		
Good	30	40	60		
Less good	20	30	40		
Low	10	20	30		
Security	**F**	**IF**	**C**	**IT**	**T**
Good	-	10	30	50	-
Less good		20	40	60	
Low		30	50	70	
Traffic Safety	**Pedestrians and Cyclists Traffic**	**Car Crossing**	**Rigid Obstacles**	**Confront Cars**	
Good	30	50	60	70	
Less good	40	60	70	80	
Low	50	70	80	90	

It can be read from the table above that the street's living-space affects the character and the security. The accessibility is affected by which traffic network the street belongs to and which public transport that uses the street. The street's design traffic safety situation affects the traffic safety.

When all information are added, there will be an optimization for each street. The aim for the optimization is to find out which speed level that best satisfies a combination of the different qualities. The combination should minimize yellow and red qualities. During the process, there will be a compromise between the urban planning qualities' speed claim, resulting in a recommended speed level for each street. (Swedish Associations of Local Authorities and Regions, Road Administration, 2008)

The method includes all five urban planning qualities, but the municipalities can by themselves prioritize the different qualities according to their own goals. One example is that the municipality would like to priority the traffic safety. The goal can then be that the recommended speed level always will provide good quality, green quality, for traffic safety in the method. Another example is if a municipality wants to promote accessibility in some part of the city, the goal can then be that the accessibility always will have a good quality level in the method on these streets.

3 The Traffic and Public Transport Authority's Work with Speed Limits

The City of Gothenburg has since the 70th worked with securing speed levels on existing streets with traffic calming measures, such as speed-bumps. Their experience says that it is not enough with a traffic regulation and related prohibitory sign "Speed Limit" to get the required speed level. Instead it is the physical design of the roadway that has the most impact on the speed level.

The Vision Zero was adopted by the Swedish Parliament in 1997 and is a basis for the work with traffic safety in Sweden. The purpose of the vision is that no one should be killed or injured for life in the traffic. In context with the Vision Zero, it was said that the area and conflict points where unprotected road users and motor vehicles may come into a conflict, must be secured to 30 km/h. The reason to 30 km/h is because unprotected road users have 90 % chance of survival in a collision with a motor vehicle in this speed level, see Figure 6.

A consequence of the Vision Zero is 30/30 and 50/30 streets. This means the speed levels on the street part and the speed level in the conflict point. On 30/30 streets it would be safe for unprotected road users to cross the street anywhere and therefore the speed level on the street will not exceed 30 km/h. On 50/30 streets, only the conflict points need to be secured to the speed level 30 km/h.

30/30 streets are mostly located on the local traffic network and in residential areas. The Traffic and Public Transport Authority has been working to identify residential areas with 30/30 streets. To ensure a speed level of 30 km/h in these areas, they uses traffic calming measures combined with the turn away sign "Recommended Lower Speed 30 km/h", which is called recommended 30 km/h in this report. The method is described in the publication *Calm Streets!* from Swedish Association of Local Authorities and Regions in 2000.

The road sign "Speed Limit 30 km/h", see Figure 9, indicates a prohibition on a higher speed level than 30 km/h. In order to use a prohibition sign, a traffic regulation with an accusation is needed. The accusation is about which speed level that is allowed

Figure 9. To the left it is the road sign "Speed Limit 30 km/h" and to the right it is the road sign "Recommended Lower Speed 30 km/h". (Swedish Transport Agency, 2010)

and at which part of the street. The sign ”Recommended Lower Speed 30 km/h”, see Figure 9, indicates that there are traffic calming measures on the street and that a lower speed level than the permitted speed limit is appropriate. On streets with traffic calming measures, such as speed-bumps, this road sign is used. This road sign indicates no prohibition against a higher speed level, it only gives a recommendation. (Swedish Transport Agency, 2010)

50/30 streets are mainly located on the main traffic network. Traffic calming measures is used at conflict points on these streets. The main traffic network often overlap the emergency network and public transport network, which have a need of high accessibility and convenience. Therefore, it will always be discussions hold with the emergency service and the public transport service about the speed bumps' suitability.

If the Traffic and Public Transport Authority has decided to introduce a local traffic regulation at 30 km/h, it is because it would not be possible to construct traffic calming measures due to geotechnical reasons or due to emergency service and public transport. The Traffic and Public Transport Authority does want to have as short distance with traffic regulation as possible and thereby increase observance and respect from road users.

The Traffic and Public Transport Authority's method to secure the speed levels, by use traffic calming measures and low usage of traffic regulation at 30 km/h, is not very common among municipalities in Sweden. Usually, there is a change of the speed limit by local traffic regulation and a prohibitory sign.

The Traffic and Public Transport Authority believes that traffic calming measures are the best solution because they reduce the speed level. By being reductive with prohibitory sign and with speed limits, they get increased acceptance from road users. (Wallin, 2011)

4 Description of Representative Streets

Together with the reference group, a number of residential areas in Gothenburg with different characters was selected. To find different characters, the areas were selected with regard to type of development, geographic location, building year and structure of the street grid. From the residential areas, ten examples of streets were selected. Depending on the characters and the environments of the examples of streets, they were divided into main categories to produce representative streets. The main categories are Residential Streets, Streets with Apartment Blocks and City Centre Streets. These categories have in turn subcategories that represent the six representative streets.

The following chapters present general descriptions of the character and environment on the representative streets. The descriptions of the representative streets are based on the character of the examples of streets that belong to them. To show how the street space looks like, a standard design cross section is presented for each representative street. The ten examples of streets are presented as examples for the representative street they belong to. For the geographical location of all the examples of streets, see Appendix 1. All standard design cross sections are presented in Appendix 2, to make it easier to compare them with each other. The traffic flows on the representative streets are presented in the terms ”low” and ”high” traffic flow. Low traffic flow means that the flow is less than 100 vehicles/hour and high traffic flow means it is more than 100 vehicles/hour. The traffic flow on each example of street is presented in Appendix 3-12.

4.1 Residential Streets

The studied residential streets have entrances that are oriented towards the street and the people stay close to and in interaction with the street. On that account, these streets are classified as a common space in the method. The streets form cohesive neighborhoods, usually without through traffic. There is basically only the residents who travel on the streets and therefore the streets have a low traffic flow. The residential streets belong to the local traffic network and they do not belong to the public transport network nor the emergency network. The residential streets are divided into newer and older residential streets. The newer residential streets were built after 1990 and the older residential streets were built before then.

4.1.1 Newer Residential Streets

The roadway on the Newer Residential Streets are relatively narrow and the distance between the walls of the street space is small, see Figure 10. There are not many car parkings along the side of the street since the cars are assembled on shared parkings or on driveways to the houses. The streets form relatively small residential areas, constructed in an organic pattern. That they are constructed in an organic pattern means that there are almost no straight streets in the neighborhood. The speed limit is recommended 30 km/h and in some places along the street there are traffic calming measures in the shape of speed bumps, narrowing street and roundabouts.

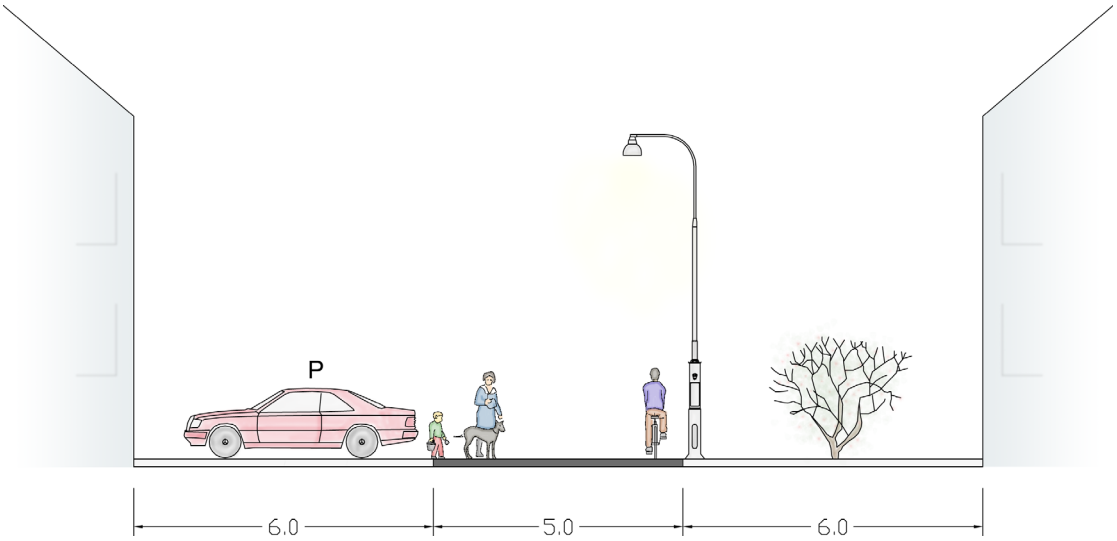


Figure 10. A standard design cross section for Newer Residential Streets. The distances are in meters.

Examples of Newer Residential Streets are Smöjträvägen in Gerrebacka, which is built in the 1990s, and Amhult Långelid in Amhult, which is built in the 2000s (Svensson, 2011). On Smöjträvägen the motor vehicles, pedestrians and cyclists interacts together on the roadway. On Amhult Långelid there are separate pedestrian and bicycle paths on both sides of the street.

4.1.2 Older Residential Streets

The Older Residential Streets that have been studied have different width of the street spaces, but in common is that there are cars parked along the streets which result in a narrower roadway, see Figure 11 and 12. The driveways to the houses are close and there is no separate pedestrian and bicycle path. For the Older Residential Streets, it can vary if it is one-way and if it is good visibility.

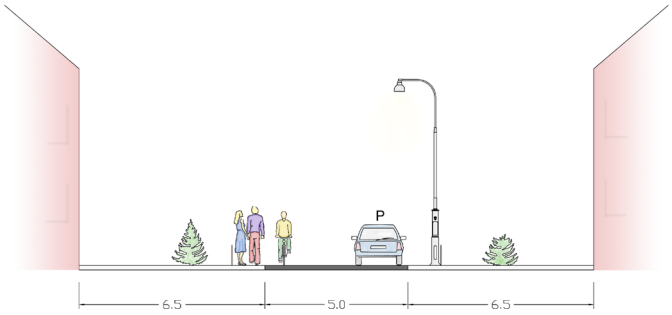


Figure 11. A standard design cross section for Older Residential Streets. The distances are in meters.

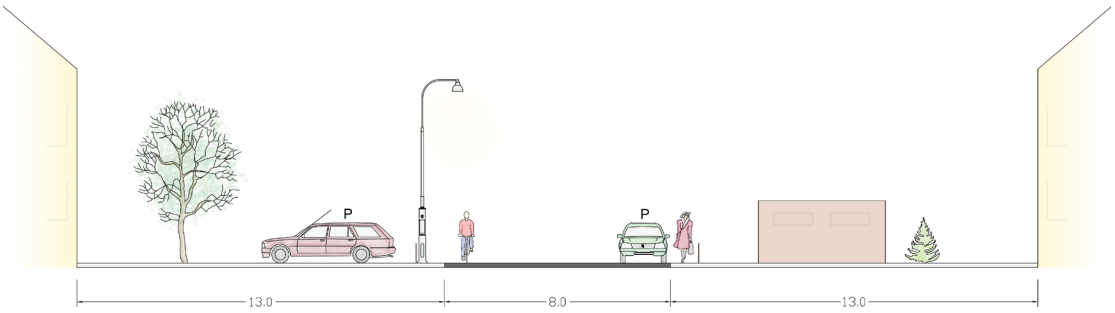


Figure 12. A standard design cross section for Older Residential Streets. The distances are in meters.

Two examples of the Older Residential Streets are Hedlundsgatan in Guldheden, which was built in the 1910s, and Förtroligheten in Skår, which was built in the 1940s (Svensson, 2011).

4.2 Streets with Apartment Blocks

The three examples of streets with apartment blocks that have been studied, are all built during the middle of the 1900s but have major differences in the appearance of the street space. Therefore, they have been divided according to the type of planning principle that the street is built for. This formed three representative streets.

4.2.1 Apartment Blocks on One Side

This representative street has high apartment blocks on one side of the street whose entrances are located towards the street. On the other side of the street, there are parking houses for the residents, see Figure 13. This causes a need to cross the street. For this reason, the street is classified as a common space in the method.

It is mostly the residents in the area that use the street, since it is not a transit route. Therefore, the traffic flow is low. The representative street has no separate pedestrian and bicycle path which result in that the pedestrians walk on the pavement and the cyclists use the roadway. The representative street is relatively straight and have good visibility. No public transport is using the street and it does not belong to the emergency network. The speed limit on this type of street is recommended 30 km/h.

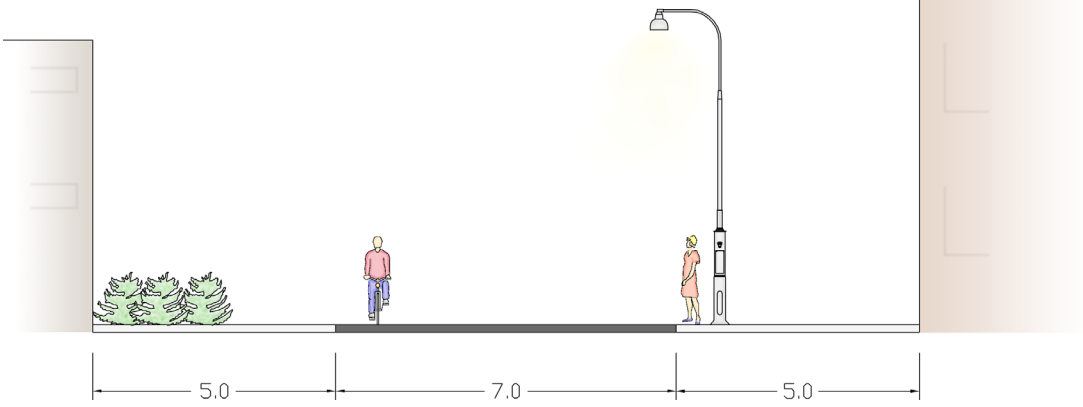


Figure 13. A standard design cross section for Apartment Blocks on One Side. The distances are in meters.

An example of this representative street is Syster Estrids gata in Guldheden, which is built in the 1950s (Svensson, 2011).

4.2.2 Wide Street Space with Narrow Roadway

Along this representative street there are low apartment blocks on both sides and in the ground floors, in some of the buildings, there are commerce and trades, see Figure 14. The entrances to the buildings are close together and they turn onto the street. That is why the street is classified as a common space in the method. The street grid is built in a grid pattern and therefor the streets are long and straight in plane. There are no driveways from the street but there are intersecting streets. The speed limit is recommended 30 km/h since there are traffic calming measures in the form of speed bumps.

It is wide between the walls of the street space but the roadway is relatively narrow. The roadway becomes even more narrow because of the parked cars along both sides of the street. This result in that the cars in both directions use the lane that arises in the middle of the street and must therefore take into account if they will encounter a vehicle or not. The street is used mostly by residents living in the area and because of that, the traffic flow is low. The street does not belong neither to the public transport network nor the emergency network. It has no separated pedestrian and bicycle path.

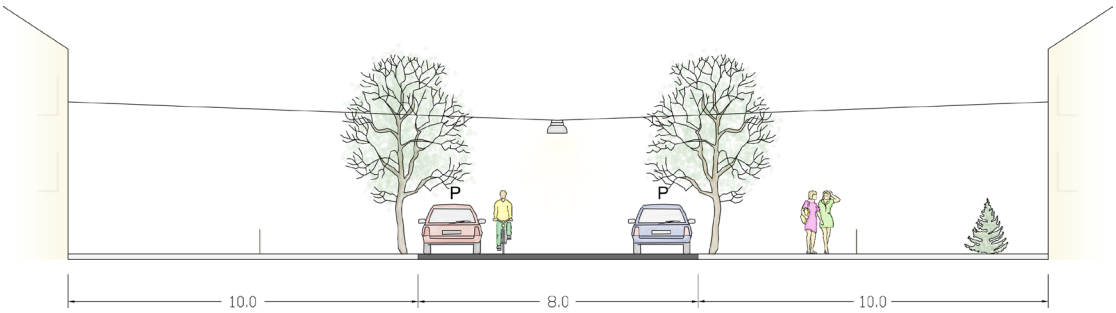


Figure 14. A standard design cross section for Wide Street Space with Narrow Roadway. The distances are in meters.

An example of this street is Stobéegatan in Kålltorp from the 1920s (Svensson, 2011).

4.2.3 Million Programme Streets

The streets in the Million Programme areas often extend around the neighborhood because of the prevailing ideal of urban planning that wanted to separate cars from pedestrians and cyclists. The buildings and their entrances are located far from the street, see Figure 15, and there is hardly any claim to cross the street. This leads to a classification as an integrated traffic space for the street in the method. The street has a high traffic flow.

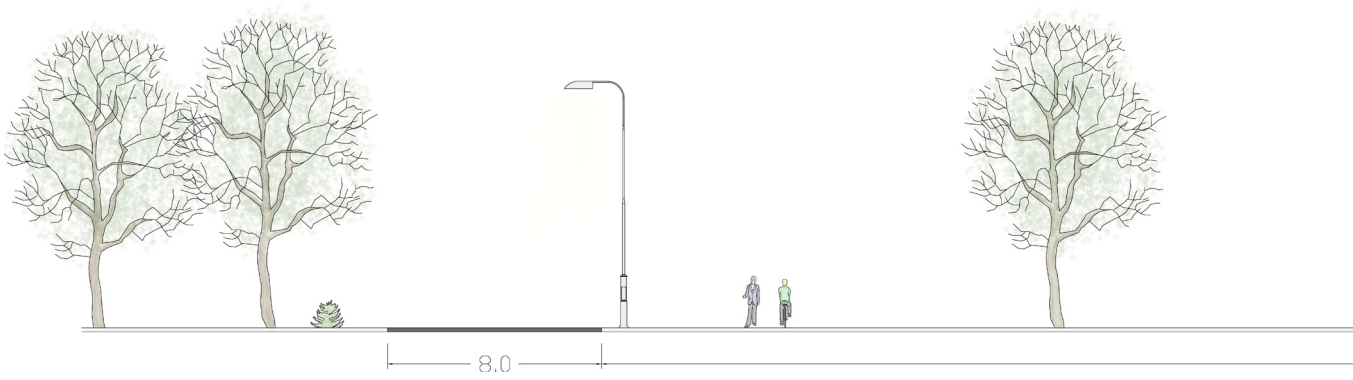
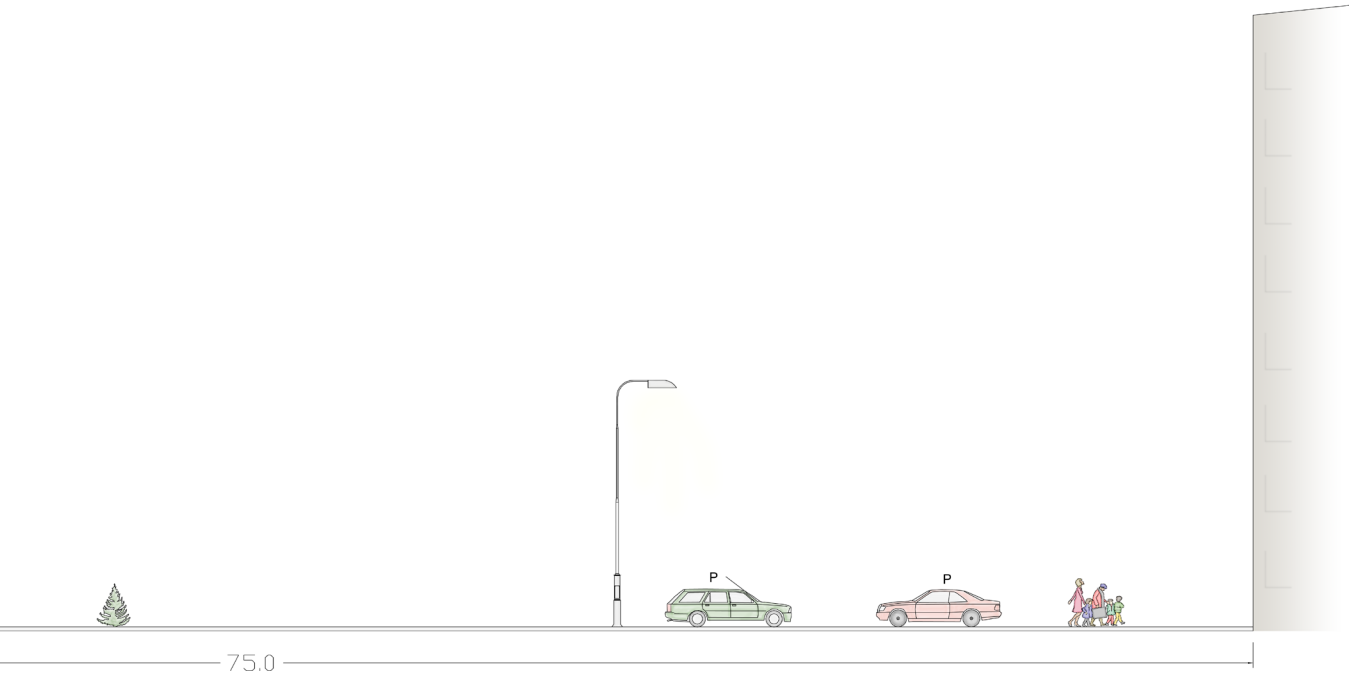


Figure 15. A standard design cross section for Million Programme Streets. The distances are in meters.

From the street there are periodic entrances to parking lots that are located between the street and the residential area. The residential area consists of high apartment blocks. The other side of the street consists of forest area. Along the street there is a separate pedestrian and bicycle path. The street is used by public transport and it belongs to the emergency network. The street belongs to the main traffic network and the speed limit is 50 km/h.



An example of this representative street is Rannebergsvägen in Rannebergen, which was built in the 1960s (Svensson, 2011).

4.3 City Centre Streets

The examples of streets that are located in the most central parts of Gothenburg have high apartment blocks on both sides of the street, see Figure 16. The ground floor in the buildings often holds commerce and trades. The entrances to the buildings turn onto the street and therefor the street is classified as a common space in the method.

The street space is wide and along the sides there are often separate pedestrian and bicycle paths. The visibility on the street is good since the street is relatively long and straight in plane. The speed limit is 50 km/h.

Many of them who use the street do not live in the area since the street is a transit route. Therefore, the street has a high traffic flow. The street belongs to the main traffic network and is a part of the public transport network. Usually the street belongs to the emergency network.

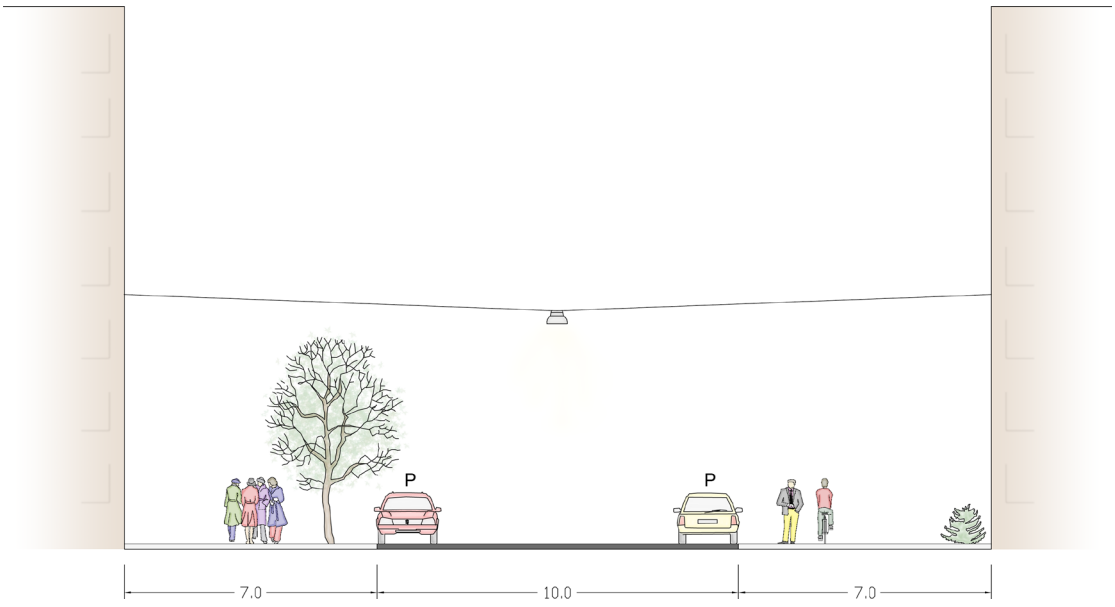


Figure 16. A standard design cross section for City Centre Streets. The distances are in meters.

Examples of streets that belong to this representative street are Berzeliigatan in Lorensberg, which was built in the 1900s, Vegagatan in Linnéstaden, which was built in the 1960s, and Eklandagatan in Johanneberg, which was built in the 1940s (Svensson, 2011).

5 Results

To get knowledge about which speed level that is used on the representative streets, a measurement of the speed level was performed. A recommended speed level was given for each example of street from the Excel-program.

5.1 Measured Speed Levels

This report does not study the exact speed level for each example of street, but it will give an idea about the representative streets' speed levels. This leads to that it is acceptable with a small number of measurements. However, a higher number of measurements give a more representative result. Therefore, 50 measurements have been tried to obtain for each street. Streets with low traffic flow, less than 100 vehicles/hour, have a less number of measured speed levels. The measured speed levels are then evaluated to see if a larger number of measurements are needed.

To evaluate if the numbers of measured values are enough for each street, the measured values' spread are checked. The spread is studied with the method of standard deviation, to know how much the values differ from the mean value. If the values are widely spread, more measured values are needed.

The confidence interval for the measured values can be calculated by using the standard deviation. Confidence interval indicates, for example with 95 % accuracy, within which interval the speed level is, see Equation 1. For every street, a 95 % confidence interval has been calculated and became as highest ± 2 km/h, see Appendix 3 – 12, which is accepted in this study. It is most common in similar studies that 95 % confidence intervals are applied and therefore it is used in this report. (Karlgren, 2001)

$$1{,}96 * \sqrt{\frac{S^2}{n}} = \mathrm{X}$$

Equation 1. Equation for confidence interval. S is the standard deviation, n is the number of measurements and X is the maximum error with 95 % accuracy. (Karlgren, 2001)

For each street the measured value is presented in 85th percentile and 95th percentile, see Table 2 on the next page. For other results, such as mean value, median, standard deviation and 95 % confidence interval, see Appendix 3 – 12. The speed levels are rounded to the nearest whole number because they are received as whole number from the laser camera.

Table 2. The measured speed levels on the example of streets.

Name	*Measured Speed Level 85th percentile*	*Measured Speed Level 95th percentile*
Amhults Långelid	27 km/h	30 km/h
Berzeliigatan	47 km/h	53 km/h
Eklandagatan	49 km/h	53 km/h
Förtroligheten	42 km/h	44 km/h
Hedlundsgatan	21 km/h	25 km/h
Rannebergsvägen	60 km/h	64 km/h
Smöjträvägen	25 km/h	25 km/h
Stobéegatan	36 km/h	41 km/h
Syster Estrids gata	46 km/h	55 km/h
Vegagatan	47 km/h	53 km/h

5.2 Recommended Speed Levels from the Right Speed in the City

The Excel-program has been used to produce recommended speed levels for the examples of streets. Table 3 below presents information about the examples of streets together with the recommended speed levels from the Excel-program.

Table 3. Information about each example of street together with the recommended speed level.

Name	*Living-Space*	*DTSS*	*Traffic Network*	*Public Transport*	*Emergency Service*	*Rec. Speed*
Amhults Långelid	C	PC-traffic	Lokal network			30 km/h
Berzeliig.	C	Car-crossing	Main network	Region bus		40 km/h
Eklandag.	C	Car-crossing	Main network	Town bus	Yes	30 km/h
Förtrolig-heten	C	PC-traffic	Main network			30 km/h
Hedlundsg	C	PC-traffic	Main network			30 km/h
Ranne-bergsv.	IT	Car-crossing	Main network	Town bus	Yes	50 km/h
Smöjträv.	C	PC-traffic	Lokal network			30 km/h
Stobéeg.	C	PC-traffic	Lokal network			30 km/h
Syster Estrids g.	C	PC-traffic	Lokal network			30 km/h
Vegag.	C	PC-traffic	Main network	Town bus	Yes	30 km/h

To see which inputs that were used in the Excel-program, see Appendix 13.

The majority of the streets get a recommended speed level of 30 km/h. The recommended speed levels are mainly based on that the streets belong to the living-space common space. Two of the streets get 40 km/h and 50 km/h, these streets are Berzeliigatan and Rannebergsvägen. Berzeliigatan gets a higher recommended speed level because the region bus 100 travels there. Rannebergsvägen is classefied as an integrated transport space and has a separate pedestrians and bicycle path, which results in higher speed claims.

The recommended speed levels from the Excel-program and how well the urban planning qualities' speed claims are meet, is presented in Table 4.

Table 4. The recommended speed levels and how well the urban planning qualities' speed claims are meet.

Name	*Rec. Speed*	*Accessibility*		*Character*	*Security*	*Traffic Safety*
		Car Traffic	*Public Transport*			
Amhults Långelid	30 km/h	Good	-	Good	Good	Good
Berzeliig.	40 km/h	Less good	Less good	Less good	Less good	Good
Eklandag.	30 km/h	Less good	God	Good	Good	Good
Förtrolig-heten	30 km/h	Good	-	Good	Good	Good
Hedlundsg	30 km/h	Good	-	Good	Good	Good
Ranne-bergsv.	50 km/h	Good	Good	Good	Good	Good
Smöjträv.	30 km/h	Good	-	Good	Good	Good
Stobéeg.	30 km/h	Good	-	Good	Good	Good
Syster Estrids g.	30 km/h	Good	-	Good	Good	Good
Vegag.	30 km/h	Less good	Good	Good	Good	Good

For the results from the Excel-program, see Appendix 14.

6 The Representative Streets' Speed Level

A number of examples of streets in Gothenburg represent each representative street. The result from the ten example of streets are used to get a general image of which speed level the *Right Speed in the City* recommends and which speed level that is measured, for each representative street. Table 5 presents the measured speed levels and the recommended speed levels for the examples of streets, at the representative street they belong to.

Table 5. Representative streets with measured and recommended speed levels.

Representative Streets	**Measured Speed Levels, 85th percentile [km/h]**	**Recommended Speed Levels from the *Right Speed in the City* [km/h]**
Newer Residential Streets	25, 27	30, 30
Older Residential Streets	21, 42	30, 30
Apartment Blocks on One Side	46	30
Wide Street Space with Narrow Roadway	36	30
Million Programme Streets	60	50
City Centre Streets	47, 47, 49	30, 30, 40

The two studied streets that belong to the representative street Newer Residential Streets get relatively equal measured speed levels; 25 km/h and 27 km/h. Both streets got the same recommended speed level from the *Right Speed in the City*; 30 km/h.

For the representative street Older Residential Streets, two streets have been studied. The measured speed levels for the streets differ from each other. One street has a measured speed level of 21 km/h and one of 42 km/h. For both streets, the recommended speed level became 30 km/h in the *Right Speed in the City*.

For the representative streets that belong to the main category Streets with Apartment Blocks, only one street has been studied for each representative street. The street that belongs to the representative street Apartment Blocks on One Side had a measured speed level of 46 km/h. The recommended speed level from the *Right Speed in the City* was 30 km/h. For the representative street Wide Street Space with Narrow Roadway, a speed level of 36 km/h was measured. The recommended speed level from the *Right Speed in the City* was 30 km/h. The representative street Million Programme Streets had a measured speed level of 60 km/h and a recommended speed level from the *Right*

Speed in the City of 50 km/h. This street gets a speed level of 50 km/h because the street is classified as an integrated traffic space and it has a separate pedestrian and bicycle path.

The representative street City Centre Streets has three examples of streets. The measured speed levels for the three streets differs relatively little; two streets with 47 km/h and one with 49 km/h. The recommended speed levels from the *Right Speed in the City* differ more. Two of the streets received a speed level of 30 km/h and one of the streets received 40 km/h. The reason that the street received a speed level of 40 km/h, is that a region bus uses the street.

7 Accidents on the Representative Streets

In STRADA, accident statistics from 2000 to 2008 have been studied for the different examples of streets. The accident statistics have been studied to get an idea if there are more accidents on a particular representative street and where on the street the accidents occur. STRADA is a database with traffic accidents reported from police and health care. The kind of accidents that are presented for the examples of streets in this chapter are between motor vehicles – motor vehicles and motor vehicles – pedestrians. For explanations of the symbols in the maps, see the legend at the bottom of the page.

Newer Residential Streets
For the representative street Newer Residential Streets, there are no accidents on the studied examples of streets. This may be related to that the speed level is low for this kind of street.

Older Residential Streets
For the representative street Older Residential Streets there are no accidents on the studied examples of streets. As for Newer Residential Streets, this may be related to that the speed level is relatively low on these streets.

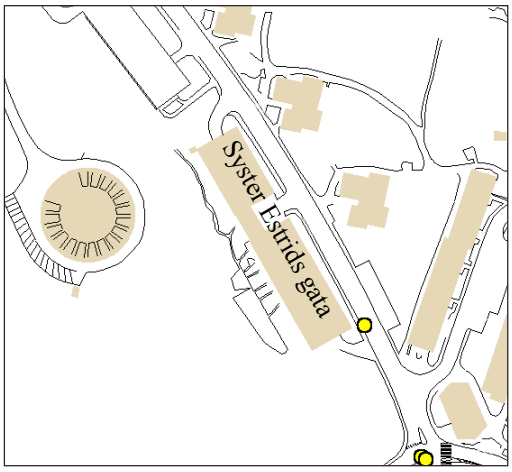


Figure 17. Map over Syster Estrids gata with information about accidents from STRADA.

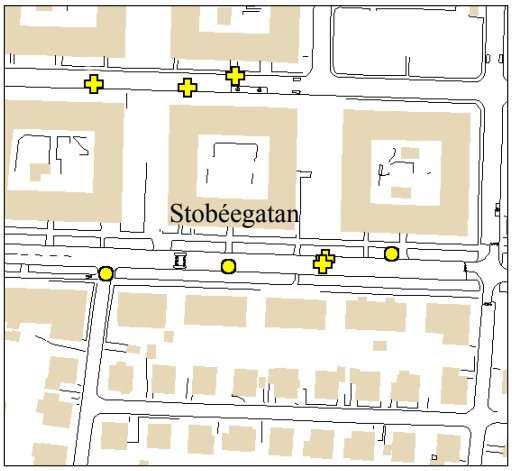


Figure 18. Map over Stobéegatan with information about accidents from STRADA.

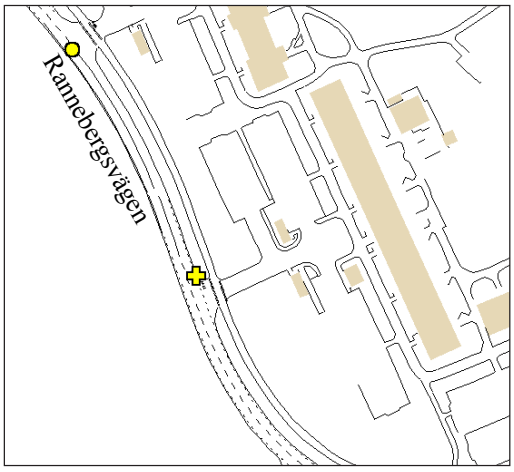


Figure 19. Map over Rannebergsvägen with information about accidents from STRADA.

- Moderate accident, police report
- Moderate accident
- Severe accident, police report
- Severe accident
- Fatal accident, police report

Apartment Blocks on One Side

For the representative street Apartment Blocks on One Side, it is a few moderate accidents.

Wide Street Space with Narrow Roadway

The example of street Stobéegatan, that belongs to the representative street Wide Street Space with Narrow Roadway, has a number of moderate accidents along the studied street.

Million Programme Streets

On the example of street Rannebergsvägen, for the representative street Million Programme Streets, it is few and moderate accidents which have occurred at the exits to the street. This representative street has the highest speed level but not most accidents. In this case, it is likely due to the pedestrian and bicycle path is located at a safe distance from the roadway and that there is no need to cross the roadway. It contributes to that the number of accidents between motor vehicles and pedestrians are low.

For more details about where the accidents have occurred on the examples of streets, see Figure 17 – 19.

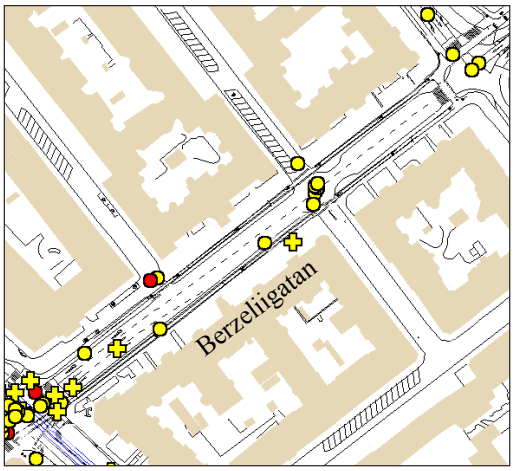


Figure 20. Map over Berzeliigatan with information about accidents from STRADA.

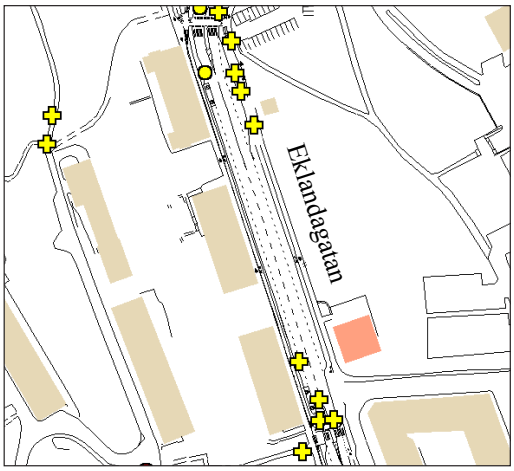


Figure 21. Map over Eklandagatan with information about accidents from STRADA.

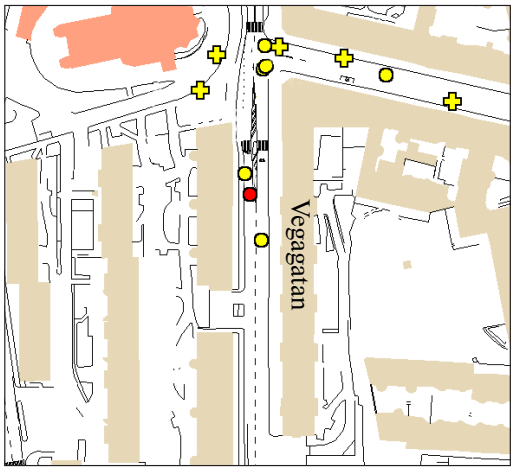


Figure 22. Map over Vegagatan with information about accidents from STRADA.

- Moderate accident, police report
- Moderate accident
- Severe accident, police report
- Severe accident
- Fatal accident, police report

City Centre Streets

The representative street that has most accidents is the City Centre Streets. The injury rate varies from severe to moderate. Furthermore, it varies if it is accidents between two vehicles or if it is between vehicles and pedestrians. A lot of accidents do not occur on the roadway, instead they occur on the pedestrian and bicycle path. For more details about the accidents, see Figure 20 – 22.

On this type of street it is a large amount of vehicles and pedestrians. There are also often commerce and trades on the side of the roadway that attract pedestrians to cross the street. The accidents on the roadway are not widely spread along the street and they occur mainly at intersections or crosswalks. This depends on the high traffic flow, which results in that the pedestrians only want to cross the roadway at crosswalks.

8 Discussion

8.1 Sources of Error in the Measurement

While measuring the speed levels on the ten examples of streets, there were circumstances that may have affected the results. These factors may have contributed to that the measured speed levels have been slightly higher or lower than the actual speed levels.

The measurement was made only during a part of the day and therefore represent not the measured values both the day and night. For the measurement that were made during the morning, the speed levels could have been influenced by the fact that many motorist are on the way to work and therefore increases the speed level due to factors such as stress and time pressure. During the day, the amount of commercial transports increases. They may have a tight schedule, which also might lead to a higher speed level.

To get as accurate results as possible, the measurement should be made directly towards the measured vehicle's direction of travel. On some streets, it was difficult to achieve this since an angle between the laser beam and the vehicle's direction of travel sometimes was formed. This may have contributed to that the measured speed levels was lower than the actual speed levels. However, there were no significant angles between the laser beams and the vehicles direction of travel during the measurements and therefore the possible error became relatively small. For more information, see Chapter 2.1.

On the examples of streets with high traffic flow, the distances between the vehicles were sometimes small and it may have resulted in that the vehicle behind was affected by the vehicle in front. If the vehicle in front for any reason drove slowly, the vehicle behind was forced to slow down. This may have affected the measuring result with a lower speed level.

The sources of error that have been identified and presented above are considered to have a small influence on the measuring result. Since the aim of the measurement was to give an idea of what speed levels that occur on the examples of streets, the sources of error are accepted in this report.

To get a more accurate idea of what speed levels that are most commonly occurring on each representative street, a greater number of examples of streets are required for each representative street. Since the number of examples of streets, that have been studied for each representative street, varies from one to three streets, a mean value of the examples of streets' 85th percentiles were not presented. Instead all the examples of streets' 85th percentiles were presented. This due to avoid creating an appearance of that the mean value was based on more values than it actually did. Therefore, the speed level for each representative street in this report only gives an indication of what speed levels that are the most common on the representative street.

8.2 The Street Space's Impact on the Speed Level

For the representative street Older Residential Streets there is a big difference between the two speed levels that were measured on the two examples of streets. One speed level is 25 km/h and the other one is 42 km/h. Both examples of streets have the same walls and belong to the same living-space in the *Right Speed of the City*. The difference between them, that affects the speed level, is the width of the street space and the visibility. The example of street that have the widest roadway and the best visibility, also have the highest speed level.

Between the other representative streets with more than one example of street, that is to say the Newer Residential Streets and City Centre Streets, the speed levels are more similar. There are a lot more similarities between the street spaces for the examples of streets and therefore it is suited well to combine these examples of streets to representative streets.

For the representative street Newer Residential Streets, the speed level is low according to our measurements. This is because the street space invites to a low speed level since the roadway is narrow and the visibility is not good.

For the representative street City Centre Streets, which mainly serves as transport routes, the speed level is high, the roadway is wide and the street has good visibility in comparison with the representative streets that belong to the main category Residential Streets. The City Centre Streets are the representative street with the greatest amount of road users; both motorists, pedestrians and cyclists. In the *Right Speed in the City,* the street is classified as a common space since both sides of the street contain buildings with trade and commerce. The large number of commerce results in a high claim for pedestrians to cross the street. However, the high volume of motorists result in that the pedestrians choose to cross the street where there is a crosswalk. Therefore, the floor in the street space is not classified as a common space, it is more likely classified as an integrated traffic space. This contributes to a higher speed level.

The representative street, which has the maximum speed level, is the Million Programme Streets. In this representative street, the walls of the street space are far away, the roadway is wide and the visibility is good. There is a separate pedestrian and bicycle path and the claim from pedestrians to cross the street is low. Because of these factors, the speed level is high.

If the visibility and the width of the roadway on the streets are compared with the speed level, it is possible to see a connection. The representative streets which have a wider roadway and a better visibility, also have a higher speed level. The width and visibility in the street space are factors that do not indirectly affect the recommended speed level in the *Right Speed in the City*.

As mentioned earlier in the report, the recommended speed level is affected by which living-space the walls in the street space belong to, not by which living-space the floor in the space belongs to. One example of this is a street where the floor belongs to integrated traffic space because of its wide roadway, good visibility and without any claim from pedestrians to cross the street, and the walls belong to common space. Here

it is the common space that affects the recommended speed level. In the Excel-program that belongs to the method, the user marks that the floor belongs to an integrated traffic space. It is done to be able to see that the floor and the walls do not belong to the same living-space.

When the floor's living-space is not the same as the wall's living-space, see Figure 23, it can be assumed that there will be a lower acceptance for the recommended speed level. Therefore, the mark that is made in the Excel-program shows that the street space may need a measure to provide a higher acceptance for the recommended speed level. The street owners decide themselves whether there is a need for a measure and if so; what measures that are required.

Figure 23. Swap of floor between same walls in a street space. Illustration made by PeGe Hillinge. Published with permission. (Swedish Association of Local Authorities and Regions, Road Administration, 2008)

8.3 Presumed Observance of the Recommended Speed Levels

This chapter will discuss the presumed observances of the recommended speed levels from the method. The observance is based on that the measured speed levels remain unchanged and that the streets' design does not change. The observance is therefore a comparison between the measured speed level and the recommended speed level from the method. If the two speed levels are the same, it is assumed that the observance is high. If the speed levels are different, the observance is assumed to be low. Then it may be necessary to add measures that affect the speed level, to acquire a high observance.

The speed level that the Traffic and Public Transport Authority has secured is 30 km/h and the speed level is based on the crash force curve. As mentioned earlier, the *Right Speed in the City* is also based on the crash force curve to some extend. The method contains five urban planning qualities and of these it is the quality traffic safety that is based on the crash force curve. Therefore, both the Traffic and Public Transport Authority's work and the method are based on the crash force curve. Theoretically, it is likely that the actual speed levels are the same as the recommended speed levels, in residential areas where the Traffic and Public Transport Authority has secured the speed levels.

The two representative streets the Newer Residential Streets and the Older Residential Streets, have measured speed levels which corresponds well with the recommended speed levels from the method. Therefore, it is assumed that the presumed observance will be high.

The representative street Apartment Blocks on One Side has a measured speed level that is higher than the recommended. Therefore, the presumed observance will be low, since the street space invites to a higher speed level than the recommended speed level of 30 km/h.

The representative street Wide Street Space with Narrow Roadway has a measured speed level that comport with the recommended speed level from the method. Here the presumed observance is high.

For the representative street Million Programme Streets, the speed level is recommended to be 50 km/h but the measured speed level is 60 km/h. The presumed observance is therefore low.

The representative street City Centre Streets has measured speed levels that are higher than the recommended speed levels of 30 km/h and 40 km/h. This means that the presumed observance of the recommended speed levels from the method will be low.

The presumed observance differs for the examples of streets. Why this is so mainly depends on one of the following reasons:

- The Traffic and Public Transport Authority has not secured the speed level on the street.
- The speed level that has been secured differs from the method's recommended speed level.
- The method is not suitable for this kind of street and does not give a suitable speed level.

The last reason, the method's suitable for the street, are discussed further in Chapter 8.5.

8.4 Conflicts of Interest

The street spaces' appearances have a major impact on the speed levels, as discussed in Chapter 8.2. Therefore, it is assumed that measures in the street space is required to secure the desired speed level on a street with either too high or too low speed level.

In the method, the speed claims from different street users are weighed together. The method mentions that measures should be taken to achieve a modification in the speed level on a street. The method does not describe what kind of measures that are needed to achieve the recommended speed level since it differs for each street. The introduction of these measures can arise potential conflicts of interest. These conflicts arise because the street users have different claims on speed level and availability.

If the recommended speed levels from the method will be introduced on the representative streets, it is assumed that the presumed observance will be the same as discussed in Chapter 8.3. The following discussion is based on that the speed levels on the representative streets are secured to the recommended speed levels that are received from the method.

On the representative streets Newer Residential Streets, Older Residential Streets and Wide Street Space with Narrow Roadway, it generally not occur any conflicts of interest. This is due to the high presumed observance of the recommended speed levels and therefore no further measures will be needed on the streets.

The representative street Apartment Blocks on One Side needs measures in the street space to decrease the speed level. The representative street belongs to neither the public transport network nor the emergency network. Therefore, it does not occur any conflicts of interest with the public transport and the emergency traffic.

For the representative street Million Programme Streets, the presumed observance of the recommended speed level is low. Therefore, measures in the street space that decrease the speed level are required. This can lead to conflicts of interest since the representative street belongs to the public transport network, the emergency network and the main traffic network.

The emergency traffic wants to keep their defined travel times to the emergency sites. Therefore, they have a claim of high availability and they do not want to lose time due to, for example, too many speed bumps. The emergency traffic uses, as much as possible, their emergency network which largely overlaps the main traffic network. Therefore, they have a greater claim of availability on the streets which belong to the emergency network compared to the streets that do not belong to the network. On the streets that not belong to the network, more measures that affect their availability therefore are accepted. The Traffic and Public Transport Authority keeps a regular discussion with the emergency traffic to be agreed on appropriate measures on the entire traffic network.

The public transport strives to keep their schedules and to offer their travelers a good comfort during their trip. Therefore, they have a claim of availability on the streets that they travel on. As with the emergency services, they do not want to lose time due to too many traffic calming measures that affect both their mobility and comfort. In order to know if the measures affect the schedule, it requires that the entire route's travel time is studied and not only the specific street. There are traffic calming measures that decrease the speed level for cars while they increase the availability for public transport. An example of this is the hourglass bus stop, where the cars are forced to wait behind the bus at the stop, see Figure 24 on the next page. The bus is thus prioritized and does not need to wait for a gap in the traffic to go along. The hourglass bus stop's function is not fullfilled if the behind buses' availability is affected by traffic jams, which are formed due to the traffic flow temporarily stops after the stand-stilling bus.

Figure 24. Hourglass bus stop on Stockholmsgatan in Gothenburg. (Google Maps, 2011)

The motorists' claim of availability is mainly affected by which network they drive on. If they use the main traffic network, a conflict of interest develops when the availability decreases and affect the travel time. Travels on the main traffic network often have a longer total distance than travels on the local traffic network. Because of this, it is not the individual street's design that is most interesting, instead it is the entire distance's design that matters, just as for the public transport. The motorists' claim of availability is lower on the local traffic network compared to the claim on the main traffic network. A larger number of measures that affects the availability are therefore accepted on the local traffic network.

On the representative street City Centre Streets, the same conflicts of interest as for the representative street Million Programme Streets occur. This is because the observance is low and there is need for measures that decrease the speed level. One thing that differs from the representative street Million Programme Streets is the amount of pedestrians in the street space. On the City Centre Streets, the amount of pedestrians is much higher than on the Million Programme Streets. No conflicts of interest between pedestrians and measures occur since the pedestrians are not affected negatively by measures in the roadway. For example, a raised crosswalk could decrease the availability for the motorists and instead increase the availability for the pedestrians in the street space.

On all representative streets there may occur conflicts of interest, between the residents along the street and some motorists' behavior, because of certain types of measures. This depends primarily on measures that increase motorists' deceleration and acceleration before and after the measure, for example before and after a speed bump. This can lead to increased noise for the residents along the street and because of that create a conflict of interest.

8.5 The Right Speed in the City's Suitability for the Examples of Streets

Based on the presumed observance and potential conflicts of interest on the studied examples of streets, it can bring a discussion about the method's suitability for each example of street. The suitability that is discussed is the *Right Speed in the City's* suitability for Gothenburg. The results from the *Right Speed in the City*, the recommended speed levels' suitability, are not discussed.

On the examples of streets that belong to the main category Residential Streets, no conflicts of interest will appear and the presumed observance of the method's recommended speed levels will be high. The method is therefore considered to be suitable for these four examples of streets.

The example Syster Estrids gata, which belongs to the representative street Apartment Blocks on One Side, will have a low presumed observance of the recommended speed level. No conflict of interest will appear due to possible measures. The method is therefore considered to be suitable for this street.

Stobéegatan, which is an example of street for the representative street Wide Street Space with Narrow Roadway, will have a good presumed observance and there is no conflict of interest on the street. The method is therefore considered to be suitable for this example of street.

The example Rannebergsvägen will have a somewhat low presumed observance of the recommended speed level from the method. In order to increase the observance, traffic calming measures can be introduced. If there are many traffic calming measures, it could lead to a possible conflict of interest because the street belongs to public transport network, emergency network and main traffic network. The method is therefore considered as less suitable for Rannebergsvägen.

The examples Berzeliigatan, Eklandagatan and Vegagatan, belong to the representative street City Centre Street and are all assumed to have a somewhat low observance of the recommended speed levels from the method. To increase the presumed observances, measures are needed on the streets, which could possible lead to conflicts of interest because the streets belong to public transport network, emergency network and main network. Vegagatan has no separat pedestrian and bicycle path that could possibly raise the recommended speed level, which would lead to better presumed observance and reduce conflicts of interest. However, the recommended speed level is not increased due to a separate pedestrian and bicycle path, since Vegagatan belongs to the living-space common space. The method is considered less suitable for all three examples of streets that belong to the representative street City Centre Streets.

8.6 The Right Speed in the City's Suitability for Residential Areas in Gothenburg

On the representative streets Newer Residential Streets, Older Residential Streets, Apartment Blocks on One Side and Wide Street Space with Narrow Roadway, no conflicts of interest will appear in connection with the introduction of the recommended speed levels from the method. On these representative streets, the method are suitable to use. On the representative streets Million Programme Streets and City Centre Streets, the method is less suitable because it may occur conflicts of interest in connection with a change of the speed level. These streets need more work to get a suitable speed level and a suitable design of the street space. However, the method gives in a simple way a clear indication of which speed levels that are suitable.

For certain types of streets with conflicts of interest, a solution is able to find to ensure the speed level, for other types of streets it could be more difficult. The kind of measures that is required to solve the conflicts of interest is individual for each street. It is therefore impossible to say how these measures might look like for a specific representative street and if it is possible to resolve the conflicts of interest to make sure that all road users' claims are satisfied.

On the representative streets that belong to the main category Residential Street, the method is suitable to use. The examples of streets' appearance differs relatively little compared with each other. Therefore, it is assumed that the method is suitable also for other residential areas in Gothenburg in the main category Residential Streets.

The streets' appearances in the main category Streets with Apartment Blocks differ more between the representative streets. For all three representative streets, it is only one example of street that the representative streets' information is based on. Therefore, it is uncertain how well the three representative streets represent the whole Gothenburg. It is therefore also uncertain how suitable the method is for residential areas belonging to these representative streets.

The City Centre Streets is based on three examples of streets, which is presumed to be sufficient to create a representative street. Since the method is not suitable for these three examples of streets, the method is assumed to be less suitable for similar residential areas in Gothenburg. The representative street is a street that appears in larger cities because of the many transport routes, compared to smaller cities. In Gothenburg, there is many transport routes through residential areas in the central parts that apply to the City Centre Streets. Therefore, this representative street is probably common in Gothenburg.

The method does not account for the size of the traffic flow and the number of pedestrians. The traffic flow affects the road users' movement in the street space. However, streets that belong to the same living-space differ significantly depending on the amount of road users in the room. In a common space with an extremely low number of pedestrians, a low speed level could be difficult to justify. This is because the motor vehicles' acceptance to a low speed level will be lower when they mostly are alone in the street space. In a common space with extremely high traffic flow, it is difficult for pedestrians to move around in the street space. This leads to that the

motor vehicles “own” most of the space and that the street’s living-space changes to integrated transport space, according to Figure 6 in Chapter 2.2.1. This scenario applies to residential areas belonging to the City Centre Streets and this is one factor that makes it harder to apply the method on these types of streets.

On the City Centre Streets, the street space’s wall and floor belongs to different living-spaces. On these types of streets, there are a large number of pedestrians and therefore the traffic safety should be prioritised, but since the traffic flow is high, no pedestrians are on the roadway. By studying the accidents on these types of streets, it clearly shows that the accidents occur mainly at pedestrian crossings. Therefore, the street is not an obvious common space.

It varies between different residential areas how the pedestrians move in the street space. In residential areas with small houses in the outskirt of the city, many pedestrians use the roadway. Children play on the roadway and it is easy to cross the street. In the centre parts of Gothenburg, with areas of apartment blocks, the pedestrians’ behaviour are different. It is harder to cross the street, depending on the number of vehicles, and crossings are only made on specific places. Both the residential areas are classed as common space in the method but it is not appropriate to recommend same speed level and measures for the both representative streets. Streets that belong to the same living-space can vary substantially due to that there are only five different kinds of living-spaces in the method. Even though all representative streets belong to the living-space common space, except for the Million Programme Streets, the representative streets’ character varies substantially.

9 Conclusion

In the previous discussion, it concludes that the method is suitable for residential streets while the suitability for streets in areas with apartment blocks are unsure. In residential areas with apartment blocks, the streets' appearance varies more then in residential areas. This contributes to difficulties to find suitable representative streets in areas with apartment blocks, compared to residential streets.

In this report, only a few example of streets have been studied for each representative street. Therefore, it is hard to say how common the representative streets are in Gothenburg. To determine if the representative streets represent Gothenburg, more example of streets need to be studied.

In the Excel-program, green qualities should be obtained while yellow and red qualities should be avoided. Depending on which urban planning qualities the street owner prioritise to have green quality, yellow and red quality on other urban planning qualities can be accepted. For example, if the street owner wants green quality on traffic safety on a street, it can result in red quality on the accessibility. The method can in that way work as an implement that can be adjusted if the adjustment is more suitable.

Something to take in consideration when the method is used, is that the speed level does not always need to be changed. Instead the source to the recommended speed level can be found and adjusted. For example, on a street without separate pedestrian and bicycle paths, the recommended speed level could be increased by installing separated paths. In that way, the speed claim for the traffic safety increases.

In smaller cities, the streets' appearances are more alike than in larger cities. Therefore, a less number of representative streets are obtained compared to Gothenburg. In the smaller cities, the representative streets Million Programme Streets and City Centre Streets are more uncommon. Because of this, the method is assumed to be suitable for residential areas in smaller cities. The method is uncomplicated and user friendly, which make it for example suitable to use for small municipalities where the resources in urban planning are less than in larger municipalities.

10 Recommendations for Further Work

The method's suitability depends on if there are any conflicts of interest on the streets. This report does not take in consideration if the conflicts can be solved. A recommendation for further work is to find suitable traffic calming measures on streets with conflicts of interest. The measures should secure the speed level on the street and at the same time meet the road users' claim of accessibility. In that way, the conflicts of interest could eventually be reduced and thereby make the method more suitable.

For the studied streets in the report, the recommended speed levels have been the same or lower than the measured speed levels. However, the recommended speed levels can be higher than the measured the speed levels. As a result of this, the streets' availability need to be increased. Our recommendation is to study different types of availability-increasing measures that are appropriate for different types of streets.

When the City Centre Streets is studied, it is clear that high traffic flow affects road users' movement in a different way compared to other similar streets with low traffic flow. A final recommendation is to try to include the studied streets' vehicle flow in the *Right Speed in the City*, to find out if the results become different.

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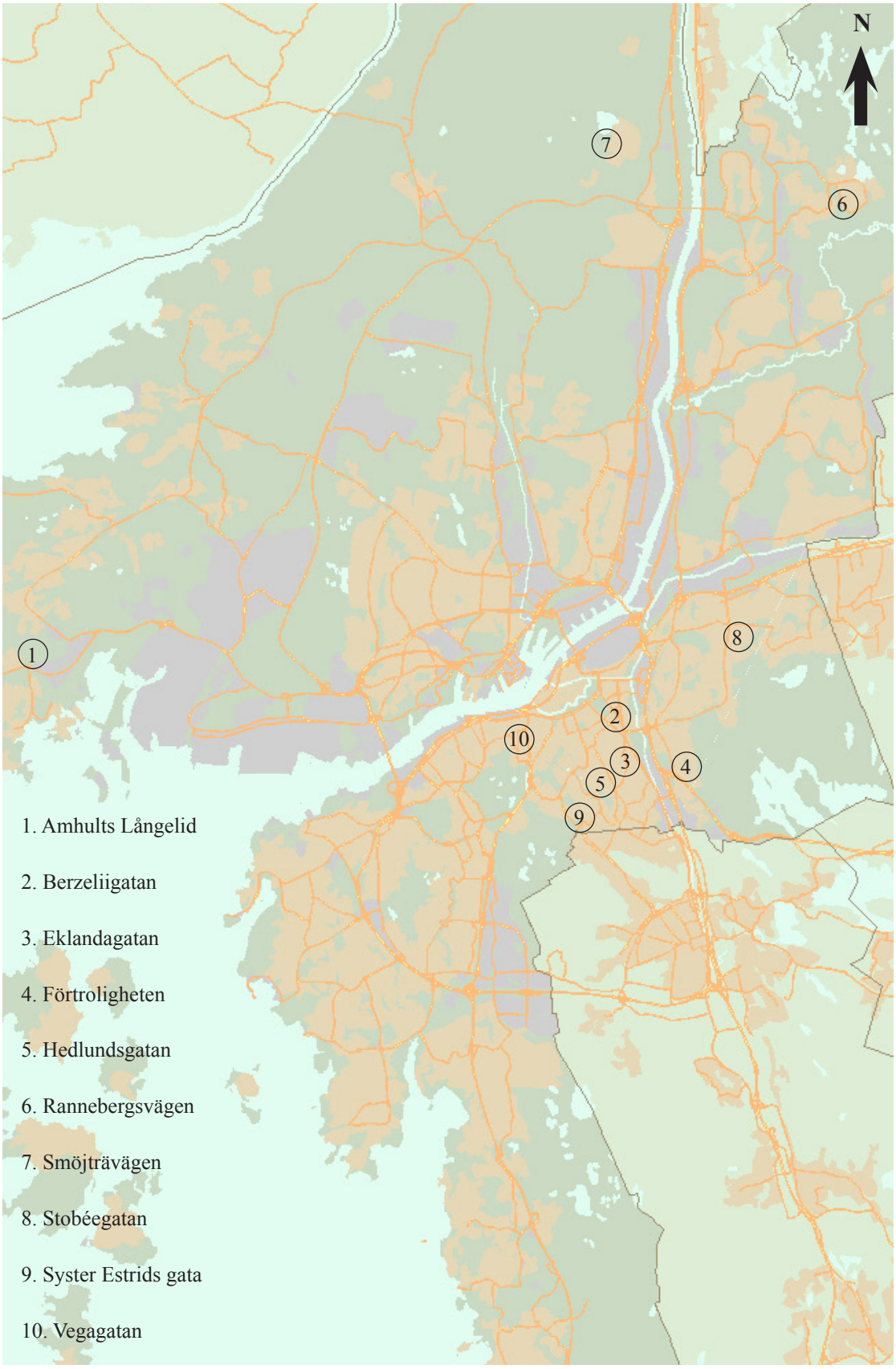
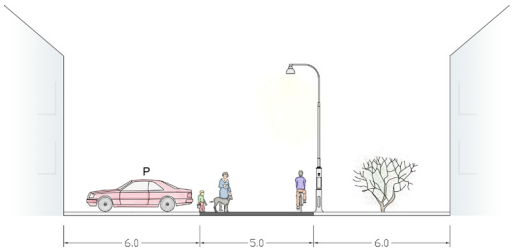
Appendix

Appendix 1: Map with Example of Streets

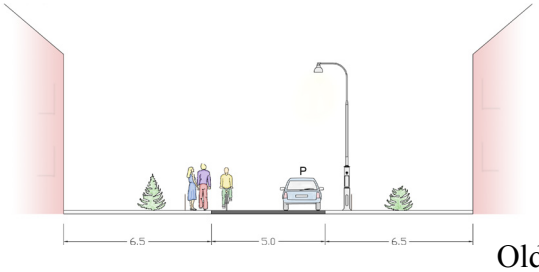
Map over Gothenburg with markings to see the geographical location of the studied examples of streets. (Google Maps, 2011)



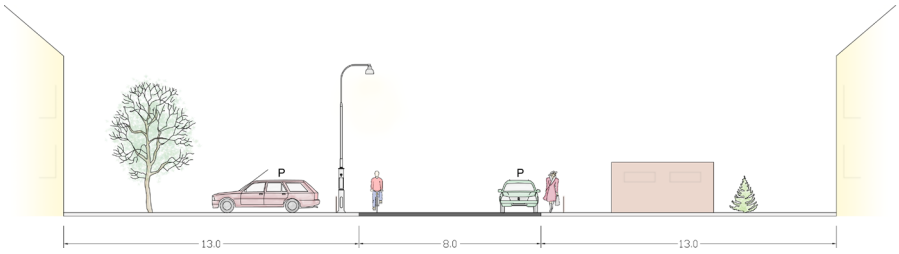
Appendix 2: Overview of Standard Design Cross Sections



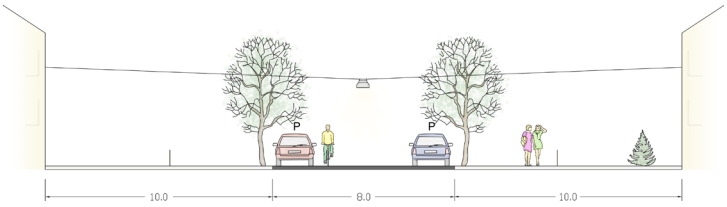
Newer Residential Streets



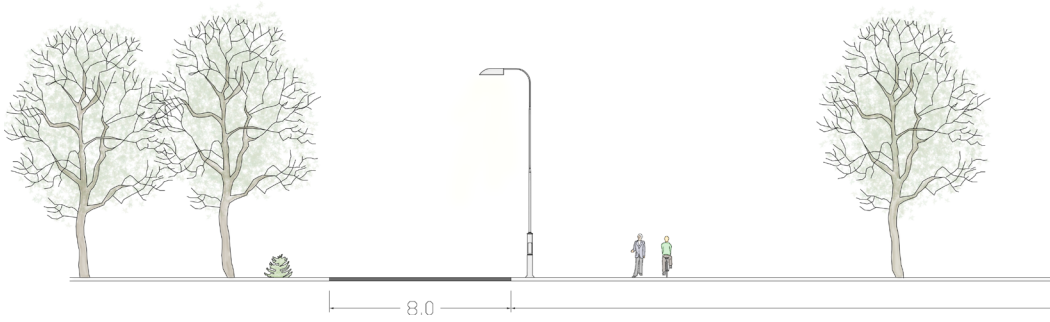
Older Residential Streets



Older Residential Streets

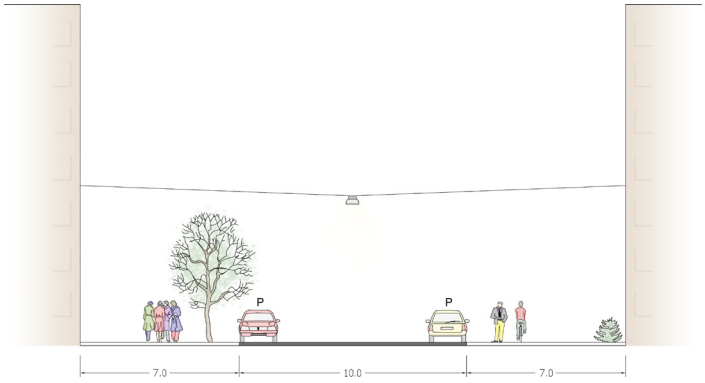


Wide Street Space with Narrow Roadway

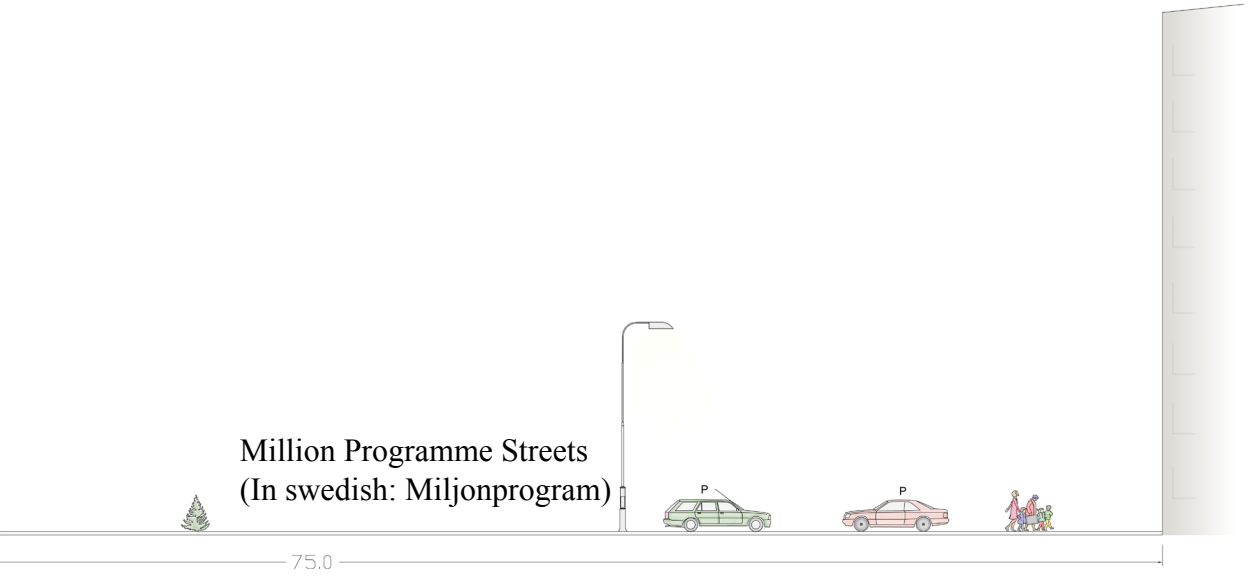


Apartment Blocks on One Side

City Centre Streets



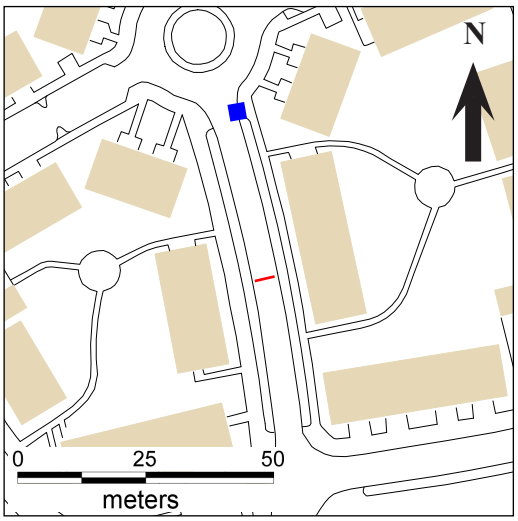
Million Programme Streets
(In swedish: Miljonprogram)



Appendix 3: Measured Values for Amhults Långelid

Representative Street: Newer Residential Streets

Map over the surrounding of Amhults Långelid. The area inside the square is shown in a smaller scale to the right.



Map over Amhults Långelid. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 27 km/h

95th percentile: 30 km/h

Mean value: 24 km/h

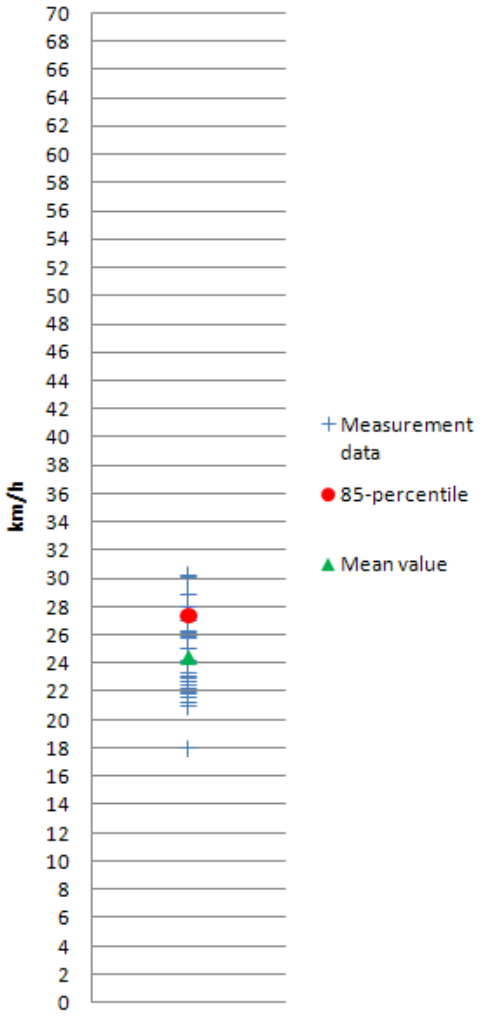
Median value: 24 km/h

Numbers of measurement values: 25

Standard deviation: 3 km/h

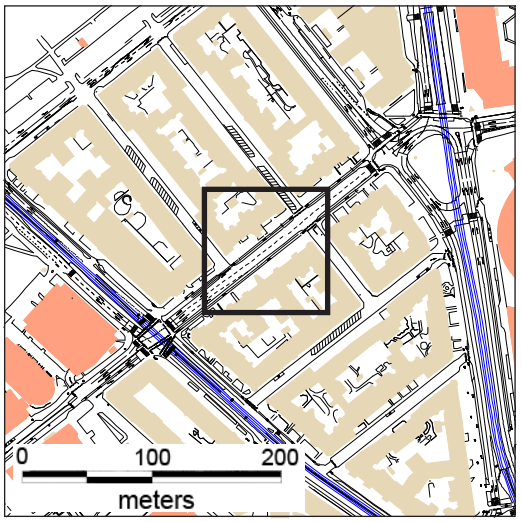
95 % confidence interval: 23-25 km/h

Traffic flow: 33 vehicles/hour, at 1:00 pm

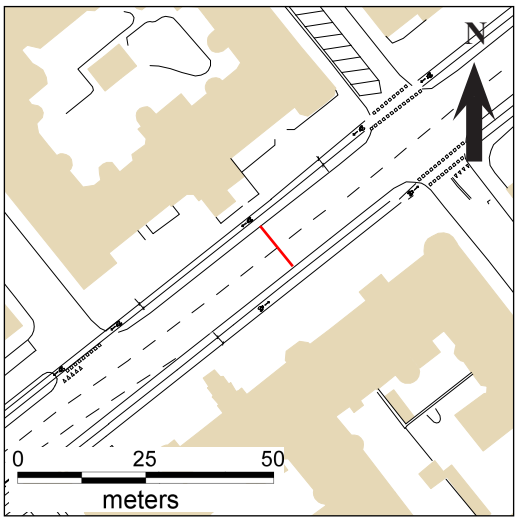


Appendix 4: Measured Values for Berzeliigatan

Representative Street: City Centre Streets



Map over the surrounding of Berzeliigatan. The area inside the square is shown in a smaller scale to the right.



Map over Berzeliigatan. The line on the street, shows where measurement of speed levels were made. The position of the laser camera was approximately 150 meters west from the measurement point.

85th percentile: 47 km/h

95th percentile: 53 km/h

Mean value: 40 km/h

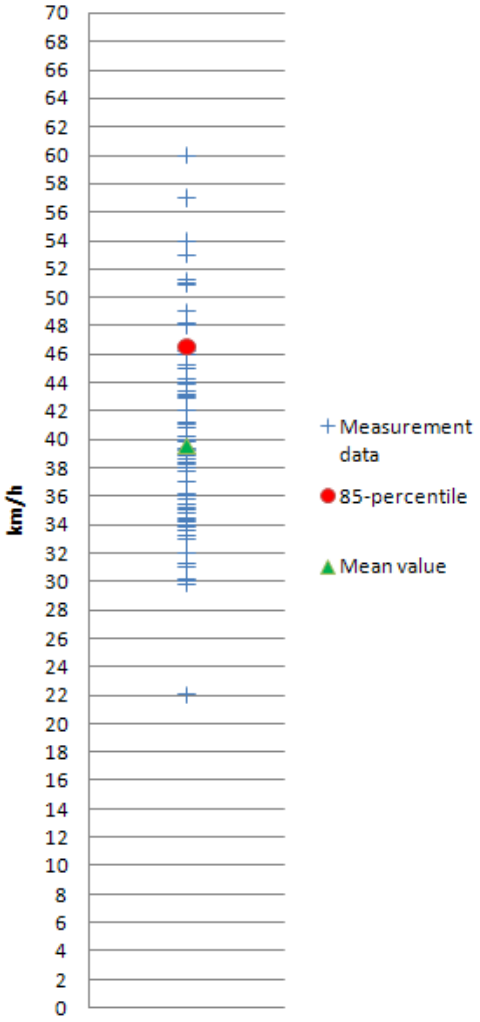
Median value: 39 km/h

Numbers of measurement values: 66

Standard deviation: 7 km/h

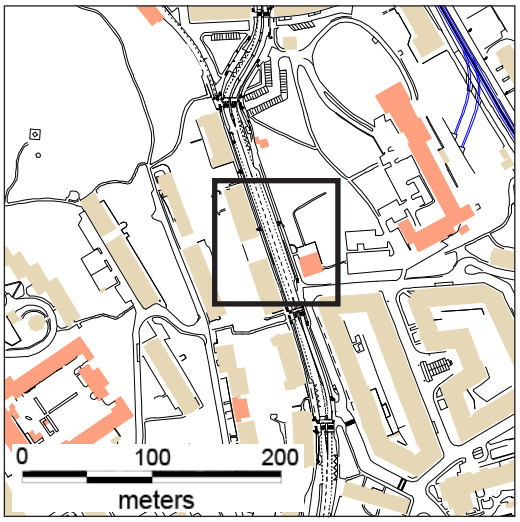
95 % confidence interval: 38-42 km/h

Traffic flow: 570 vehicles/hour,
maximum hour PM
(Traffic and Public Transport Authority, 2010)

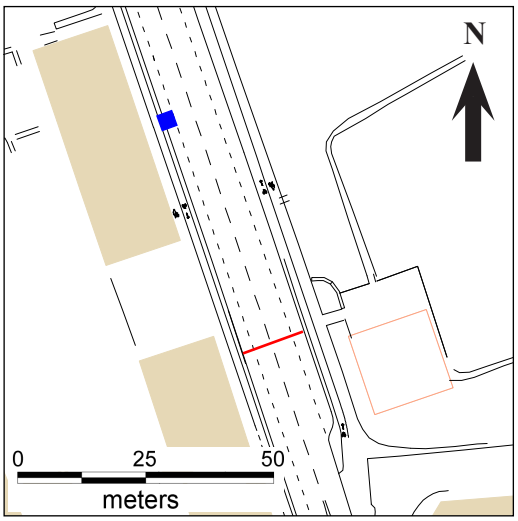


Appendix 5: Measured Values for Eklandagatan

Representative Street: City Centre Streets



Map over the surrounding of Eklandagatan. The area inside the square is shown in a smaller scale to the right.



Map over Eklandagatan. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 49 km/h

95th percentile: 53 km/h

Mean value: 43 km/h

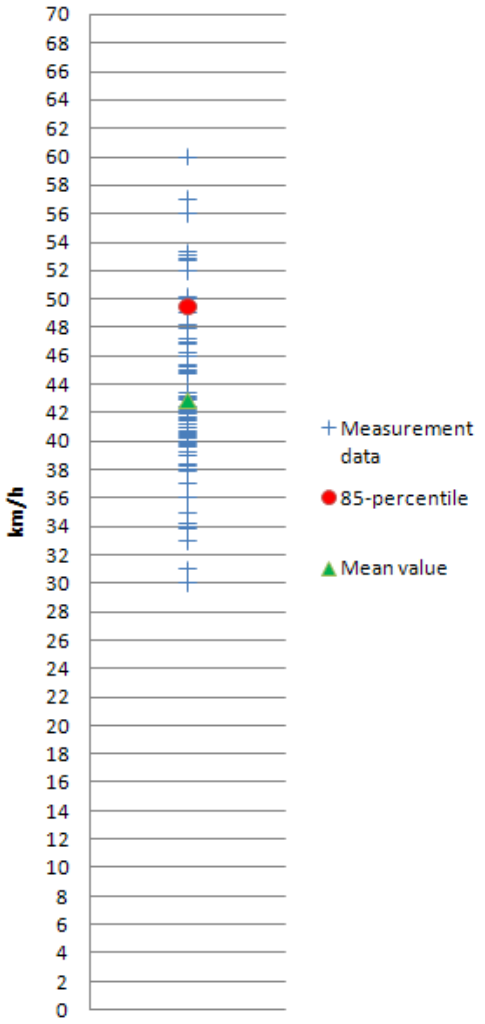
Median value: 41 km/h

Numbers of measurement values: 65

Standard deviation: 6 km/h

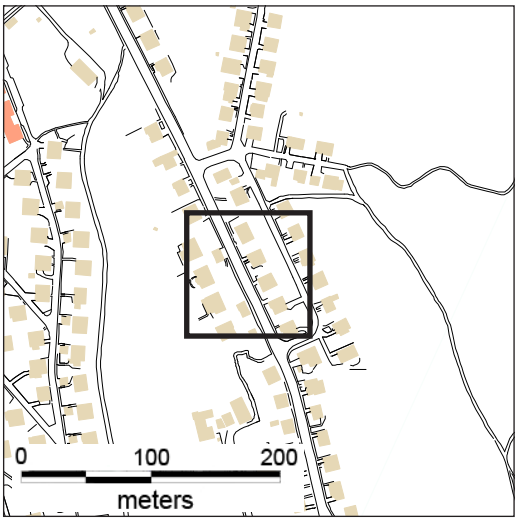
95 % confidence interval: 41-45 km/h

Traffic flow: 940 vehicles/hour,
maximum hour PM
(Traffic and Public Transport Authority, 2010)



Appendix 6: Measured Values for Förtroligheten

Representative Street: Older Residential Streets



Map over the surrounding of Förtroligheten. The area inside the square is shown in a smaller scale to the right.

Map over Förtroligheten. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 42 km/h

95th percentile: 44 km/h

Mean value: 35 km/h

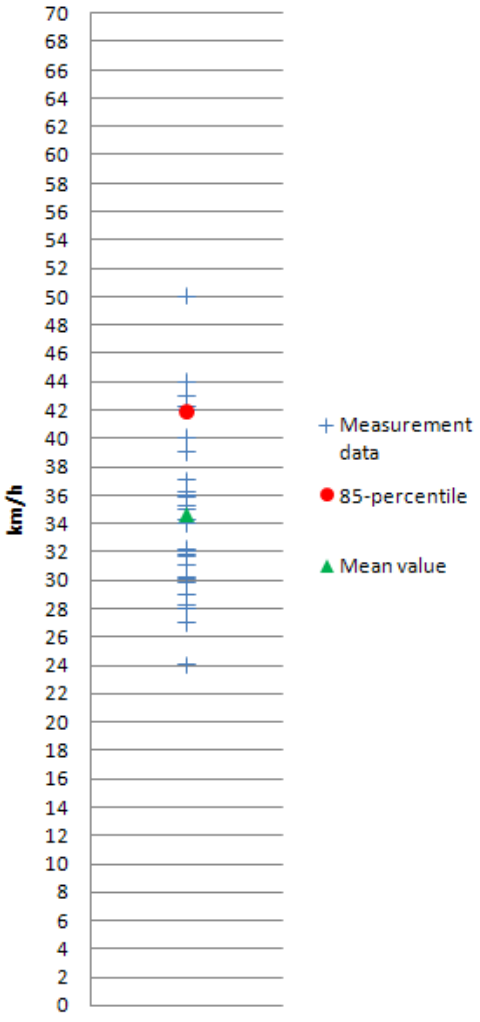
Median value: 34 km/h

Numbers of measurement values: 28

Standard deviation: 6 km/h

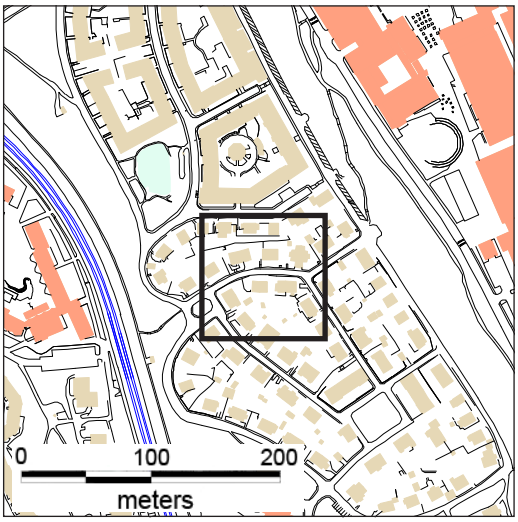
95 % confidence interval: 33-37 km/h

Traffic flow: 17 vehicles/hour, at 10:00 am

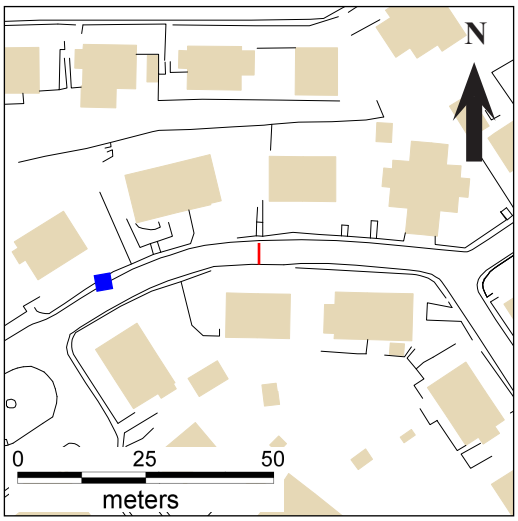


Appendix 7: Measured Values for Hedlundsgatan

Representative Street: Older Residential Streets



Map over the surrounding of Hedlundsgatan. The area inside the square is shown in a smaller scale to the right.



Map over Hedlundsgatan. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 21 km/h

95th percentile: 25 km/h

Mean value: 19 km/h

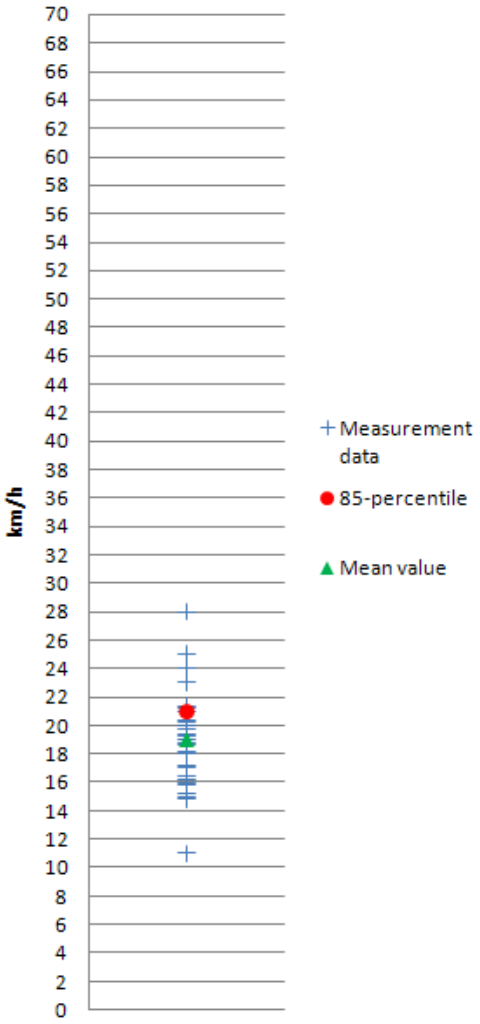
Median value: 19 km/h

Numbers of measurement values: 28

Standard deviation: 4 km/h

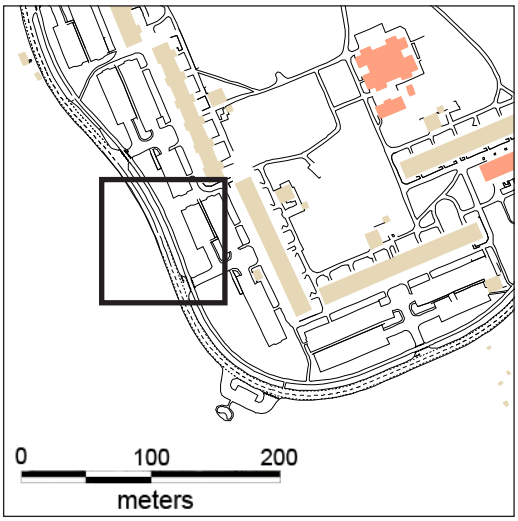
95 % confidence interval: 18-20 km/h

Traffic flow: 16 vehicles/hour, at 8:00 am

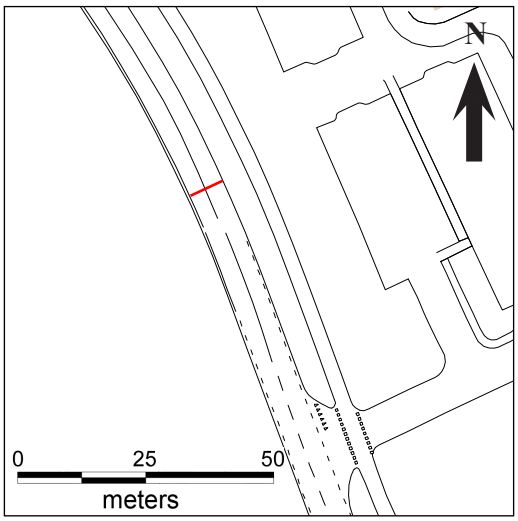


Appendix 8: Measured Values for Rannebergsvägen

Representative Street: Million Programme Streets



Map over the surrounding of Rannebergsvägen. The area inside the square is shown in a smaller scale to the right.



Map over Rannebergsvägen. The line on the street, shows where measurement of speed levels were made. The position of the laser camera was approximately 150 meters south from the measurement point, on a rest stop.

85th percentile: 60 km/h

95th percentile: 64 km/h

Mean value: 52 km/h

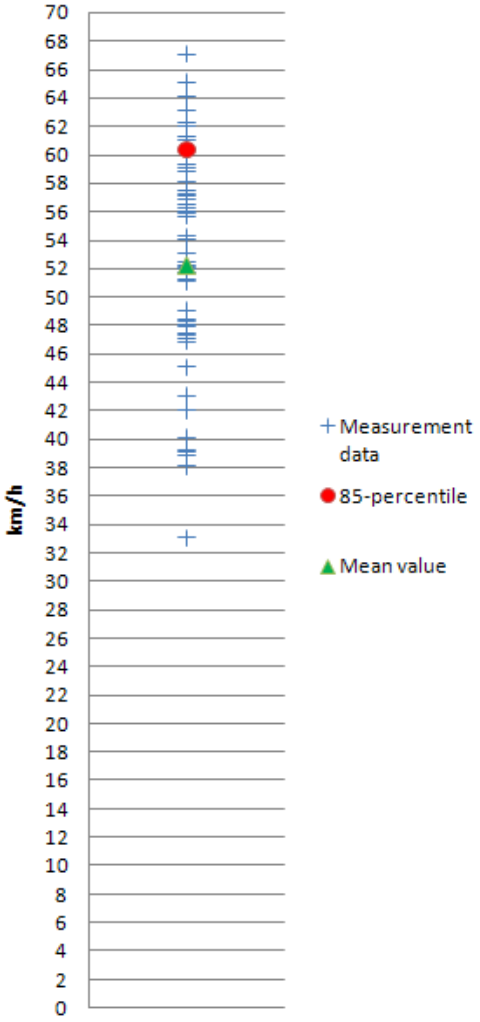
Median value: 52 km/h

Numbers of measurement values: 50

Standard deviation: 8 km/h

95 % confidence interval: 50-54 km/h

Traffic flow: 140 vehicles/hour,
maximum hour PM 2008
(Traffic and Public Transport Authority, 2010)



Appendix 9: Measured Values for Smöjträvägen

Representative Street: Newer Residential Streets

Map over the surrounding of Smöjträvägen. The area inside the square is shown in a smaller scale to the right.

Map over Smöjträvägen. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 25 km/h

95th percentile: 25 km/h

Mean value: 20 km/h

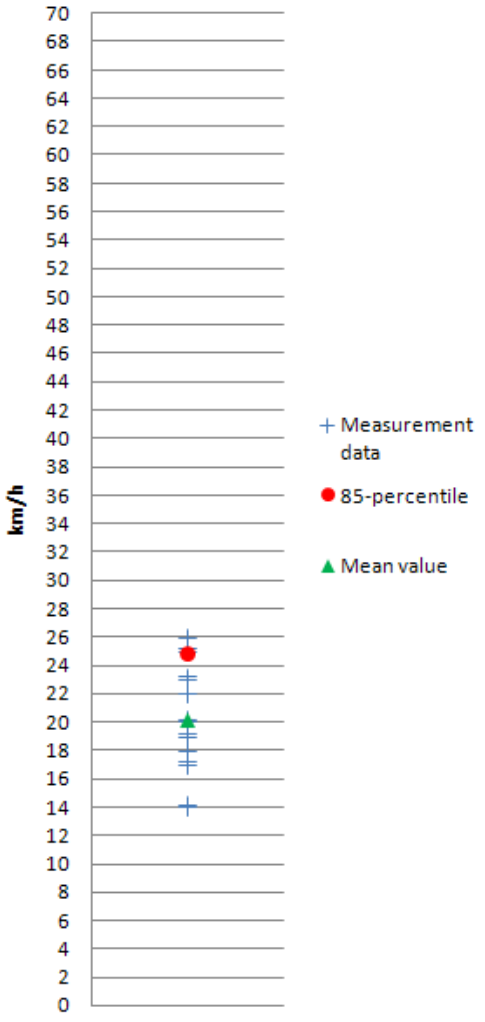
Median value: 20 km/h

Numbers of measurement values: 15

Standard deviation: 4 km/h

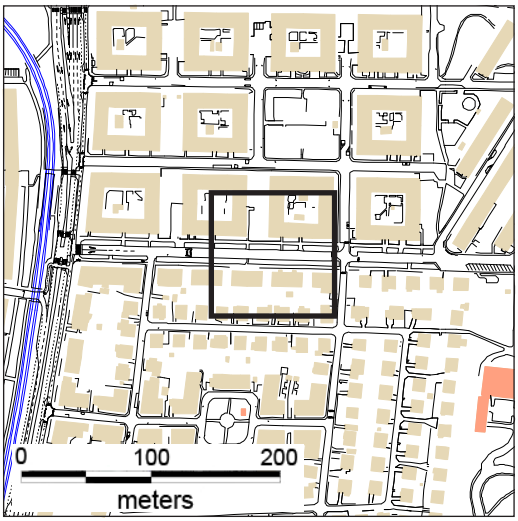
95 % confidence interval: 18-22 km/h

Traffic flow: 13 vehicles/hour, at 8:00 am

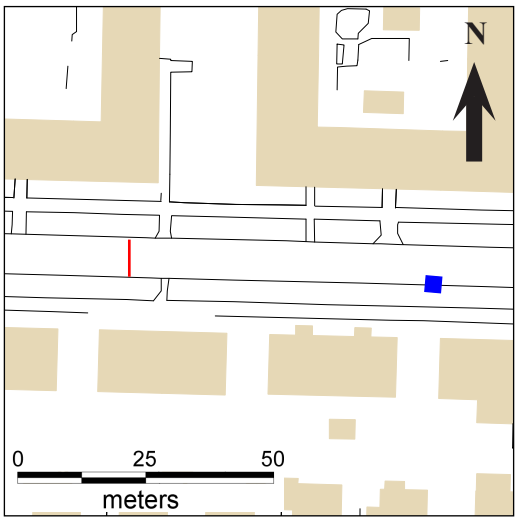


Appendix 10: Measured Values for Stobéegatan

Representative Street: Wide Street Space with Narrow Roadway



Map over the surrounding of Stobéegatan. The area inside the square is shown in a smaller scale to the right.



Map over Stobéegatan. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 36 km/h

95th percentile: 41 km/h

Mean value: 30 km/h

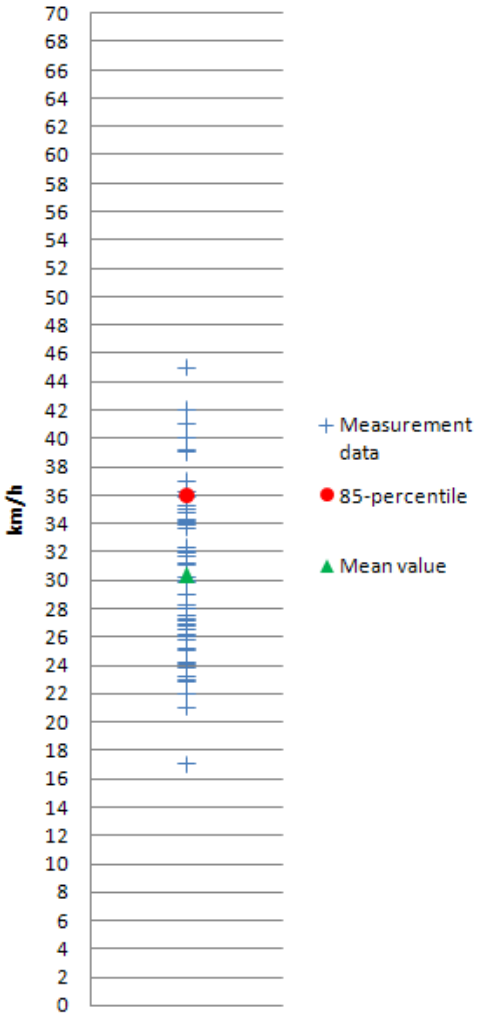
Median value: 30 km/h

Numbers of measurement values: 50

Standard deviation: 6 km/h

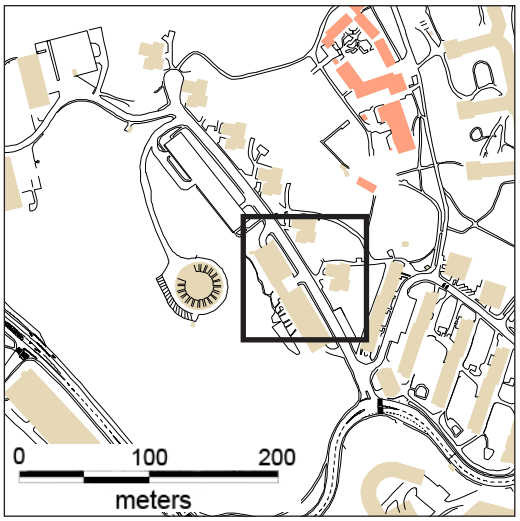
95 % confidence interval: 28-32 km/h

Traffic flow: 41 vehicles/hour, at 3:00 pm

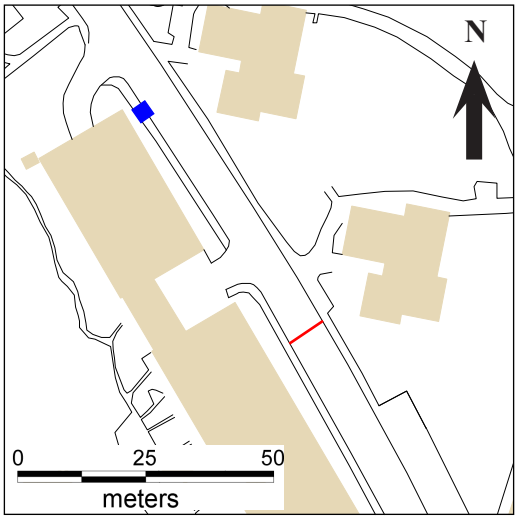


Appendix 11: Measured Values for Syster Estrids gata

Representative Street: Apartment Blocks on One Side



Map over the surrounding of Syster Estrids gata. The area inside the square is shown in a smaller scale to the right.



Map over Syster Estrids gata. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 46 km/h

95th percentile: 55 km/h

Mean value: 38 km/h

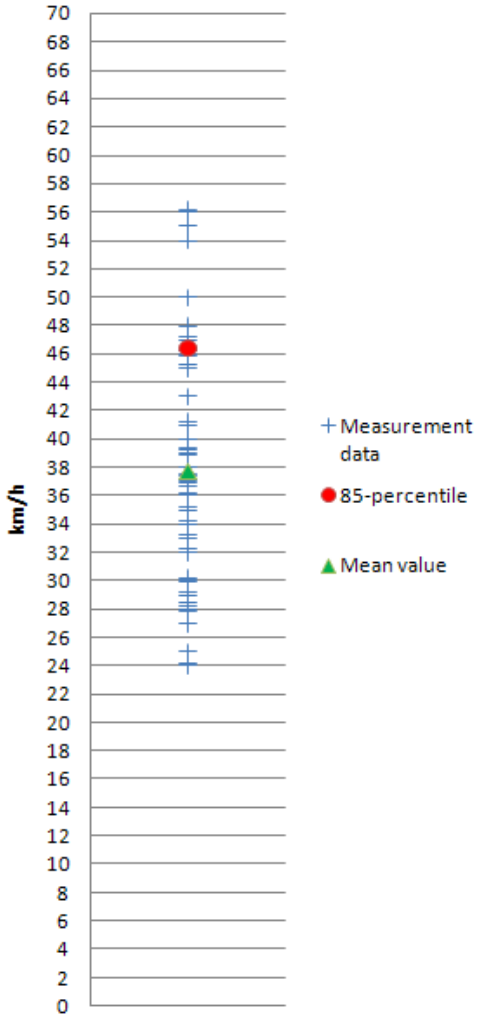
Median value: 37 km/h

Numbers of measurement values: 52

Standard deviation: 8 km/h

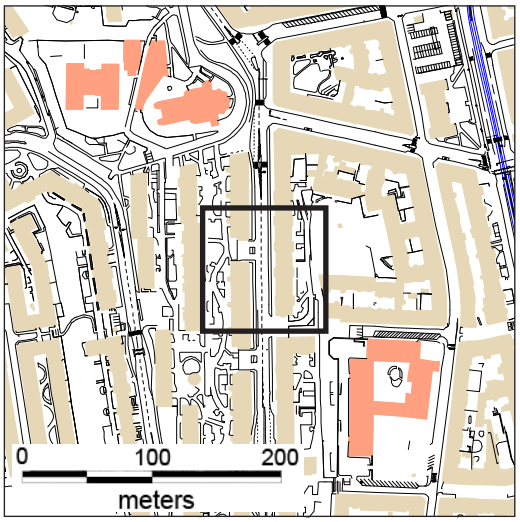
95 % confidence interval: 36-40 km/h

Traffic flow: 44 vehicles/hour, at 9:00 am

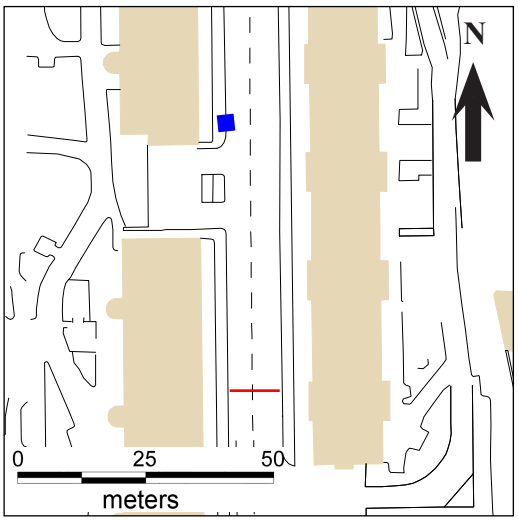


Appendix 12: Measured Values for Vegagatan

Representative Street: City Centre Streets



Map over the surrounding of Vegagatan. The area inside the square is shown in a smaller scale to the right.



Map over Vegagatan. The line on the street, shows where measurement of speed levels were made and the square shows the position of the laser camera.

85th percentile: 47 km/h

95th percentile: 53 km/h

Mean value: 42 km/h

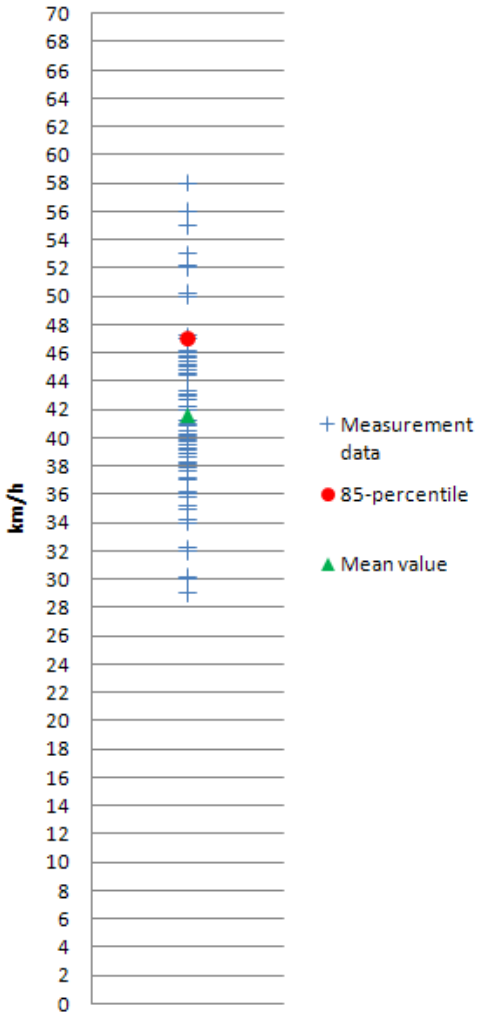
Median value: 41 km/h

Numbers of measurement values: 57

Standard deviation: 7 km/h

95 % confidence interval: 40-44 km/h

Traffic flow: 710 vehicles/hour,
maximum hour PM
(Traffic and Public Transport Authority, 2010)



Appendix 13: Inputs to the Right Speed in the City

The table below shows what information that can be added under each category in the *Right Speed in the City's* Excel-program. PC stands for pedestrian and cyclist traffic.

			Speed	Living-Space	DTSS		Traffic Network		
Nr	Name	Type	Existing		Part	Point	Car	Public Transport	Emergency Service
		Place Part Area		T IT C IF F	Oncom. car Rigid obstac. Intersection PC	y Intersect. x PC	Superior net. Main net. Local net.	Region bus Trunk bus Town bus	Primary Secondary

Right Speed in the City: Studied Streets

			Speed	Living-Space		DTSS		Traffic Network		
Nr	Name	Type	Existing	Wall	Floor	Part	Point	Car	Pub. Tran.	Emergency
1	Amhults Långelid	Part	50	C		PC traffic		Local net.		
2	Berzeliigatan	Part	50	C	IT	Intersection		Main net.	Region bus	
3	Eklandagatan	Part	50	C		Intersection		Main net.	Town bus	Primary
4	Förtroligheten	Part	50	C		PC traffic		Local net.		
5	Hedlundsgatan	Part	50	C		PC traffic		Local net.		
6	Rannebergsvägen	Part	50	IT		Intersection		Main net.	Town bus	Primary
7	Smöjträvägen	Part	50	C		PC traffic		Local net.		
8	Stobéegatan	Part	50	C		PC traffic		Local net.		
9	Syster Estrids gata	Part	50	C		PC traffic		Local net.		
10	Vegagatan	Part	50	C		PC traffic		Main net.	Town bus	Primary

Appendix 14: Results from the Right Speed in the City

The link optimised speed level is the speed level that the *Right Speed in the City* recommends. TS stands for traffic safety.

Right Speed in the City : The Studied Streets

		Living-Space		Speed		Accessibility			Character	Security	TS
Nr	Name	Wall	Floor	Existing	Link Optimised	Car	Public Transport	Emergency Service			
1	Amhults Långelid	C		50	**30**	Good	-		Good	Good	Good
2	Berzeliigatan	C	IT	50	**40**	Less good	Less good		Less good	Less good	Good
3	Eklandagatan	C		50	**30**	Less good	Good	Primary	Good	Good	Good
4	Förtroligheten	C		50	**30**	Good	-		Good	Good	Good
5	Hedlundsgatan	C		50	**30**	Good	-		Good	Good	Good
6	Rannebergsvägen	IT		50	**50**	Good	Good	Primary	Good	Good	Good
7	Smöjträvägen	C		50	**30**	Good	-		Good	Good	Good
8	Stobéegatan	C		50	**30**	Good	-		Good	Good	Good
9	Syster Estrids gata	C		50	**30**	Good	-		Good	Good	Good
10	Vegagatan	C		50	**30**	Less good	Good	Primary	Good	Good	Good