Thesis 295

Do we learn more from situation based accident coding?

Case study of Malmö and Gothenburg

Anna Björnberg

Trafik och Väg
Institutionen för Teknik och Samhälle
Lunds Tekniska Högskola
Lunds Universitet

LTH, Institutionen för Teknik och samhälle
CODEN: LUTVDG/(TVTT-5262)/1-80/2016
ISSN 1653-1922

Tryckt i Sverige av Media-Tryck, Lunds universitet
Lund 2016

Examensarbete

CODEN: LUTVDG/(TVTT-5262)/1-80/2016

Thesis / Lunds Tekniska Högskola, Instutionen för Teknik och samhälle, Trafik och väg, 295

ISSN 1653-1922

Author(s): Anna Björnberg

Title:	Lär vi oss mer från situationsbaserad olyckskodning? Fallstudie Malmö och Göteborg
English title:	Do we learn more from situation based accident coding? Case study of Malmö and Gothenburg
Language	English
Year:	2016
Keywords:	Accident coding; VRU; Manoeuvre; CARE; STRADA
Citation:	Anna Björnberg, Do we learn more from situation based accident coding? Case study of Malmö and Gothenburg. Lund, Lunds universitet, LTH, Institutionen för Teknik och samhälle. Trafik och väg 2016. Thesis. 295

Abstract:
Road traffic accidents in Sweden are today registered in the national database called STRADA (Swedish Traffic Accident Data Acquisition). To every accident information is gathered, but an efficient way of compiling this information is lacking.

In countries like Germany or Denmark accidents are classified by the type of manoeuvre that leads to the accident. With help from reference tables, every movement possible for a part involved in an accident is given a code, and searches are possible based on accident type. There is also a European accident database, CARE, where accidents are registered based on CADaS structure.

By building up a code system and then analyse serious and fatal accidents in Gothenburg and Malmö (2nd and 3rd biggest cities in Sweden) between 2009 and 2013, traffic accidents could be studied in a different way than before.

The conclusion is that accident classification similar to CADaS gives another view of the safety problems. Much of the information can only be found in the accident sketch and makes it important to identify the contributing factors. Since a majority of the accidents are single accidents hospital data contribute a lot to understanding the extent of the safety problems, but not as much to understanding the conditions of the accidents. However, going into too much disaggregation quickly results in very few accidents per type and becomes meaningless.

Trafik och väg
Institutionen för Teknik och samhälle
Lunds Tekniska Högskola, LTH
Lunds Universitet
Box 118, 221 00 LUND

Transport and Roads
Department of Technology and Society
Faculty of Engineering, LTH
Lund University
Box 118, SE-221 00 Lund, Sweden

Acknowledgements

This master thesis is the final part of my education in Civil Engineering at the Department of Technology and Society, LTH. The report was written during the first half of 2016.

This work would not have been possible without the support and help from a few people that I would like to thank.

Thank you Carl Johnsson and Aliaksei Laureshyn for all the help and guidance I received during the work. Also thank you to my examiner Andras Varhelyi for your contribution to my work. Part of the work was written at the unit of Traffic and Road and I want to thank for the opportunity to be able to work there.

I also want to thank my family and friends for all the support and help. Your patience sometimes amaze me, but I would not have been able to do this without you.

Lund, June 2016
Anna Björnberg

Contents

1 Sammanfattning

Vägtrafikolyckor i Sverige registreras idag i den nationella databasen STRADA (Swedish Traffic Accident Data Acquisition). Till varje olycka finns information om olyckan till exempel skedde i en korsning eller på en vägsträcka och hur många inblandade trafikanter det var. Till olyckan finns också ofta en skiss och textbeskrivning över olycksförloppet, men det saknas ett effektivt sätt att sammanställa denna information.

I länder som Tyskland eller Danmark klassificeras olyckor efter den typ av manöver som leder till olyckan. Med hjälp av referenstabeller, där varje möjlig rörelse för en inblandad trafikant i olyckan får en kod, blir sökningar möjligt utifrån olyckstyp. Det finns också en europeisk olycksdatabas, CARE, där olyckor registreras baserat på CADaS (Common Accident Data Set) struktur. Detta gör det också möjligt att på ett liknande sätt klassificera olyckor baserat på vilken manöver som ledde fram till den.

Liknande referenstabeller tycks ha funnits i Sverige tidigare. Detta går bland annat att se i rapporten Trafikolyckor i tätort av dåvarande Trafiksäkerhetsverket från 1981. Idag används dock inga sådana tabeller. Varför dessa försvunnit är oklart och eventuellt skulle ett återinförande av liknande system kunna bidra till en bättre förståelse av olyckors underliggande orsaker. I denna studie undersöks i vilken utsträckning införandet av en mer detaljerad olyckskodning kan förbättra användbarheten av STRADA.

Genom att bygga upp ett kodsystem och sedan analysera allvarliga olyckor och dödsolyckor i Göteborg och Malmö (2:a och 3:e största städerna i Sverige) mellan 2009 och 2013, har trafikolyckor studeras på ett annat sätt än tidigare. Koden består av fyra huvuddelar. Den första delen beskriver vilken typ av manöver som ledde till olyckan och är baserad på strukturen i CADaS i databasen CARE. Den andra och tredje delen ger information om de inblandade trafikanterna och den sista och fjärde delen är om det fanns ytterligare omständigheter som bör tas i beaktande, som om det fanns andra fordon som skymde sikten.

Totalt har 734 olyckor registrerats, 423 i Malmö och 311 i Göteborg. Av de 734 olyckor, involverar 243 cyklister, 393 innefattar fotgängare och 58 vardera omfattar mopeder och motorcyklister. En majoritet av olyckorna var singelolyckor (63%). De flesta av dessa olyckor är bara registrerade av sjukvården och därför saknas värdefull information om händelseförloppet.

Slutsatserna är att en olycksklassificering som liknar CADaS ger en mer detaljerad bild av säkerhetsproblem. Med koden är det möjligt att dela upp olyckor mer och ta reda på orsaken bakom dem. Men att göra en allt för stor uppdelning av olyckorna resulterar snabbt i mycket få olyckor per typ och blir meningslös.

Mycket av informationen kan bara hittas i olycksskissen och det gör det viktigt att identifiera de bidragande faktorerna. Eftersom majoriteten av olyckorna är singelolyckor bidrar sjukhusdata till stor del i att förstå omfattningen av säkerhetsproblemen, men inte så mycket för att förstå bakgrunden till olyckorna.

Kodsystemet och STRADA är bara överens om platsattribut (väg eller korsning) i cirka 60 procent av olyckorna. Vissa olyckors platsattribut kan ifrågasättas eftersom den beskrivande texten och olycksskissen motsäger varandra.

Om en mer detaljerad introduktion av CARE-databasen kommer att införas i Sverige, behöver förändringar göras i STRADA. Dagens system inte är optimalt för en sökning baserad på manöver som i Danmark eller Tyskland och om det beslutas att Sverige i framtiden ska bidra mer med liknande uppgifter bör det övervägas om ett manöveralternativ ska ingå i STRADA.

2 Summary

Road traffic accidents in Sweden are today registered in the national database called STRADA (Swedish Traffic Accident Data Acquisition). To every accident information is gathered regarding how many road users involved and if it happened on a section or at a crossroad. To the accident there is also a sketch or a text describing the accident, but an efficient way of compile this information is lacking.

In countries like Germany or Denmark accidents are classified by the type of manoeuvre that leads to the accident. With help from reference tables, where every movement possible for a part involved in an accident is given a code, search is possible based on accident type. There is also a European accident database, CARE, were accidents are registered based on CADaS (Common Accident Data Set) structure. This also makes it possible in a similar way classify accidents based on the manoeuvre leading up to it.

Similar reference tables seems to have existed in Sweden before. This is for example shown in the report ”Trafikolyckor i tätort” by the then authority Trafiksäkerhetsverket from 1981. Today, however, no such tables are used. Why these disappeared is unclear and potentially a re-introduction of similar systems could contribute to a better understanding of the underlying causes of accidents. In this exploratory study it is investigated to which extent introduction of a more detailed accident coding can enhance the usefulness of STRADA.

By building up a code system and then analyse serious and fatal accidents in Gothenburg and Malmö (2nd and 3rd biggest cities in Sweden) between 2009 and 2013, traffic accidents could be studied in a different way than before. The code is made up of four main parts. The first part describes which type of manoeuvre that led to the accident and is based on the structure in CADaS in the CARE database. The second and third part give information about the road users involved and the fourth part describes whether there were additional circumstances that should be taken into account such as if there were other vehicles that obscured the view.

Totally 734 accidents were registered, 423 in Malmö and 311 in Gothenburg. Of the 734 accidents, 243 involving cyclists, 393 involving pedestrians and 58 each involving mopeds and motorcyclists. A majority of the accidents were single accidents (63%). Most of those accidents are only registered by hospitals and therefore missing valuable information on the course of events preceding the accident.

The conclusions are that accident classification similar to CADaS gives another view of the safety problems. With the code it is possible to separate the accidents more and find out the reason behind them. However, going into too much disaggregation quickly results in very few accidents per type and become meaningless.

Much of the information can only be found in the accident sketch and makes it important to identify the contributing factors. Since a majority of the accidents are single accidents hospital data contribute a lot to understanding the extent of the safety problems, but not as much to understanding the conditions of the accidents.

The code system and STRADA only agree on the location (road or intersection) in about 60 percent of the accidents. Some accidents location can be questioned since the describing text and sketch contradict each other.

If a more detailed introduction of the CARE database is to be introduced in Sweden, changes needs to be done in STRADA. Today’s system is not optimal for a manoeuvre based search like in Denmark or Germany and if it is decided that Sweden in the future should contribute more with similar data it should be considered to get a manoeuvre option included in STRADA.

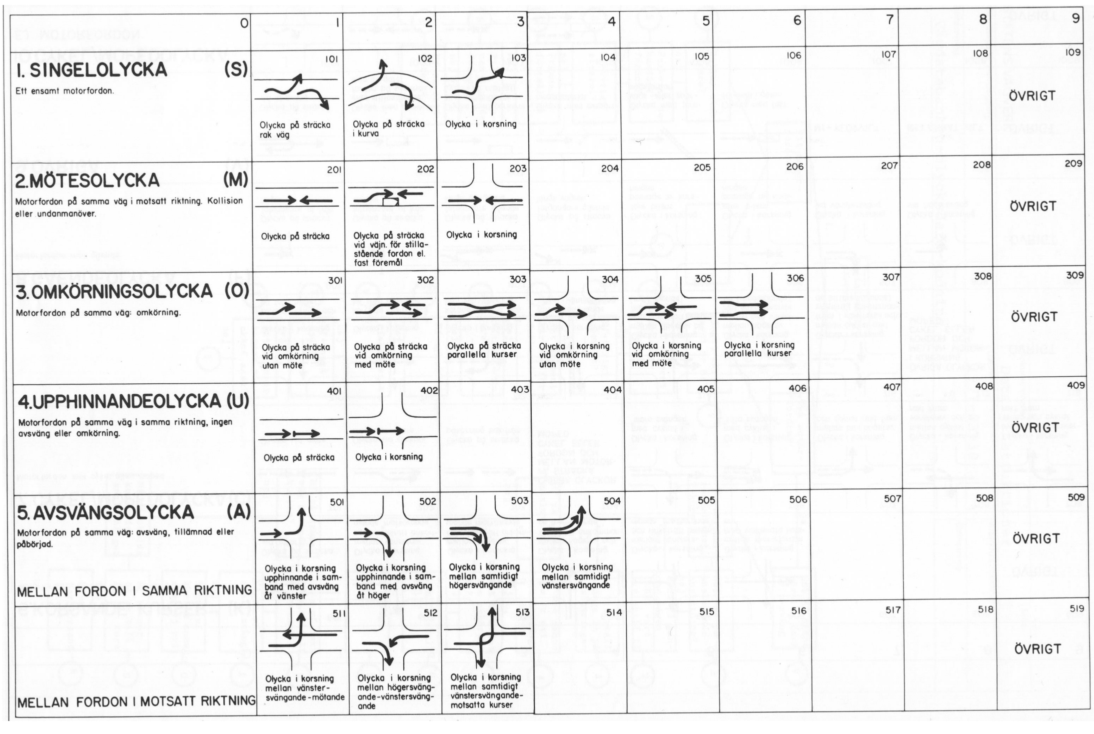
3 Introduction

3.1 Background

Road traffic accidents in Sweden are today registered in the national database called STRADA (Swedish Traffic Accident Data Acquisition) (Transportstyrelsen, 2016a). To every accident information is gathered regarding how many road users involved and if it happened on a section or at a crossroad. To the accident there is also a sketch or a text describing the accident, but an efficient way of compile this information is lacking.

In countries like Germany or Denmark accidents are classified by the type of manoeuvre that leads to the accident. With help from reference tables, where every movement possible for a part involved in an accident is given a code, search is possible based on accident type. There is also a European accident database, CARE, were accidents are registered based on CADaS (Common Accident Data Set) structure. This also makes it possible in a similar way classify accidents based on the manoeuvre leading up to it.

Similar reference tables seems to have existed in Sweden before. This is for example shown in the report "Trafikolyckor i tätort" by the then authority Trafiksäkerhetsverket from 1981, as can be seen below in Figure 1 and Figure 2.



0	1	2	3	4	5	6	7	8	9
1. SINGELOLYCKA (S) Ett ensamt motorfordon.	101 Olycka på sträcka rak väg	102 Olycka på sträcka i kurva	103 Olycka i korsning	104	105	106	107	108	109 ÖVRIGT
2. MÖTESOLYCKA (M) Motorfordon på samma väg i motsatt riktning. Kollision eller undanmanöver.	201 Olycka på sträcka	202 Olycka på sträcka vid väjn. för stilla-stående fordon el. fast föremål	203 Olycka i korsning	204	205	206	207	208	209 ÖVRIGT
3. OMKÖRNINGSOLYCKA (O) Motorfordon på samma väg: omkörning.	301 Olycka på sträcka vid omkörning utan möte	302 Olycka på sträcka vid omkörning med möte	303 Olycka på sträcka parallella kurser	304 Olycka i korsning vid omkörning utan möte	305 Olycka i korsning vid omkörning med möte	306 Olycka i korsning parallella kurser	307	308	309 ÖVRIGT
4. UPPHINNANDEOLYCKA (U) Motorfordon på samma väg i samma riktning, ingen avsväng eller omkörning.	401 Olycka på sträcka	402 Olycka i korsning	403	404	405	406	407	408	409 ÖVRIGT
5. AVSVÄNGSOLYCKA (A) Motorfordon på samma väg: avsväng, tillämnad eller påbörjad. MELLAN FORDON I SAMMA RIKTNING	501 Olycka i korsning upphinnande i sam-band med avsväng åt vänster	502 Olycka i korsning upphinnande i sam-band med avsväng åt höger	503 Olycka i korsning mellan samtidigt högersvängande	504 Olycka i korsning mellan samtidigt vänstersvängande	505	506	507	508	509 ÖVRIGT
MELLAN FORDON I MOTSATT RIKTNING	511 Olycka i korsning mellan vänster-svängande-mötande	512 Olycka i korsning mellan högersväng-ande-vänstersväng-ande	513 Olycka i korsning mellan samtidigt vänstersvängande-motsatta kurser	514	515	516	517	518	519 ÖVRIGT

Figure 1: Reference table over accident manoeuvre, part one (Trafik- och informationsbyrån, 1981).

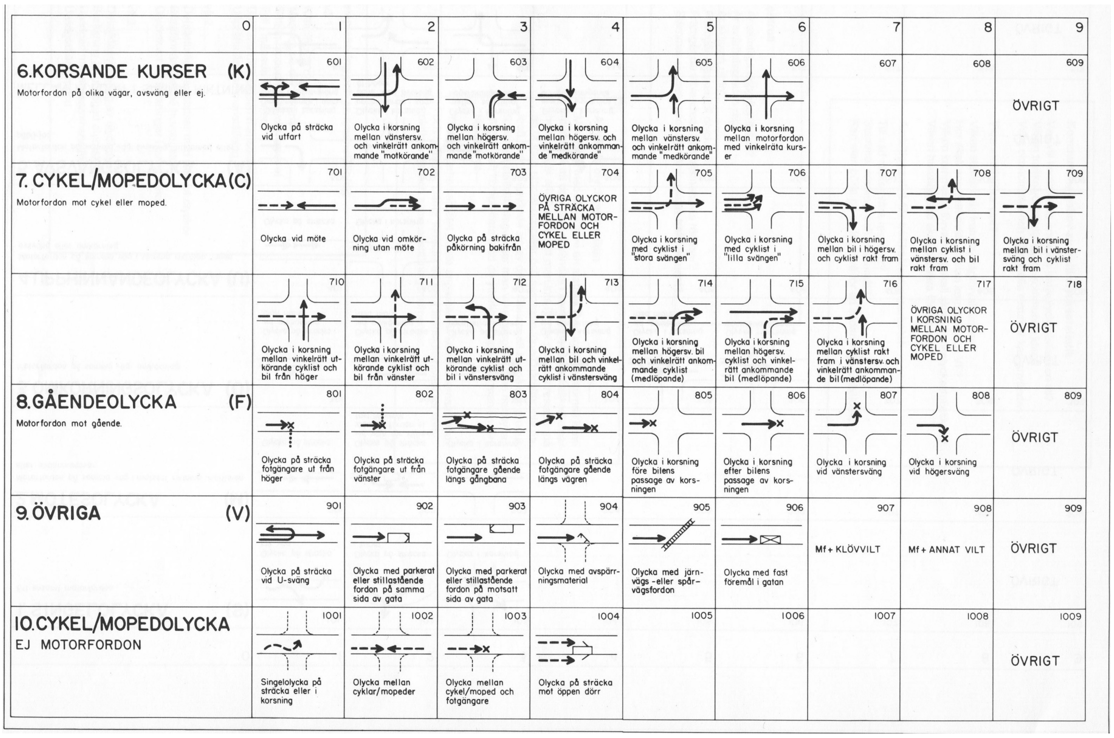


Figure 2: Reference table over accident manoeuvre, part two (Trafik- och informationsbyrån, 1981).

Today, tables like in Figure 1 and 2 are not used anymore. Why that is, is unclear and maybe would a reintroduction of a similar system help to get a better understanding of the underlying factors behind an accident.

STRADA has the advantage of containing health care records of injuries that are seldom reported by the police. But the accident typology used is very limited. Is it possible that an introduction of a more detailed accident coding can enhance the usefulness of STRADA?

This thesis will investigate what effect an introduction of a more detailed accident coding gives by manually examining all serious and fatal injury accidents records involving vulnerable road users during 2009-2013 in the cities of Gothenburg and Malmö.

3.2 Purpose

The main goal of this thesis is on one hand to investigate if and how an introduction of a more detailed accident coding can enhance the usefulness of STRADA. What more information can we get from looking at and identify the riskiest types of manoeuvres, where vulnerable road users are involved, that leads to accidents? Is it possible to identify something that requires safety improvements?

On the other hand it is investigated how reference tables over accidents in Sweden started and have been used since. When did they first start? How have they been used during the years of road accident registration and why are they not used anymore?

3.3 Disposition and delimitations

The thesis is divided into two main parts, a literature study and an analysis part. The literature study makes a historical overview of accident statistics in Sweden, with some significant years in the accident data collection as focus.

In the analytical part it is examined how an introduction of a more detailed accident coding would affect the information you get out of the accident statistics and the results are studied from each group of vulnerable road users' point of view. Focus lies on vulnerable road users, since much information about their accidents is lacking. The result and conclusions are then discussed.

Included in the study are only accidents in Sweden during 2009-2013 in Malmö and Gothenburg and much of the fact-based material is based on reports from Swedish universities, authorities and other major research institutions. Only a few comparisons with Europe (EU) and some European countries are made.

3.4 Method

A literature study is made to find the background for the accident database used in Sweden today, STRADA, and to find out how the accident database and accident types have changed over time. In essence, this is based on reports from universities and authorities.

A code system is built up where all the information about the accident can be described in a code. The part of the code that gives information about manoeuvre is based on the structure in CADaS in the CARE database. Some changes might occur to make the system suitable for vulnerable road users. Based on the code system accidents in STRADA (in selected cities and chosen time period) will be sorted and then presented.

4 Accident types in Sweden

4.1 The history of the accident database

Sweden first started publishing official statistics about road traffic accidents in 1935 and the Swedish systems for registration has with some changes been used ever since. Up until 1938 the database only consisted of accidents with motor vehicles, but in 1939 information about other types of road traffic accidents were included (Statistiska centralbyrån, 1968). Through the years there has been some changes in the system of registration. The largest ones and most drastically happened in 1955, 1966 and 2003 (Statistiska centralbyrån, 2003). A timeline over the significant years mentioned in this chapter can be seen in Figure 3.

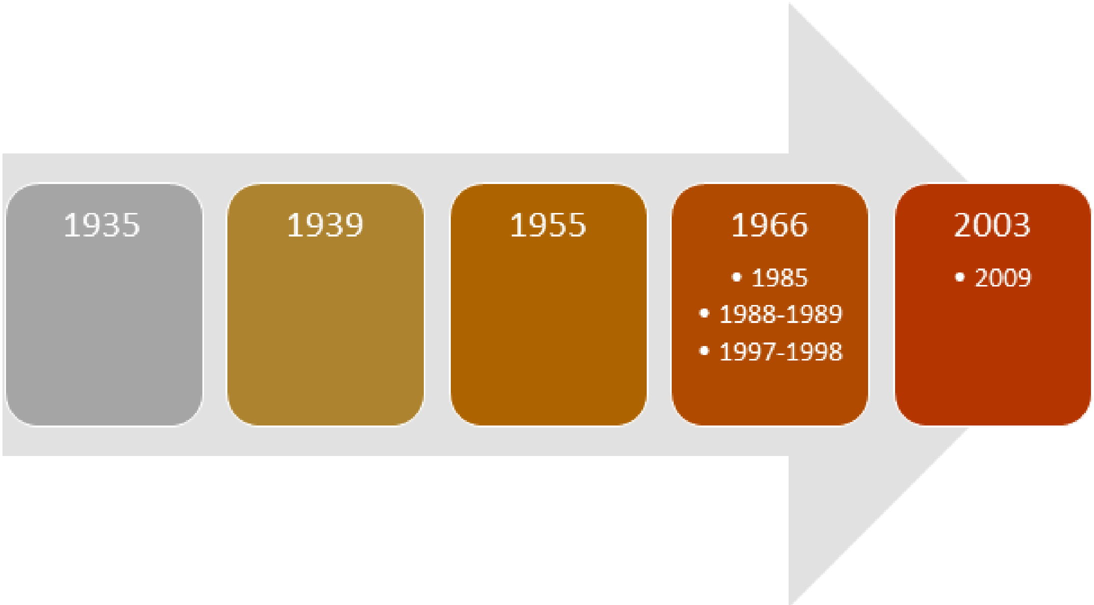


Figure 3: Timeline showing the major changes in Swedish road traffic accident registration.

4.1.1 The changes in 1955

Before the year of 1955 it was up to the chief of police in each district to once every three months send data to Statistics Sweden (SCB) of the accidents in the district who led to police investigation. The data was supposed to be based on police reports, records of police interviews or similar. However, it was already known that there was a limitation that only those accidents that led to police investigation were collected. That led to misleading information about the number of accidents between different road user groups, but also a difference in the number of accidents registered depending on whether the accident occurred in the city or in the countryside. Since the accidents needed to be police investigated there is also reasons to believe that fatal accidents are more correctly registered than minor accidents (Statistiska centralbyrån, 1954).

In 1953, "Statens Trafiksäkerhetsråd" suggested a diversification of statistics. The basis for the proposal are comments made by the 1945 traffic safety committee. When Statistics Sweden had approved the suggestion a new entry form was adopted in 1955 (Statistiska centralbyrån, 1955). The main purpose of the reorganization was to produce preliminary summaries, monthly reports (Statistiska centralbyrån, 1990), faster than in the past, for the benefit of road safety work and the importance of enlightenment activities (Statistiska centralbyrån, 1955).

The changes in 1955 mainly meant that the entry form for accidents was updated. For each accident, a form was written in four copies labelled A-D. The differences between the forms were small, but the A and B form was missing such circumstances of the accident that cannot be specified without a police investigation. In the C and D form a brief description of the accident sequence was included. Within 24 hours of the accident the front page of all the forms were filled in with general information about the accident. Within the same time form A would be sent to Statistics Sweden and form B to the local road or street management. When the police investigation later was completed the rest of the forms were filled in and form C was, just like form A, sent to Statistics Sweden and form D was filed at the chief of police (Statistiska centralbyrån, 1955).

The statistics included both accidents with personal injury and accidents with only property damage. Furthermore the presentation of the circumstances which the police thought contributed to the accident resumed (Statistiska centralbyrån, 1990).

4.1.2 The changes in 1966

In 1966 one of the most comprehensive changes was made regarding how to classify the degree of injury and how to classify the accident types. It was decided that the official statistics were limited to only include road accidents that resulted in personal injury. This means that the accident data of accidents leading to serious or fatal injury is not relatable with accidents in previous years (Statistiska centralbyrån, 1968).

According to the new system, information about an accident is to be sent in to Statistics Sweden within 48 hours from the accident became known by the police. This replaces all the previous forms, but a supplementary statement is necessary to send in within 30 days from the accident to give information if the personal injuries led to fatalities (Statistiska centralbyrån, 1968).

The most important changes compared with previous years (Statistiska centralbyrån, 1968):

- Only road traffic accidents involving personal injury and known by the police are registered.
- The typology of the accidents has been changed.
- The terms serious and fatal injury has been given a slightly different meaning than before.
- Reporting has mainly been limited to such data that can be determined objectively.

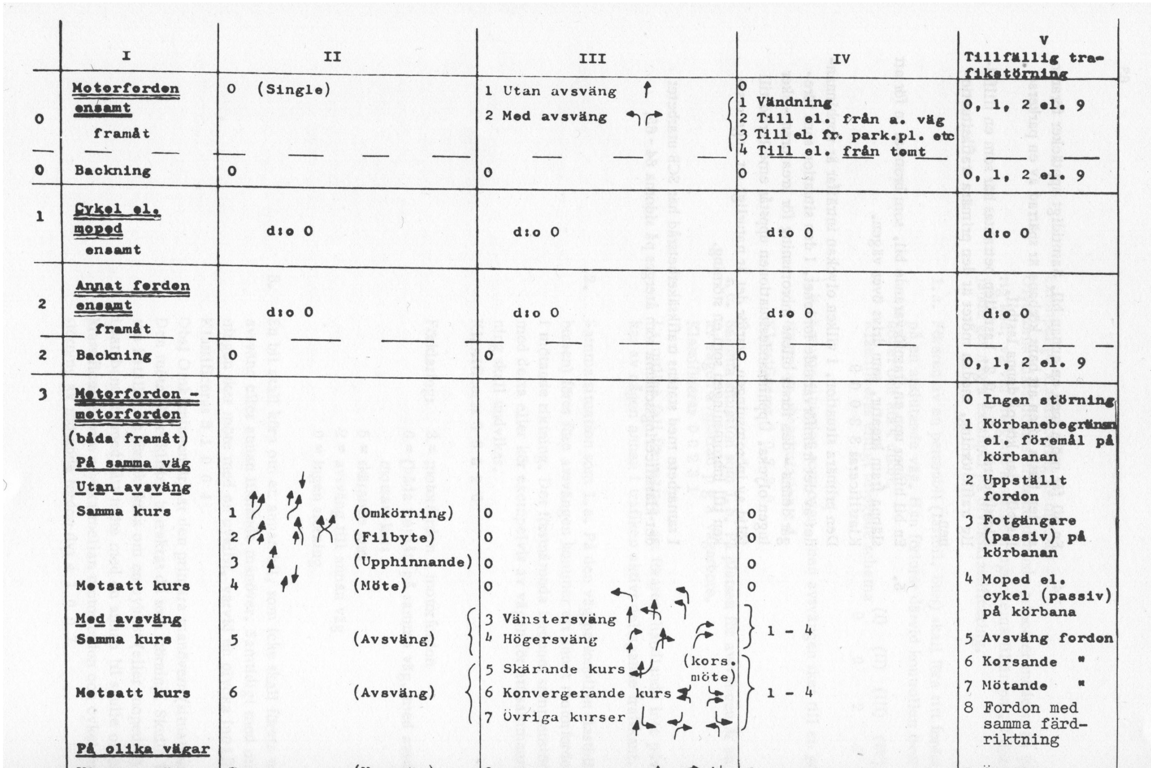
Accident types had before 1966 been based on the direct cause of injury, for example a single accident or collision between two oncoming vehicles. Starting in 1966, it is rather the situation that provokes the accident that determines the accident type classification. The classification was made by ”Statens Trafiksäkerhetsråd” and is based on the situations and manoeuvres which preceded the accident (Statistiska centralbyrån, 1968).

It is of great value to know how an accident develops and as the external circumstances before the accident objectively best gives an image of this, these circumstances has been chosen to be the basis for the classification of accident types. The initial principle for this has been to let the vehicles or road user positions and thought courses immediately before the accident and not the manoeuvres that will be a result of the accident to determine what type that accident should belong to (Statistiska centralbyrån, 1968).

In cases where a swerving or evasive action is taken to avoid for example collision, the accident is classified with respect to what would have occurred if the evasive manoeuvre had not been made. An example would be where a pedestrian suddenly steps out into the road in front of a vehicle and the driver, to avoid hitting the pedestrian, swerves and instead hit an object or drive into the ditch. The pedestrian will in this case not get hurt, but has however been actively involved in the accident and been part of the traffic situation that the driver has not mastered. It is therefore said to be natural to headline the accident as a pedestrian accident (Statistiska centralbyrån, 1968).

The reason that the accident gets a different course than the one dictated by external circumstances, however does not always need to be evasive or avoidance manoeuvre. For example when there is an overtaking between two vehicles and the overtaking vehicle collides with an oncoming vehicle or drives off the road, meaning that the two primary involved vehicles do not collide, the occurred accident is classified as an overtaking accident, as the overtaking was the primary manoeuvre that led to the accident. The oncoming vehicle is considered in this case as a temporary obstruction (Statistiska centralbyrån, 1968).

The principles of accident classification according to this system result in a five-digit code and it can be seen in Figure 4 and 5. In the first column to the left, the road users in conflict are listed, like "Motorfordon - gående" (Motor vehicle - pedestrian) and in the other columns different manoeuvres for each accident can be found. For example a motor vehicle tries to overtake another motor vehicle, but at the same time the motor vehicle meets a bicycle and an accident occurs. The accident is classified as overtaking and the bicycle is an obstruction. This gives the code 31004 according to the system shown in Figure 4 and 5 (Statistiska centralbyrån, 1968).



	I	II	III	IV	V Tillfällig trafikstörning
0	**Motorfordon ensamt** framåt	0 (Single)	1 Utan avsväng 2 Med avsväng	0 1 Vändning 2 Till el. från a. väg 3 Till el. fr. park.pl. etc 4 Till el. från tomt	0, 1, 2 el. 9
0	Backning	0	0	0	0, 1, 2 el. 9
1	**Cykel el. moped** ensamt	d:o 0	d:o 0	d:o 0	d:o 0
2	**Annat fordon ensamt** framåt	d:o 0	d:o 0	d:o 0	d:o 0
2	Backning	0	0	0	0, 1, 2 el. 9
3	**Motorfordon - motorfordon** (båda framåt)				0 Ingen störning 1 Körbanebegränsn el. föremål på körbanan 2 Uppställt fordon 3 Fotgängare (passiv) på körbanan 4 Moped el. cykel (passiv) på körbana 5 Avsväng fordon 6 Korsande " 7 Mötande " 8 Fordon med samma färdriktning 9 Övrigt
	På samma väg				
	Utan avsväng				
	Samma kurs	1 (Omkörning)	0	0	
		2 (Filbyte)	0	0	
		3 (Upphinnande)	0	0	
	Motsatt kurs	4 (Möte)	0	0	
	Med avsväng Samma kurs	5 (Avsväng)	3 Vänstersväng 4 Högersväng	1 - 4	
	Motsatt kurs	6 (Avsväng)	5 Skärande kurs (kors. möte) 6 Konvergerande kurs 7 Övriga kurser	1 - 4	
	På olika vägar				
	Utan avsväng	7 (Korsväg)	0	0	
	Med avsväng	8 (Korsväg)	5 Skärande kurs 6 Konvergerande kurs 7 Övriga kurser	1 - 4	

Figure 4: Accident classification system used from 1966, part one.

	Övrigt	9 (Övrigt)	0	0	
3	Backning	0	0	0	0
4	Motorfordon - cykel el. moped	d:o 3	d:o 3	d:o 3	d:o 3
5	Motorfordon - annat fordon	d:o 3	d:o 3	d:o 3	d:o 3
6	Motorfordon - gående Mf framåt	0	5 Skärande kurs 7 Övriga kurser 9 Övrigt	0 5 Samma färdriktn. gående t. vä. 6 Samma färdriktn. gående t. hö. 7 Motsatt färdriktn. gående t. vä. 8 Motsatt färdriktn. gående t. hö.	0 - 9
6	Backning	0	0	0	0
7	Motorfordon - djur	0	0	0	0
8	Spårfordon - annat trafik-element	d:o 3	d:o 3	d:o 3	d:o 3
9	Övrigt	0	0	0	0

Figure 5: Accident classification system used from 1966, part two.

The accident types used to present the statistics is following (Statistiska centralbyrån, 1968):

- Single (motor vehicle alone)
- Motor vehicle - Motor vehicle
- Meeting
- Overtaking and lane change
- Turning, same direction
- Turning, opposite direction
- Crossroad, no turning
- Crossroad, turning
- Motor vehicle - Bicycle/Moped
- Motor vehicle - Pedestrian
- Other (everything that does not fit in the categories above)

It can be noted that focus is on accidents with motor vehicles and not on vulnerable road users (Statistiska centralbyrån, 1968). The original proposal from "Statens Trafiksäkerhetsråd", however, had the following accident types in their own class (Larsson, 2007):

- Bicycle/Moped alone
- Other vehicle alone
- Motor vehicle - Animal
- Rail vehicle - Other traffic elements

4.1.3 The changes in the eighties and nineties

From year 1985 Statistics Sweden changed the presentation of accidents. Not only did the annual publication change the title from ”Vägtrafikolyckor med personskada” (Road traffic accidents with personal injury) to ”Trafikskador” (Traffic injuries). The change also meant that Motor vehicle - wild animal (moose, deer or reindeer) became a separate accident type. In contrast, accidents with U-turn got placed in ”other” accidents. They had previously belonged to turning accidents (Larsson, 2007).

A new computer system had been put into use, which meant opportunities for combining data from the car registry as well as the driver's license registry. The classification of accident types also almost got completely automatic based on the direction of movement of the primary involved traffic elements (Larsson, 2007).

In the yearly publication statistics of the following main groups now exists (Larsson, 2007):

- Motor vehicle single
- Motor vehicle - Motor vehicle
- Motor vehicle - Moped
- Motor vehicle - Bicycle
- Motor vehicle - Pedestrian
- Motor vehicle - Wild animal
- Other vehicle single
- Other

For the second, third and fourth main groups divisions are made based on overtake/lane change, rear end, meeting, turning (on the same road), Crossroad (in different directions) and other (Larsson, 2007). Examples of the manoeuvres included can be seen in Figure 6.

At the same time in the ”text chapters” accidents were divided into (Larsson, 2007):

- Single accidents (motor vehicle)
- Motor vehicle - Motor vehicle accidents (with subgroups overtake/lane change, rear end, meeting, crossroad and others)
- Motorcycle accidents (accidents with motorcycles involved, which really belongs to the accident above)
- Moped accidents (originally motor vehicle - moped or other)
- Bicycle accidents (originally motor vehicle - bicycle or other)
- Pedestrian accidents (which means motor vehicle - pedestrian)
- Wild animal accidents (motor vehicle - wild animal)
- Train accidents (refers to when motor vehicle collide with a train)

From 1988 tractor accidents were reported separately in the text chapter regarding accident types and in 1989 the wild animal accidents got replaced with animal accidents (Larsson, 2007).

Also, a more divided breakdown of the accident type ”other” is presented in the tables, which gives a clearer description of the traffic elements included. It shows for example bike - bike, bike - moped, bicycle - pedestrian, moped - moped, but also car - train and car - tram (Larsson, 2007).

In 1997 the police stopped the direct reporting of road accidents involving personal injury to statistic Sweden, which meant that only the Swedish Road Administration (Vägverket) carried out data recording and accident type classification. This means that comparisons backwards in time must be made with caution. The same accident types were however reported as previously in both tables and text in the annual publication (Larsson, 2007).

In 1998, the annual publication concerning road safety becomes a part of the series Official Statistics of Sweden and does once again change name. This time to ”Vägtrafikskador” (Road traffic injuries). No change is however made to the accident type classification (Larsson, 2007).

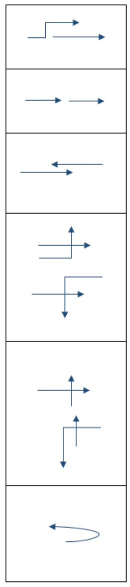


Figure 6: Manoeuvres presented in the statistics for accidents with motor vehicles (Statistiska centralbyrån, 1990).

The ten main groups of accident types used until 2002 was (Larsson, 2007):

- Single (S) - accident with only a motor vehicle involved
- Meeting (M) - motor vehicles on the same road, opposite directions, collision or swerving
- Overtaking (O) - motor vehicles on the same road overtaking
- Rear end (U) - motor vehicles on the same road in the same direction, no turning or overtaking
- Turning (A) - motor vehicles on the same road turning
- Crossing (K) - motor vehicles on different roads, turning or not turning
- Bicycle (C) - motor vehicle in conflict with bicycle or moped
- Pedestrian (F) - motor vehicle in conflict with pedestrian
- Animal (W) - conflict between motor vehicle and cloven
- Varia (V) - Conflict that cannot be attributed to any of the above types of accidents, for example animals (not cloven), rail vehicles, parked vehicle, U-turn or reversing, conflict between vulnerable road users

4.1.4 The changes in 2003 and STRADA

In 1993, the National Road Administration, then called Vägverket, was commissioned by the government to develop the traffic injury statistics database. It was thought then that the preventative safety work needed to be more effective (Vägverket, 2007).

The collected statistics were mainly based on police reported accidents and much information were considered missing. Certain road user groups were under-represented compared to reality and information about the personal injuries severity was lacking. In addition, there was duplication when several parties registered the police-reported accidents in their database. The lack of information about the actual traffic situation led to road safety problems were underestimated and that the wrong priorities were made. The picture below gives an overview of the problem, where the left part is based on the police reported accidents that normally is used for the traffic safety work (Vägverket, 1996).

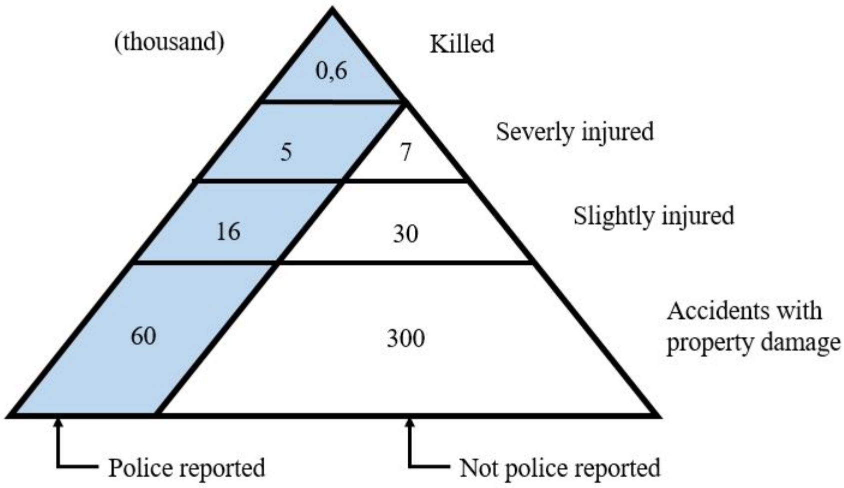


Figure 7: An overview of the problems with the statistics regarding the high number of unrecorded accidents (Vägverket, 1996).

In October 1997, the parliament adopted vision zero, the vision of a future road transport system that does not endanger human life and health. The decision meant a radical change in approach, accountability and safety philosophy. An important part of the decision was that safety work should be based on a public health perspective, where the individual's right to freedom from death and injury in the long term threatens the health should be at the centre of the whole road transport development (Vägverket, 2007).

Vision zero puts the more difficult injuries in focus, but accept that accidents happen. That led to that the concentration in road safety work in Sweden shifted from road accidents to personal injury. This means that road safety must focus on reducing injuries. The decision also meant that all actors in society have a role in the design, management and professional use of road transport and must work preventively to eliminate the risk of death and serious injury (Vägverket, 2007).

A proposal for a new information system was developed in collaboration with the police, social services, Statistics Sweden, Swedish association of local authorities and SIKA (Vägverket, 2007). The key to the new system was that it was the same for all involved in road safety work in Sweden. The system consists of two databases, a statistical database and an analysis database, and it is the medical care and police who deliver essential information to the databases (Vägverket, 1996).

This system that was introduced as STRADA (Swedish TRaffic Accident Data Acquisition) in 2003 and where the statistics of road traffic accidents are to be found today. When introducing the system Vägverket was in charge of the system, but from 2009 the main responsibility for STRADA has been transferred to the Swedish Transport Agency (Transportstyrelsen, 2016)

Regarding accident classification the new system is based on the injury occurrence rather than reason and is reminiscent to some extent the approach in the system before 1966 (Statistiska centralbyrån, 2003). This means that the accident type now stands for the consequence of the accident rather than the event that led to the accident. The difference is most prominent in the group of overtaking accidents. An accident that according to the previous accident classification definition was an overtaking accident will now be classified as a meeting accident or a single accident (Statistiska centralbyrån, 2003). In the publication ”Vägtrafikskador 2003” the names of the accident types however, are the same as before. But in the Administration's new database it can be noted that the accident types have changed and a number of new accident types have been added (Larsson, 2007).

STRADA is a GIS-based system, meaning that it is in most cases using a mapping tool, both at the registration and in the analysis of accident data. In the client program, various geographic selections can be chosen depending on what level you wish to have access to information. There are several opportunities to get access to anonymous information from STRADA. With the support of the information in STRADA the Road Administration and the municipal road maintenance can do road safety work in the places where there is coordinated registration (Vägverket, 2007).

Since the official statistics on accidents and injuries in road traffic accidents are based on police reported accidents it has quality defects due to the large number of unreported accidents. Probably only 35-50 percent of the actual number of traffic injuries in the country are reported. The statistics based on police reports, gives a very rough picture of the real situation of injury and accident situation for vulnerable road users (Vägverket, 2007).

With this background STRADA was developed to improve the information. By supplementing police reports of accidents and injuries in road traffic with injury registration at hospitals and to coordinate and make the procedures more effective you get another view of the traffic situation. The addition of Information from health care provides a better basis for deeper analysis of accidents origin and consequences and by extension of this local and regional as well as national road safety work can be more efficient (Vägverket, 2007). The basic process of STRADA registration can be seen in Figure 8.

For the police STRADA registration partly meant a new way of working, but only a few units did begin direct reporting on the accident scene. Such approaches would reduce duplication, but also raise the quality of information. Regarding health care, the new information system means extra work compared to earlier. This is because the information needed to conduct an effective road safety work is not normally demanded in healthcare (Vägverket, 2007).

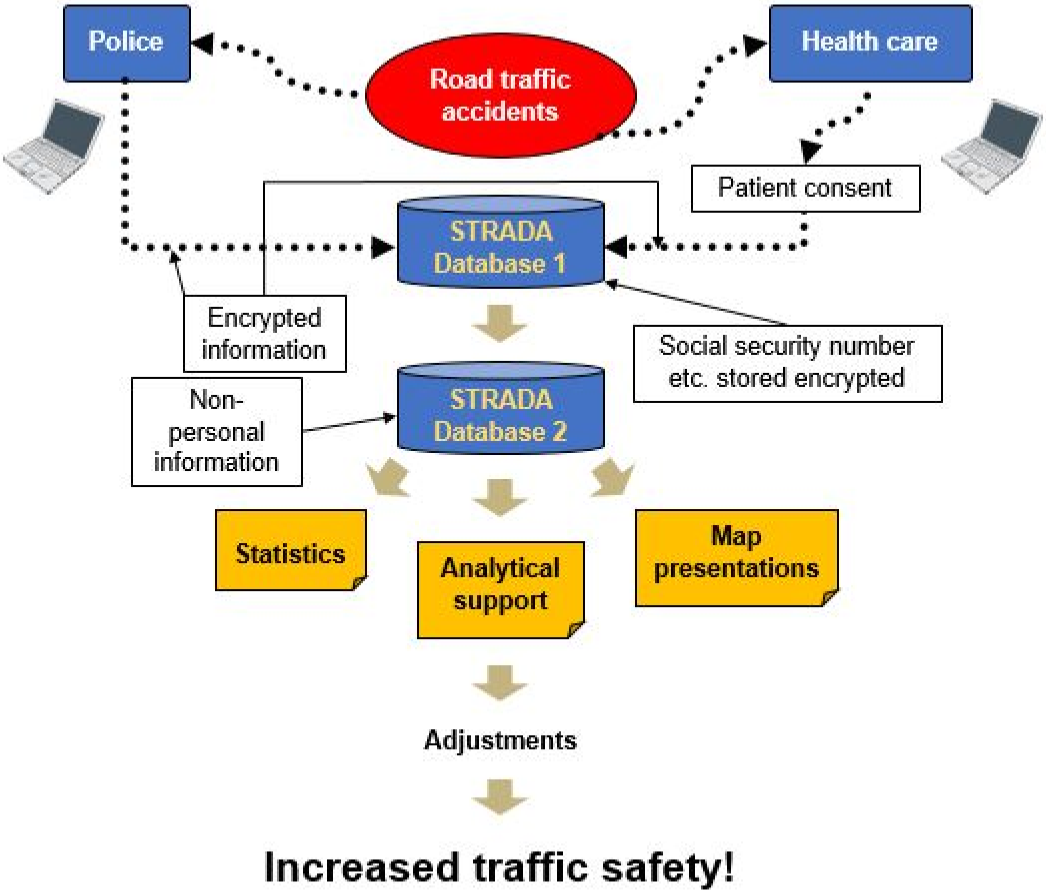


Figure 8: A simplified description of how STRADA works (Vägverket, 2007).

From the turn of the year 2002/2003 there is a nationwide registration in STRADA by the police and the official statistics are based on this information. This means that police data still is the basis for the knowledge of road traffic injuries and accidents. The difference is in reporting mode. Quality is expected to be higher as the registration takes place directly at the accident location with less impact on the basic data as a result. STRADA also has significantly more built quality controls than previous accident data system (Vägverket, 2007).

Since the turn of the year 2015/2016 there is also a nationwide registration in STRADA by the health care (Transportstyrelsen, 2016)

4.2 STRADA today

The information given on every accident consist of a police report and/or a report from health care. In the police report there is written information about time, place, accident type, description of the accident, weather conditions, road conditions, type of environment, light conditions, location type, attributes like crossings, road number, speed regulation, regulation, signalized and involved road users. Included is also a sketch describing the accident (Transportstyrelsen, 2016c). The sketch can look like in Figure 9 below.

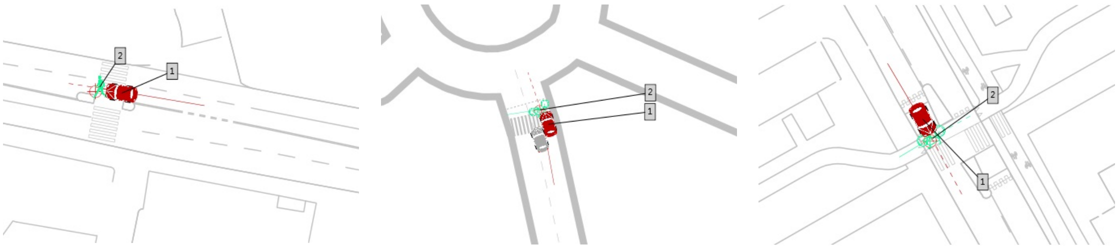


Figure 9: Examples of accident sketches in STRADA.

In the health care report there is written information about time, place, the injured road user, which hospital the road user went to, if the road user came with ambulance or not, if the police has been at the accident scene, description of the accident, accident type, road conditions, type of environment, location type, attributes like crossings and if any safety equipment was used, for example seatbelt. Along with the written information there is also a sketch showing the injuries and the severity of them according to AIS (Abbreviated Injury Scale) and ISS (Injury Severity Score). This can look like the illustration in Figure 10, where the colour grading at the top gives the severity. The more to the right, the more severe (Transportstyrelsen, 2016c).

The health care enters what body part is injured and type of injury, for example fracture. Injury registration generates an AIS Code and an ISS Code. AIS is developed to describe the harmful consequences of road accidents. The severity according to AIS is indicated on a scale from 1 to 6, where 1 = Slight damage and 6 = Maximum damage. AIS mainly indicates the probability of survival following a specific injury (Transportstyrelsen, 2016d).

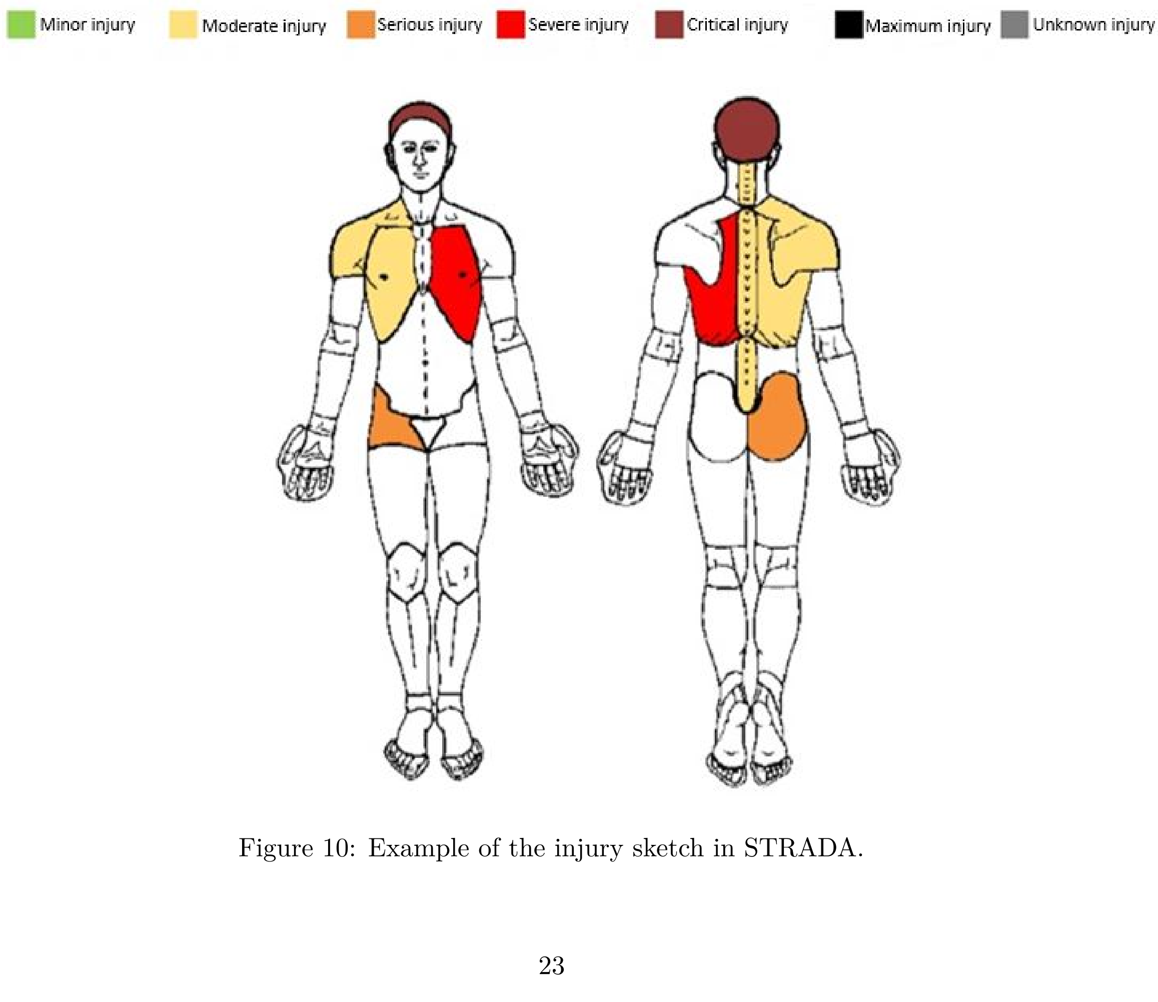


Figure 10: Example of the injury sketch in STRADA.

The AIS rate is specific to each injury and is not based on the injury's consequences, which means that the injury rate can be set as soon as the diagnosis has been set. Maximum AIS (MAIS) indicates the highest AIS degree of damage inflicted on a person (Transportstyrelsen, 2016d).

The effect of multiple injuries is graded according to ISS, which is calculated based on the AIS ranks. If any injury has AIS grade 6 ISS is always set to the maximum possible value of the ISS, which is 75. Otherwise, the ISS is calculated as follows (Transportstyrelsen, 2016d):

- Note the highest value of AIS in each body region.
- Square the three highest AIS values as noted in step 1.
- Summarize the three squared AIS values in step 2.

ISS value can be said to indicate the probability of survival with multiple injuries (Transportstyrelsen, 2016d).

The different accident types found in STRADA today are:

- A (Turning motor vehicle)
- C (Bicycle/moped - motor vehicle)
- F (Pedestrian - motor vehicle)
- G0 (Pedestrian single)
- G1 (Bicycle single)
- G2 (Moped single)
- G3 (Pedestrian - bicycle)
- G4 (Bicycle - bicycle)
- G5 (Bicycle - moped)
- G6 (Moped - pedestrian)
- G7 (Moped - moped)
- G8 (Pedestrian - pedestrian)
- J (Tram)
- J (Train)
- K (Crossing motor vehicle)
- M (Meeting motor vehicle)
- O (Overtaking motor vehicle)
- S (Motor vehicle single)
- U (Rear end motor vehicle)
- V0 (Other)
- V1 (animal, not cloven)
- V3 (tractor/snowmobile/ATV/motorized equipment)
- V5 (Parked motor vehicle)
- V6 (Backing/turning/U-turn)
- W (Wild animals - motor vehicle)

5 Accident data systems in Europe

Data of road accidents are collected in the European Union (EU) by each country with use of their own national collection systems. At European level, since 1991, road accident data are also available in CARE (Community database on Accidents on the Roads in Europe), the Community database on road accidents resulting in death or injury (Saurabh, 2013).

CARE includes detailed data on individual accidents as collected by the countries, using a structure which allows a great flexibility and potential with regard to analysing the information contained in the system (Saurabh, 2013).

The countries involved are; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom (Larsson, 2007).

According Saurabh (2013), the purpose of the CARE system is to provide a powerful tool which would make it possible to identify and quantify road safety problems throughout the European roads, evaluate the efficiency of road safety measures, determine the relevance of Community actions and facilitate the exchange of experience in this field.

Parts of each national data are integrated into the CARE database in their original national structure, but as national accident data collection systems are not always compatible and comparable the Commission provides and applies a outline on how to transformation the national data, so CARE can have compatible data (Saurabh, 2013).

The CARE database currently contains 55 common road accident variables. However, it is acknowledged that more variables and values are necessary to better describe and analyse the road accident phenomenon at EU level. Since there is so much differences in the collected accident data, both quality and availability are affected and the lack of comparable data limits the data analyses at EU level.

With this in mind the recommendation for a Common Accident Data Set (CADaS) has been developed containing of a minimum set of standardised data elements, which will allow for comparable road accident data to be available in Europe (Saurabh, 2013).

In the CADaS structure there are accident type variables (A-8 to A-12) that describes the type of the accident in terms of parties involved, type of collision and vehicle/pedestrian manoeuvre just before the accident (Saurabh, 2013).

In a report from 2000, in order to achieve the best comparability between countries, the types of accident was divided into five main groups (Larsson, 2007):

A) Accidents involving pedestrians

B) Accidents involving parked vehicles

C) Single Vehicle Accidents

D) At least two vehicles, no turning

E) At least two vehicles cross or any turning

Accident type A) is then divided into four subgroups: Pedestrians crossing the street and vehicles driving straight ahead, pedestrians crossing the street and the vehicle turns, pedestrians walk along the road or is stationary, other.

Accident B) has three types: Collision with parked vehicle on either side of the road, accident involving door opening, other.

Accident type C) is divided into two types according to whether the object has been run over or not. Accident D) has three types, overtaking, meeting and a rest subtype. U-turn can be classified as one of the first two subtypes.

Finally accident E) five subtypes. Turning - collision with vehicles behind, Turning - collision with oncoming, Crossing - both driving straight forward, Turning - collision with intersecting, other. When the accidents then are divided into a third level it appears that animal accidents and accidents between trains and road vehicles belongs to the main group C) that is single-vehicle accidents. In the third level it is also evident that it is the collision that counts, not the conflict (Larsson, 2007).

In Denmark the national accident data system uses a similar way. The accident types used in the system is based on the manoeuvre and describes the movements of the first two parties prior to the accident. The main groups that the accidents get divided into are (Hemdorff, 2004):

- One-vehicle accidents
- Vehicles on same road going in same direction without turning from road
- Vehicles on same road going in opposite directions without turning from road
- Vehicles on same road going in same direction, turning into T-junction, Y-junction, etc.
- Vehicles on same road going in opposite direction, turning into T-junction, Y-junction, etc.
- Vehicles on different roads meeting in crossroads, without turning
- Vehicles on different roads meeting in T-junction, Y-junction, etc. turning
- Accidents involving parked vehicles
- Accidents involving pedestrians
- Accident involving animals, obstacles, etc., on or above roadway

6 A proposed accident coding system

To investigate how a more extended accident coding system can enhance the usefulness of STRADA and what can be learned from it, a new code system is built up.

6.1 The code

The code system is built up were all relevant information about the accident can be described in a code, which is made up of four main parts, see Figure 11.

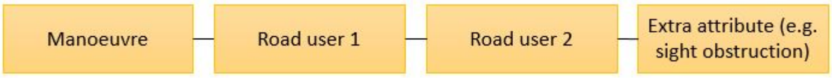


Figure 11: The main four parts of the code.

The complete code looks like presented in Figure 12.

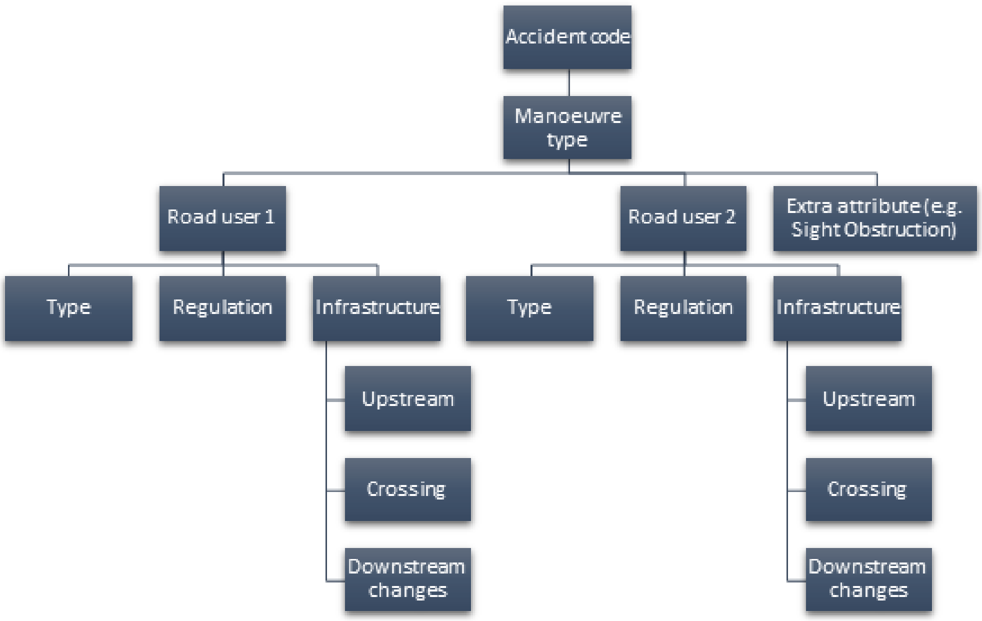


Figure 12: The complete code.

The first part describes which type of manoeuvre that preceded the accident and is based on the structure in CADaS in the CARE database. Each manoeuvre is given a three digit number where the first number in the manoeuvre code is a reference to the seven main groups of manoeuvres.

These seven groups are:

1. Single accidents
2. Accidents between road users travelling in the same or opposite direction
3. Accidents between road users travelling in the same or opposite direction into a crossroad
4. Accidents between road users meeting in a crossroad

5. Crossing without crossroad
6. Accidents with parking vehicles
7. Accidents with obstacles

In CARE For example the manoeuvre given the three digit code 402, se Figure 13, is equivalent to A-8.02, see Figure 14.

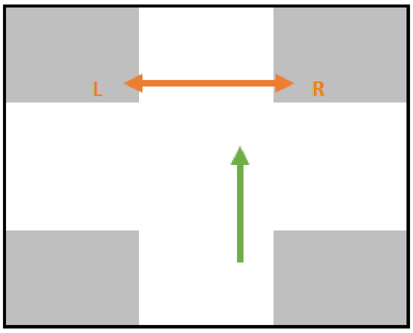


Figure 13: Manoeuvre 402 in the code system.

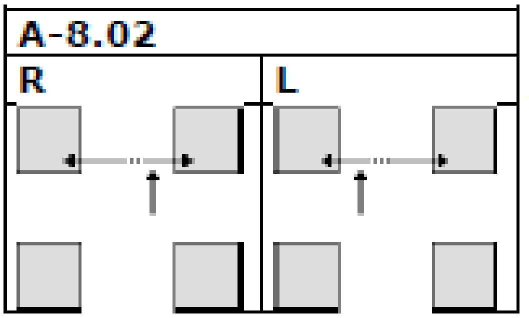


Figure 14: Manoeuvre A-8.02 in CARE.

The complete list of manoeuvres with their three-digit number can be seen in Appendix B. The colouring of the arrows in the manoeuvre pictures is related to which road user is mentioned first in the code (orange first, then green). To some manoeuvre codes an additional letter (L or R) is added to specify which version of that manoeuvre is meant.

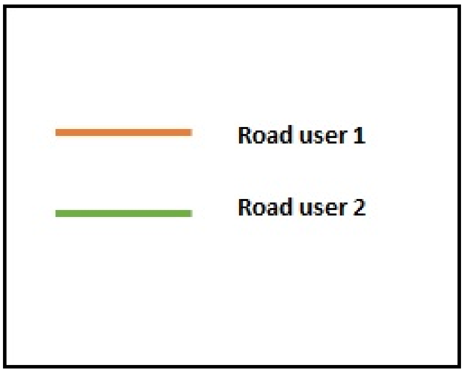


Figure 15: The colouring of the arrows in the manoeuvre pictures, road user 1 with orange and road user 2 with green.

The second and third part gives information about the road users involved. First what kind of road user and then if that road user had any known regulation to follow, for example yield or a traffic light. Any information given on the infrastructure for the road users are also included. The available road users and their codes and regulation codes can be seen in tables below.

Table 1: Road user codes.

Road user	**Code**
Pedestrian	P
Bicycle	B
Car	C
Bus	BUS
Heavy vehicle	HGV
Moped	MOP
Motorcycle	MOT
Tram	T

Table 2: Regulation codes.

Regulation	**Code**
Right hand rule	R
Yield	Y
Stop	STOP
Signalized	S
Roundabout	C

The infrastructure information is meant to give information if there are any changes from ”upstream” to ”downstream” that can be a contributing factor to the accident. For example, if the bicycle path disappears after a crossroad which forces the bicyclist to use the road instead and mix with motor vehicles. Information about the type of crossing can also be found. The different options of infrastructure codes can be seen below.

Table 3: Infrastructure upstream the accident and their codes.

Upstream	**Code**
Walk path	WW
Bicycle path	BB
Combined walk path and bicycle path	BW
Bycicle lane	CB
Carriageway	C
Unknown	U

Table 4: Type of crossing and their codes.

Crossing	**Code**
Pedestrian only	P
Bicycle	B
Combined	C
Not a crossing	N
Unknown	U

Table 5: Infrastructure changes downstream the accident and their codes.

Downstream	**Code**
Walk path disappears	WD
Bicycle path disappears	BD
Combined walk path and bicycle path disappears	BWD
Bicycle disappears	CBD
Carriageway lane decreases	CD
Same as upstream	S
Unknown	U

If something in the downstream change appears, an A is used, instead of a D which stands for disappears.

The last and fourth part is whether there were additional circumstances that should be taken into account such as if there were other vehicles that obscured the view. Examples of that can be seen below.

Table 6: Sight obstructions and their codes.

Sight obstruction	**Code**
Next to road, right	NR
Next to road, left	NL
Parked vehicle on the road, right	PR
Parked vehicle on the road, left	PL
Vehicle going in the same direction	VS
Vehicle going in the opposite direction	VO

For some accidents, there is also a part added that gives information about the accident place that can be relevant, like if it happened at a bus stop or a parking lot. If a part of the code is unnecessary for a specific accident, that part of the code is replaced by X. If information about a part of the code is lacking for a specific accident, that part is replaced with U.

6.2 Examples from the proposed coding system

Below are three examples of the code's structure and the corresponding traffic situation.

Code: 302--BUS-U-CXS--B-U-BBBBD--NR--BUSSTOP

The complete description of the parts in the code can be seen in Figure 16.

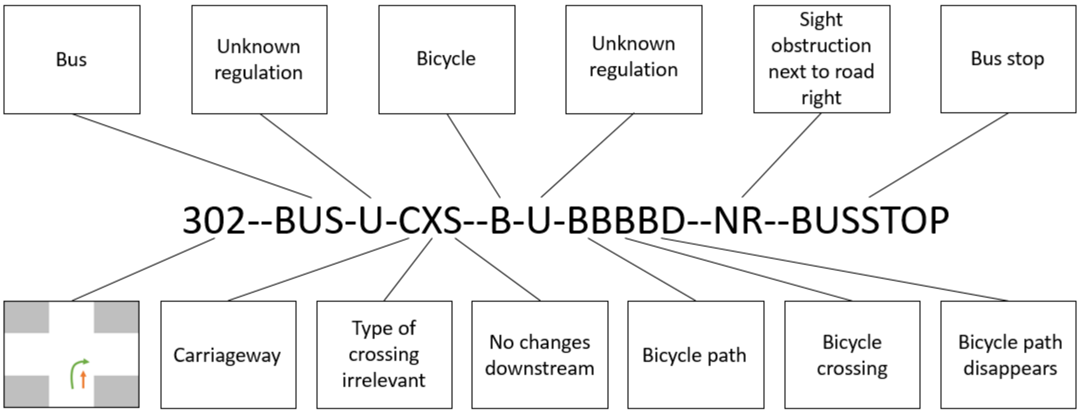


Figure 16: The complete description of the code.

In this case the bus is the inner orange arrow and the bicycle the outer green one. The regulation for the bus is unknown and it is travelling on the road without any changes after the crossroad. The regulation for the bicycle is also unknown and up to the crossroad the bike is travelling on a bicycle path. The bicycle is crossing on a bicycle only crossing and after the crossing the bicycle path disappears. There is also a sight obstruction next to the road on the right hand side and the accident happens at a bus stop. The actual scene of the accident looks like in Figure 17.

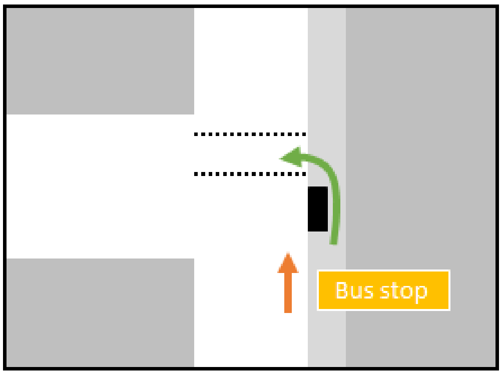


Figure 17: Actual accident scene for example one.

Code: 401.R--P-S-BWCS--C-S-CXCD--U

The complete description of the parts in the code can be seen in Figure 18.

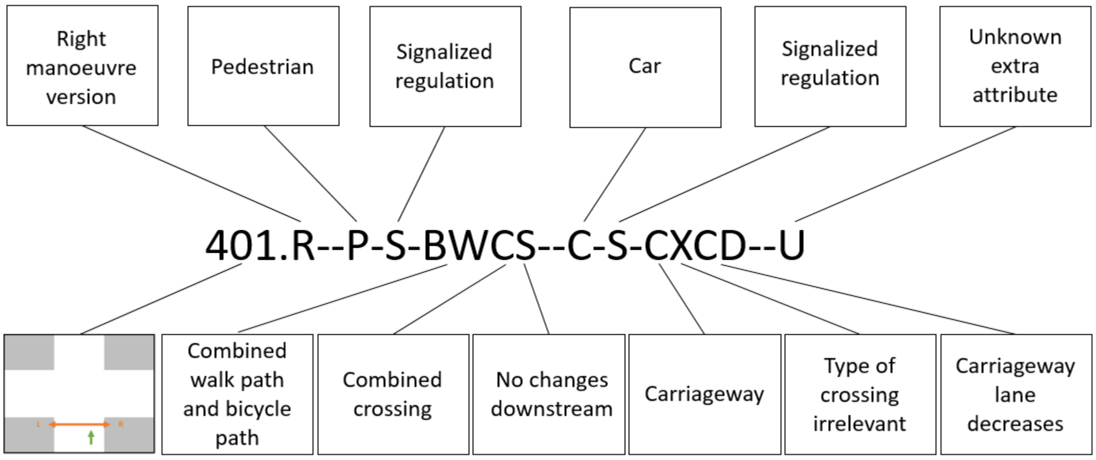


Figure 18: The complete description of the code.

In this case the pedestrian is the orange arrow and the car the green. The regulation for both road users is a signalized crossroad.

The pedestrian is before the crossroad travelling on a combined walk path and bicycle path that continues after the crossing and the crossing is a combined one (pedestrian and bicycle).

The car is travelling on the road and after the crossroad the number of lanes decreases. If there was any sight obstruction at the time of the accident is unknown.

The actual scene of the accident looks like in Figure 19.

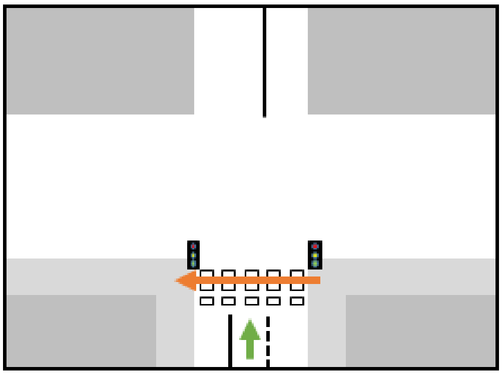


Figure 19: Actual accident scene for example two.

Code: 501.R--B-Y-BWBU--C-Y-CXS--U

The complete description of the parts in the code can be seen in Figure 20.

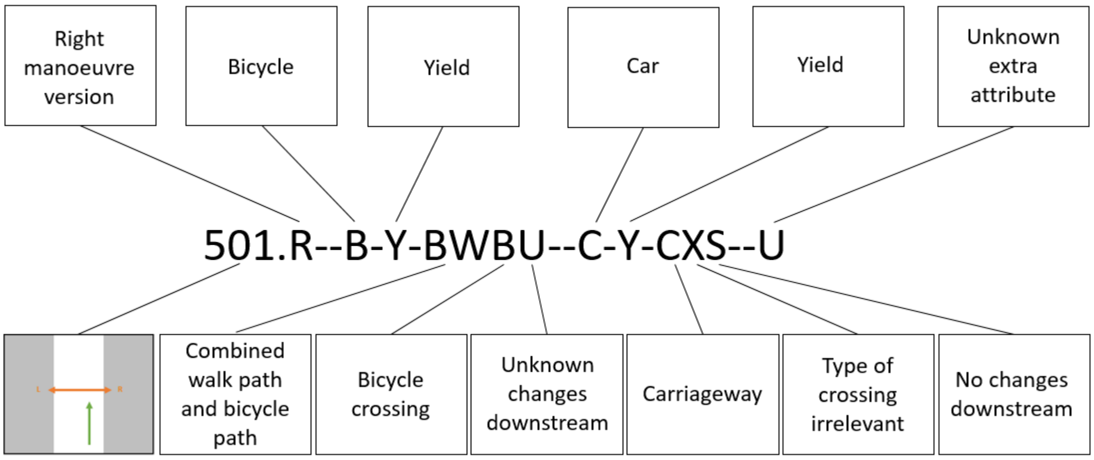


Figure 20: The complete description of the code.

In this case the bicycle is the orange arrow and the car the green. The regulation for both road users is yield.

The bicycle is before the crossroad travelling on a combined walk path and bicycle path and crosses on a bicycle only crossing. What happens after the crossing is unknown.

The car is travelling on the road that continues with no changes after the crossroad.

If there was any sight obstructions at the time of the accident is unknown. The actual scene of the accident looks like in Figure 21.

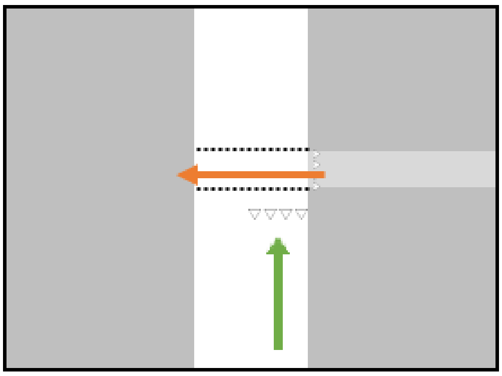


Figure 21: Actual accident scene for example three.

7 A pilot with the proposed extended accident coding system

7.1 The accidents

The accident analysis done in the study is based upon accidents that led to serious (an Injury Severity Score of 9 or higher) or fatal injury with vulnerable road users in Gothenburg and Malmö (2nd and 3rd biggest cities in Sweden) during 2009-2013. Due to the design of the database, searches based upon the information that is requested isn't possible and therefore every accident has been manually classified with the new code.

7.2 Results in general

During this time period 734 accidents were registered, 423 in Malmö and 311 in Gothenburg. Of the 734 accidents, 243 involving cyclists, 393 involving pedestrians and 58 each involving mopeds and motorcyclists.

Of the 734 accidents 274 are registered by both police and health care. But there are 12 accidents that are only registered by the police and 448 only by the health care. The police reported accidents are only 39 percent of the total number of accidents, see Figure 22.

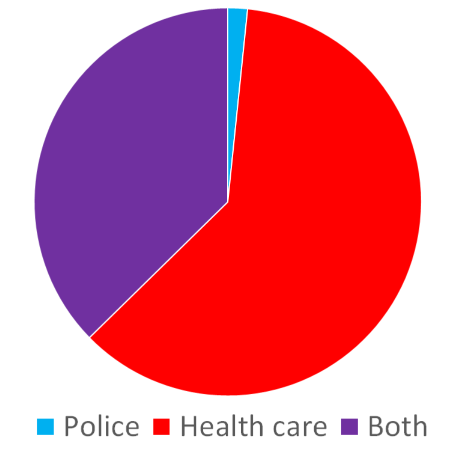


Figure 22: The distribution of the registered accidents by who reported them.

A majority of the accidents were single accidents (63%). Most of those accidents are only registered by hospitals and therefore they are missing valuable information on the course of events.

The number of accidents vary in the cities from year to year as can be seen in Figure 23.

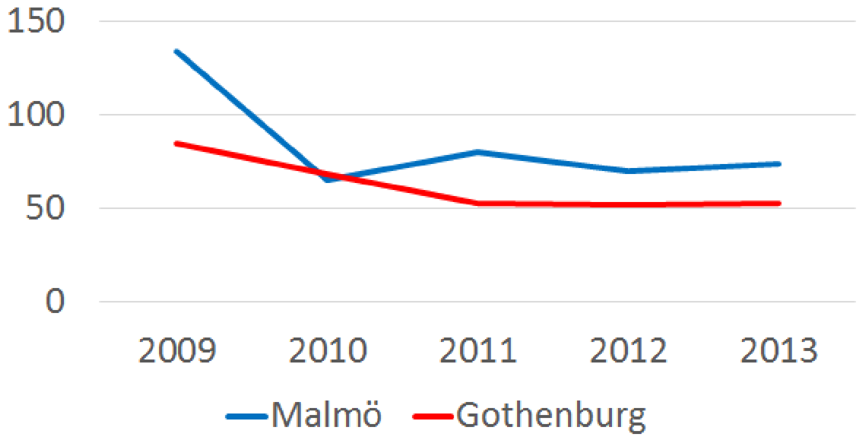


Figure 23: Accidents per year in Malmö and Gothenburg.

Looking at the manoeuvres leading to the accident, a frequency diagram can be seen in Figure 24, where each column represents a manoeuvre. This is the result for Malmö and Gothenburg combined and it is clear that the single accidents (101-104) and the unknown manoeuvres (U) are the dominating manoeuvres. If you exclude those accidents the most common manoeuvres are those who represent over 10 percent each of the remaining accidents (manoeuvre 501, 402 and 401). They represent the manoeuvres when an unprotected road user is crossing the road without a crossroad (501) and the road users are meeting from different directions in a crossroad (402 and 401). These manoeuvres can be seen in Figure 25.

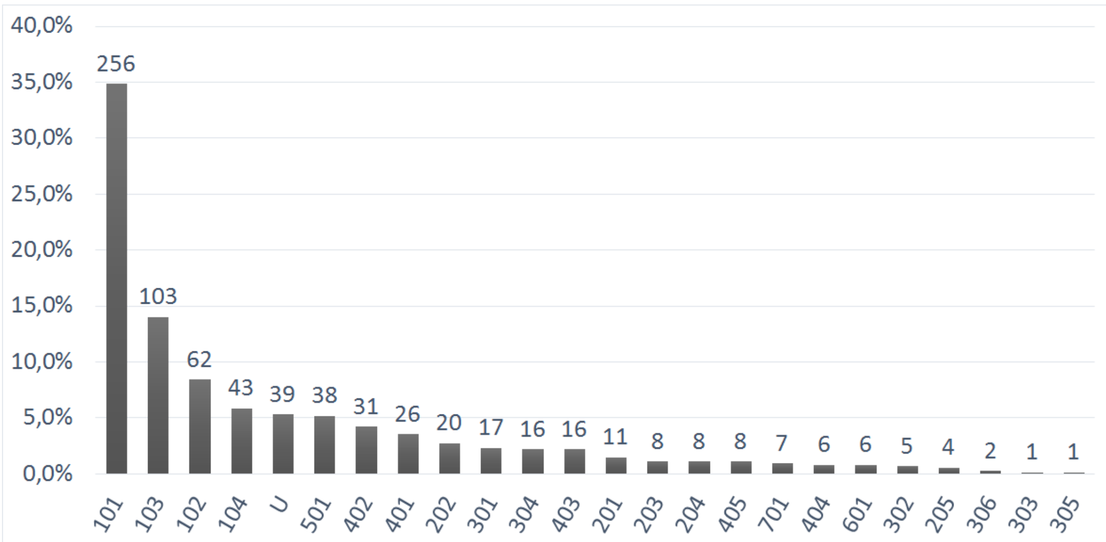


Figure 24: The distribution of the 734 accidents by manoeuvre type (see codes in Appendix B).

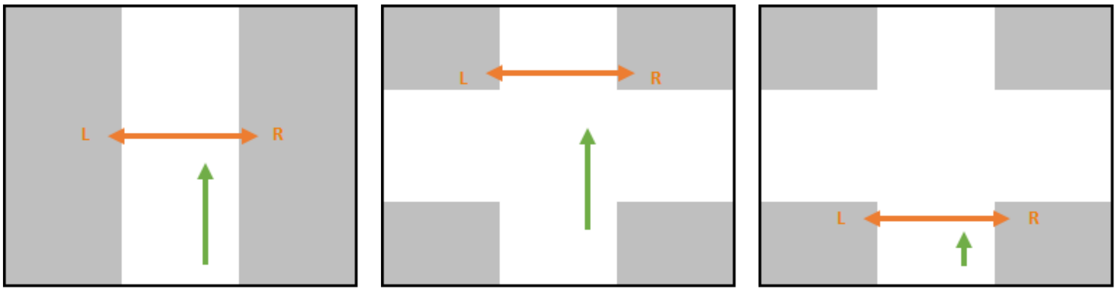


Figure 25: The most common manoeuvre types; 501, 402 and 401.

As the manoeuvre pictures indicate there is a right or left version for each of these manoeuvres depending on from which direction the first road user (the orange arrow) is coming from.

To be able to get any information out of the code it is important that the parts of the code are known. For all accidents (single not included) it can be seen in Table 7 below for how many accidents a part is known or not. It is decided that if a part is unknown, in more than 40 percent of the accidents, it would not be presented further. Those parts are marked red in the table.

Table 7: Known parts of accident code.

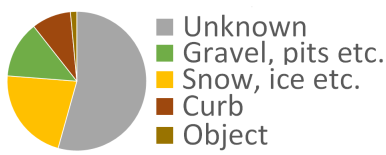
Part of the code	**Known**	**Unknown**
Road user 1	262	1
Regulation, road user 1	92	171
Upstream, road user 1	192	71
Downstream, road user 1	111	152
Road user 2	262	1
Regulation, road user 2	92	171
Upstream, road user 2	192	71
Downstream, road user 2	111	152
Crossing	179	84
Sight obstruction	15	248
All	1508	1122

7.3 Single accidents

The single accidents circumstances however have, as far as it has been possible, been divided into the following (see Table 8):

Table 8: Registered circumstances for single accidents

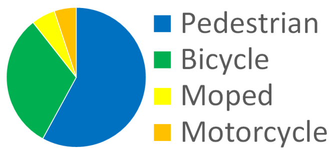
Circumstances registered	**Total**	**Malmö**	**Gothenburg**
Unknown	256	184	72
Snow, ice etc.	103	49	54
Gravel, pits etc.	62	37	25
Curb	43	26	17
Object	7	4	3
Total	471	300	171



The number of single accidents per vulnerable road user can bee seen in Table 9.

Table 9: Vulnerable road user.

Vulnerable road user	Total	Malmö	Gothenburg
Pedestrian	273	179	94
Bicycle	148	104	44
Moped	26	8	18
Motorcycle	24	9	15
Total	471	300	171



Of the 471 single accidents 51 are registered by both police and health care. But there are 3 accidents that are only registered by the police and 417 only by the health care. The accidents reported by health care make up 89 percent of the total number of registered single accidents, see Figure 26.

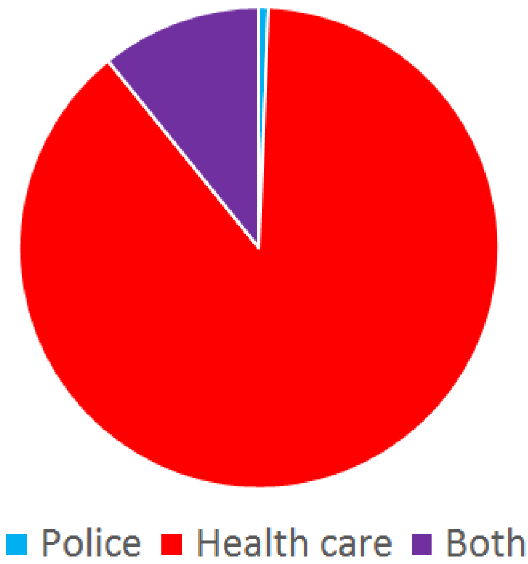


Figure 26: The distribution of the registered single accidents by who reported them.

The accidents registered by health care are however missing valuable information on the course of events. The only classification that has been possible to make is a distinction between accidents that happens because of snow, ice etc.; gravel, pits etc. or because the road user had hit the curb or an object. But for the majority of the single accidents the course of events are still unknown. Hospital data contribute a lot to understanding the extent of the safety problems, since the dominating part of the accidents are single accidents. But in order to help understanding the conditions of the accidents there needs to be more information about the course of events, something that today is lacking.

7.4 Pedestrians

Of the analysed accidents, 393 involved pedestrians. A majority of the accidents were single accidents (69%). Of the single accidents, nearly half of them (46%) is missing useful information about the events of the accident. Twenty nine percent is due to the pedestrian slipping on either snow, ice or wet leaves. In 14 percent of the single accidents the pedestrian have fallen because gravel, pits or other circumstances that has made the surface uneven and 10 percent has fallen because of the curb.

The result for all accidents involving pedestrians can be seen in Figure 27, where it is clear that the single accidents 101-104 are the majority.

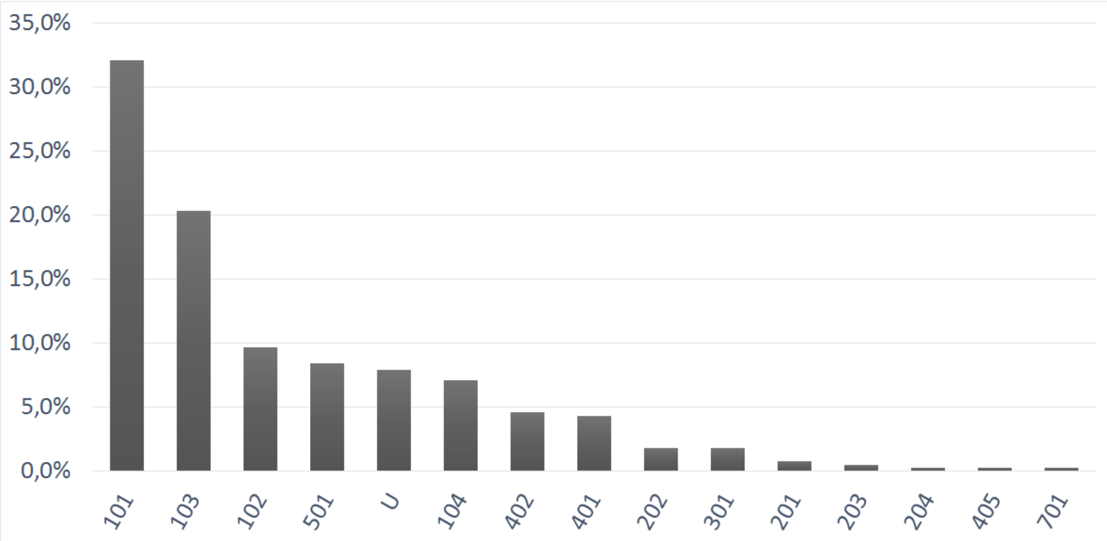


Figure 27: The distribution of the pedestrian accident by manoeuvres.

Looking at the manoeuvres leading to the accident the most common (single accident not included) in both cities combined, just like in the overall result, is when a pedestrian is crossing the road without a crossroad (501) and when the road users (one pedestrian) are meeting from different directions in a crossroad (402 and 401).

With the code it is possible to get more information regarding accidents with these manoeuvre types, which is presented in the following chapter.

7.4.1 Manoeuvre 501

Figure 28 shows manoeuvre 501.

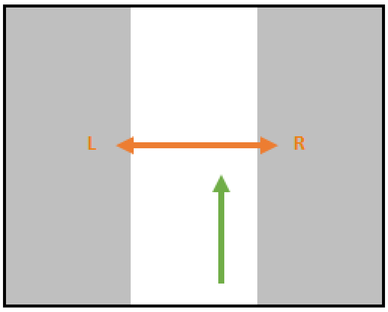
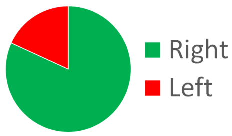
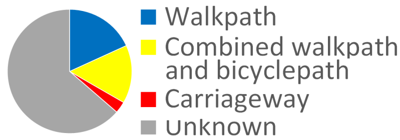


Figure 28: Manoeuvre 501.

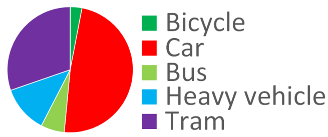
Number of accidents with manoeuvre 501	33
Right	27
Left	6



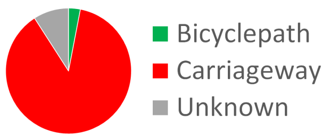
Upstream infrastructure, road user 1	Total	Malmö	Gothenburg
Walk path	6	2	4
Combined walk path and bicycle path	5	3	2
Carriageway	1	0	1
Unknown	21	6	15



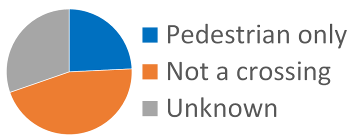
Road user 2	Total	Malmö	Gothenburg
Bicycle	1	0	1
Car	16	8	8
Bus	2	1	1
Heavy vehicle	4	2	2
Tram	10	-	10



Upstream infrastructure, road user 2	Total	Malmö	Gothenburg
Bicycle path	1	0	1
Carriageway	29	11	18
Unknown	3	0	3



Crossing	Total	Malmö	Gothenburg
Pedestrian only	8	1	7
Not a crossing	15	8	7
Unknown	10	2	8



7.4.2 Manoeuvre 402

Figure 29 shows manoeuvre 402.

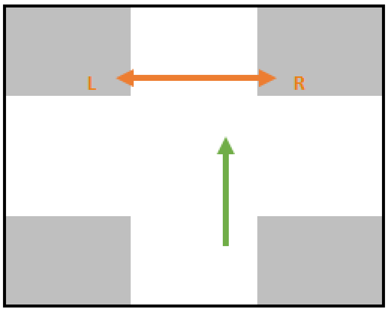
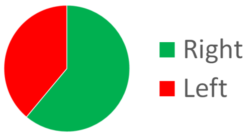


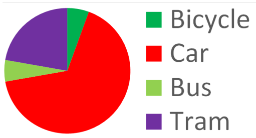
Figure 29: Manoeuvre 402.

Number of accidents with manoeuvre 402	18
Right	11
Left	7

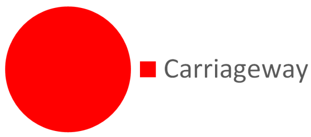


Upstream infrastructure, road user 1	Total	Malmö	Gothenburg
Walk path	1	0	1
Combined walk path and bicycle path	10	4	6
Unknown	7	1	6

Road user 2	Total	Malmö	Gothenburg
Bicycle	1	0	1
Car	12	3	9
Bus	1	0	1
Tram	4	-	4



Upstream infrastructure, road user 2	Total	Malmö	Gothenburg
Carriageway	18	5	13



Crossing	Total	Malmö	Gothenburg
Pedestrian only	12	4	8
Combined	2	0	2
Unknown	4	1	3

7.4.3 Manoeuvre 401

Figure 30 shows manoeuvre 401.

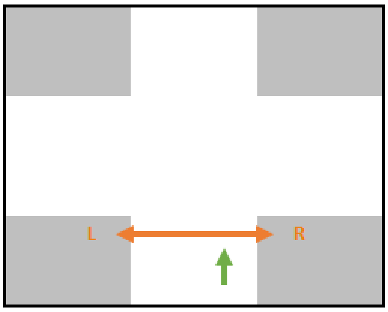
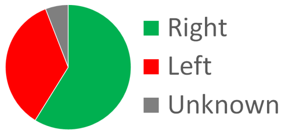


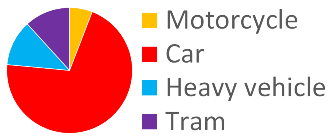
Figure 30: Manoeuvre 401.

Number of accidents with manoeuvre 401	**17**
Right	10
Left	6
Unknown	1



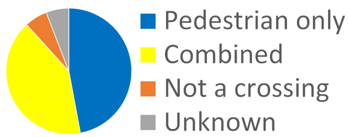
Upstream infrastructure, road user 1	**Total**	**Malmö**	**Gothenburg**
Walk path	6	1	5
Combined walk path and bicycle path	9	6	3
Unknown	2	1	1

Road user 2	**Total**	**Malmö**	**Gothenburg**
Car	12	6	6
Motorcycle	1	0	1
Heavy vehicle	2	1	1
Tram	2	-	2



Upstream infrastructure, road user 2	**Total**	**Malmö**	**Gothenburg**
Carriageway	17	8	9

Crossing	**Total**	**Malmö**	**Gothenburg**
Pedestrian only	8	3	5
Combined	7	4	3
Not a crossing	1	1	0
Unknown	1	0	1



7.4.4 All accidents with pedestrians

When looking at all accidents involving pedestrians the following information can be found. Pedestrians are most in conflict with cars, followed by tram. It is worth knowing that tram traffic only exist in Gothenburg, see Figure 31.

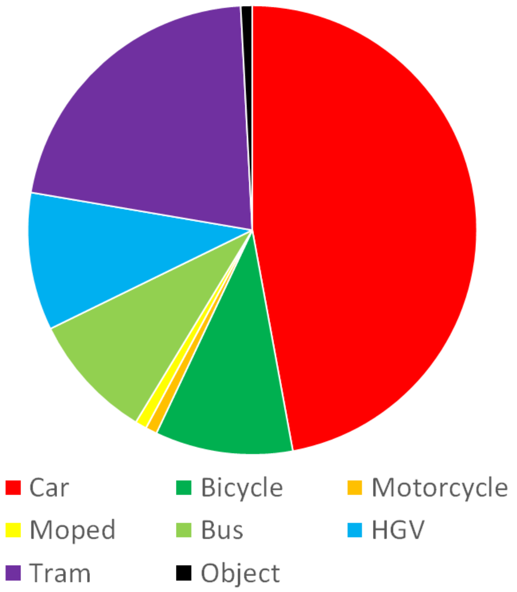


Figure 31: The road users which pedestrians are most in conflict with.

Looking at manoeuvres divided after type of regulation gives that the most common accident manoeuvre in signalized intersections is type 401 and 402 (see Figure 32).

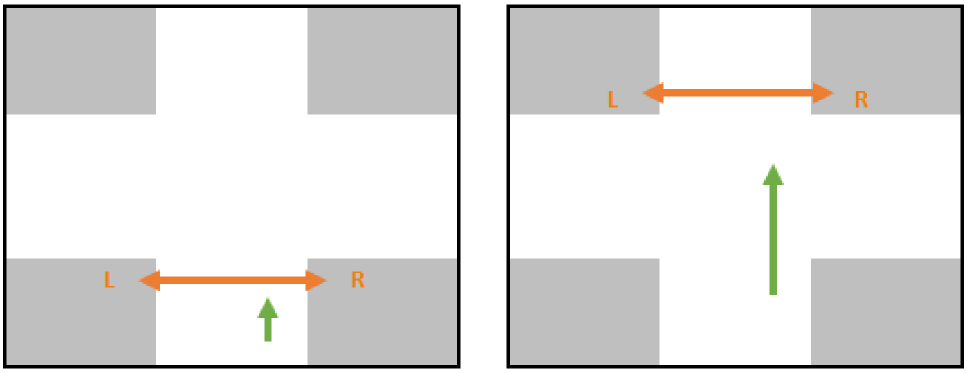


Figure 32: Manoeuvres 401 and 402.

The most common in roundabouts is 402 (see Figure 33):

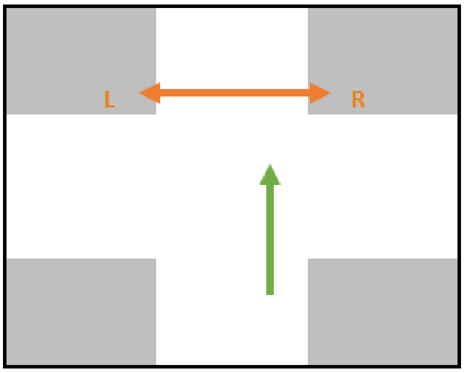


Figure 33: Manoeuvre 402.

If the regulation is yield the most common is 401(see Figure 34):

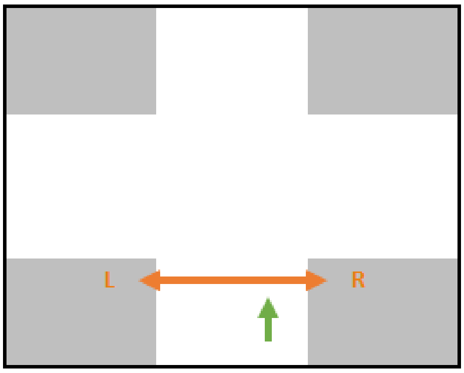


Figure 34: Manoeuvre 401.

The infrastructure for the pedestrian is presented in Table 10, 11 and 12.

Table 10: Infrastructure upstream pedestrian accident.

Upstream	
Walk path	39%
Combined walk path and bicycle path	18%
Carriageway	8%
Unknown	34%

Table 11: Type of crossing, pedestrian accident.

Crossing	
Pedestrian only	12,7%
Bicycle only	0,3%
Combined	3,1%
Not a crossing	4,3%
Unknown	78,9%
Irrelevant	0,8%

Table 12: Infrastructure changes downstream pedestrian accident.

Downstream infrastructure	
Same as upstream	9%
Unknown	91%

Some of the accidents happen at certain locations or under certain circumstances. For example 6 of the accidents were backing accidents involving three manoeuvres (202, 401 and 501, see Figure 35).

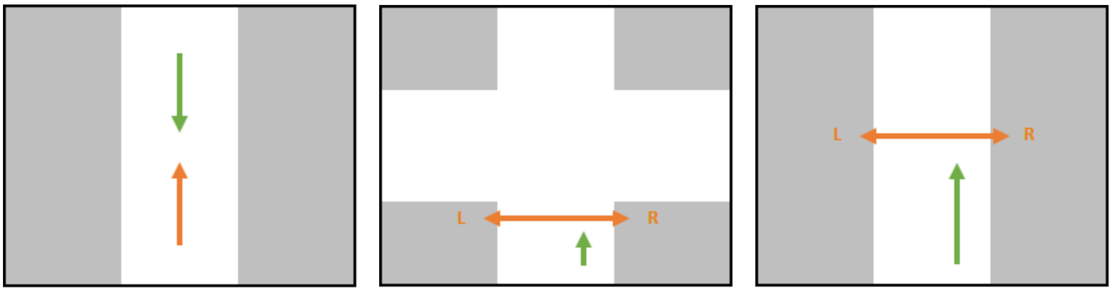


Figure 35: Manoeuvres 202, 401 and 501.

One accident happened at a pedestrian street, 21 on a parking lot and 26 at a bus stop/tram stop/train station. Of the 26 accidents at public transport stops, the accidents can be seen in Figure 36:

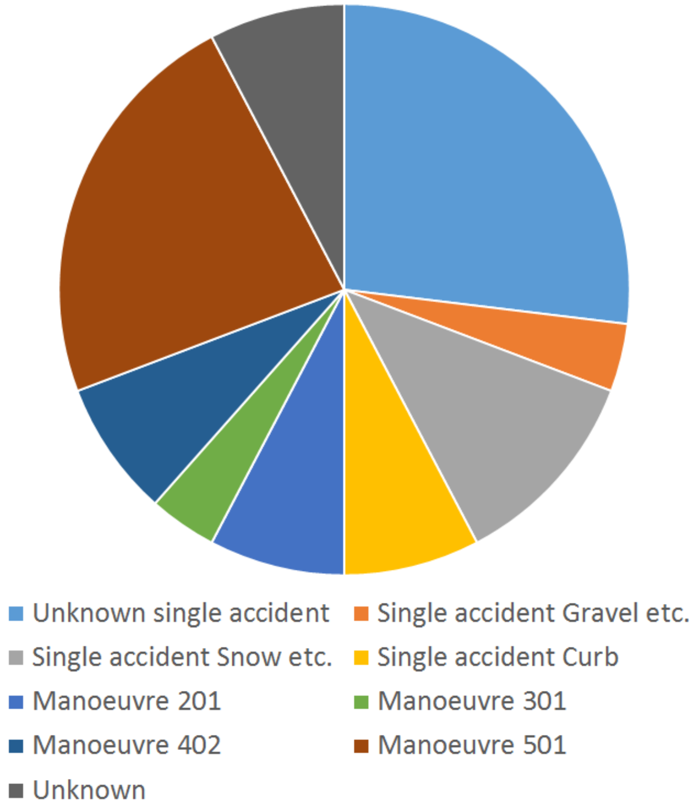


Figure 36: Distribution of accidents involving pedestrians at public transport stops.

The manoeuvres in Figure 36 are illustrated in Figure 37.

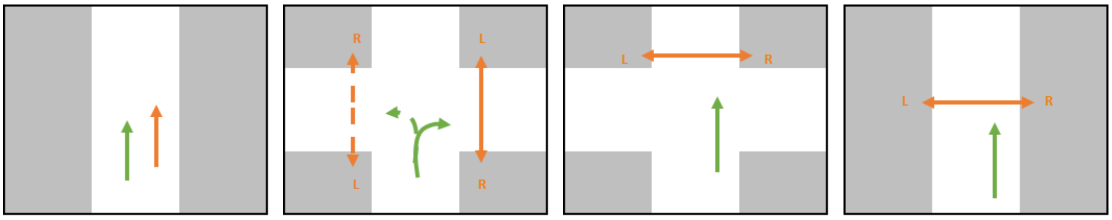


Figure 37: Manoeuvres 201, 301, 402 and 501.

7.5 Bicyclists

Of the analysed accidents, 243 involved bicyclists. A majority of the accidents were single accidents (60%). Of the single accidents more than half of them (66%) is missing information about the events of the accident. Thirteen percent is due to the bicyclist slipping on either snow, ice or wet leaves. In 13 percent of the single accidents the bicyclist has fallen because gravel, pits or other circumstances that has made the surface uneven and 8 percent has fallen because of the curb.

The result for all accidents involving bicyclists can be seen in Figure 38.

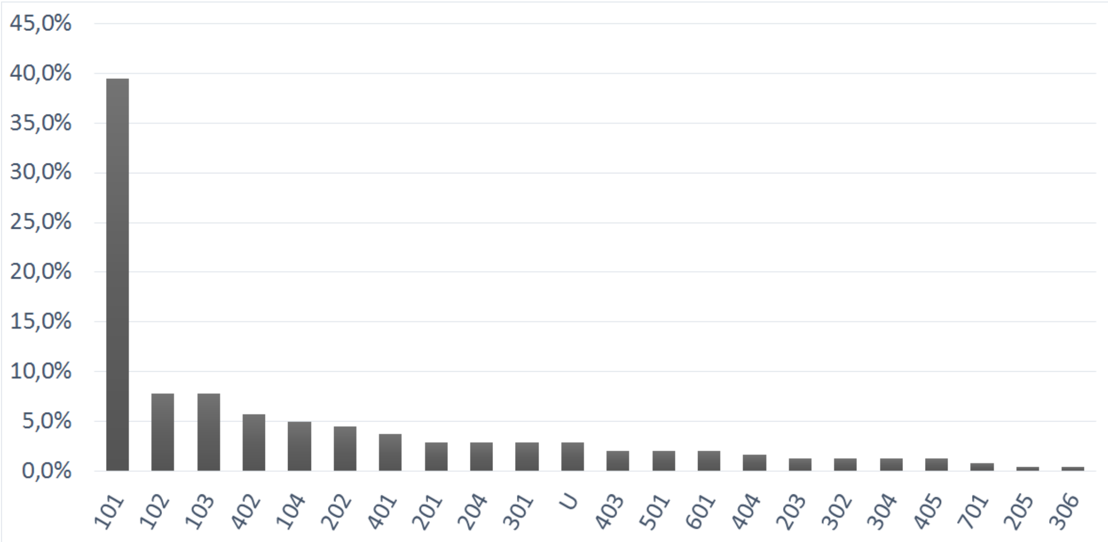


Figure 38: The distribution of the bicycle accidents by manoeuvres.

Looking at the manoeuvres leading to the accident the most common (single accident not included) in both cities combined is when the road users (at least one bicyclist) are meeting from different directions in a crossroad or meeting ”head-on”.

With the code it is possible to get more information regarding these manoeuvre accidents, which is presented below.

7.5.1 Manoeuvre 402

Figure 39 shows manoeuvre 402.

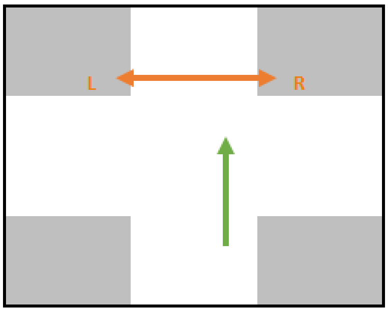
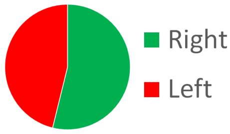
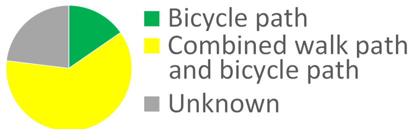


Figure 39: Manoeuvre 402.

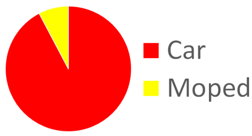
Number of accidents with manoeuvre 402	13
Right	7
Left	6



Upstream infrastructure, road user 1	Total	Malmö	Gothenburg
Bicycle path	2	1	1
Combined walk path and bicycle path	8	4	4
Unknown	3	0	3

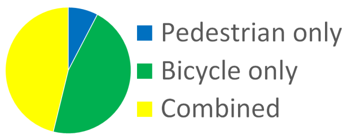


Road user 2	Total	Malmö	Gothenburg
Car	12	5	7
Moped	1	0	1



Upstream infrastructure, road user 2	Total	Malmö	Gothenburg
Carriageway	13	5	8

Crossing	Total	Malmö	Gothenburg
Pedestrian only	1	0	1
Bicycle only	6	2	4
Combined	6	3	3



7.5.2 Manoeuvre 202

Figure 40 shows manoeuvre 202.

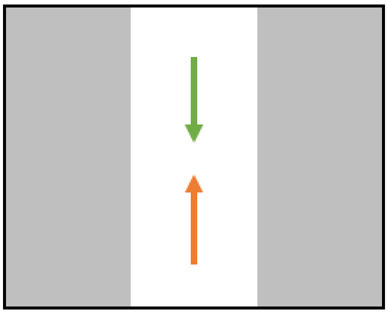
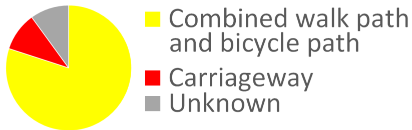
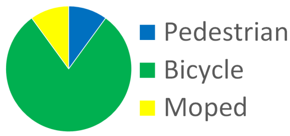


Figure 40: Manoeuvre 202.

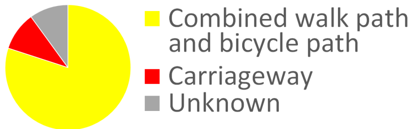
Upstream infrastructure, road user 1	Total	Malmö	Gothenburg
Combined walk path and bicycle path	8	2	6
Carriageway	1	0	1
Unknown	1	1	0



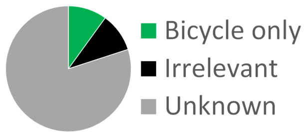
Road user 2	Total	Malmö	Gothenburg
Bicycle	8	3	5
Pedestrian	1	0	1
Moped	1	0	1



Upstream infrastructure, road user 2	Total	Malmö	Gothenburg
Combined walk path and bicycle path	8	2	6
Carriageway	1	0	1
Unknown	1	1	0



Crossing	Total	Malmö	Gothenburg
Bicycle only	1	1	0
Irrelevant	1	0	1
Unknown	8	2	6



7.5.3 Manoeuvre 401

Figure 41 shows manoeuvre 401.

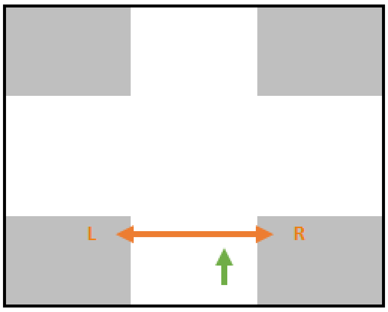
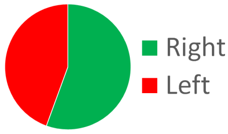
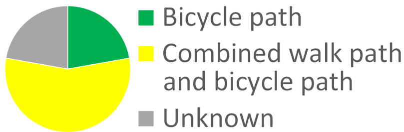


Figure 41: Manoeuvre 401.

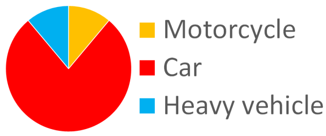
Number of accidents with manoeuvre 401	9
Right	5
Left	4



Upstream infrastructure, road user 1	Total	Malmö	Gothenburg
Bicycle path	2	1	1
Combined walk path and bicycle path	5	2	3
Unknown	2	1	1

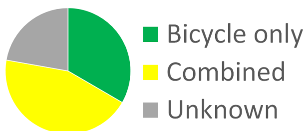


Road user 2	Total	Malmö	Gothenburg
Car	7	2	5
Heavy vehicle	1	1	0
Motorcycle	1	1	0



Upstream infrastructure, road user 2	Total	Malmö	Gothenburg
Carriageway	9	4	5

Crossing	Total	Malmö	Gothenburg
Bicycle only	3	0	3
Combined	4	3	1
Unknown	2	1	1



7.5.4 All accidents with bicyclists

When looking at all accidents involving bicyclists the following information can be found: the road user bicyclist are most in conflict with is cars, followed by pedestrians and other bicyclists (see Figure 42).

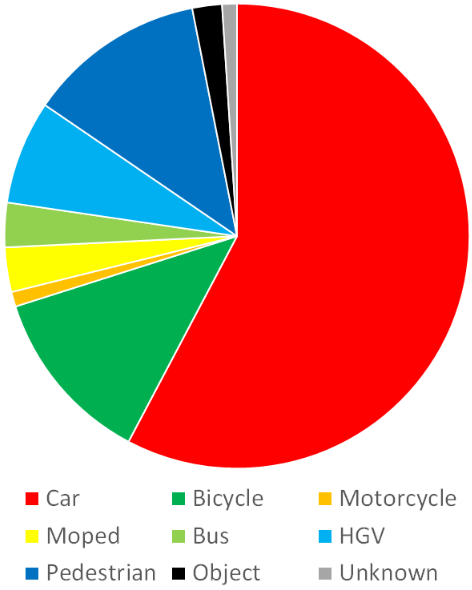


Figure 42: The road users which bicyclists are most in conflict with.

Looking at manoeuvres divided after type of regulation gives that the most common accident manoeuvre in signalized intersections as well as in roundabout is manoeuvre 402 (see Figure 43):

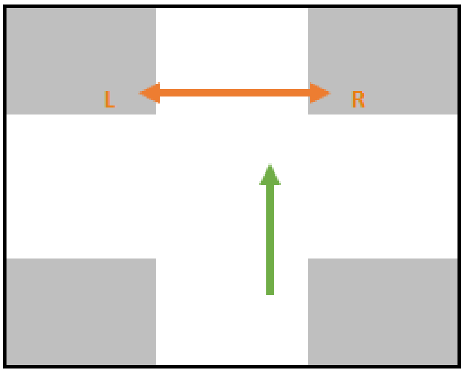


Figure 43: Manoeuvre 402.

If the regulation is yield the most common manoeuvres are 401 and 404 (see Figure 44):

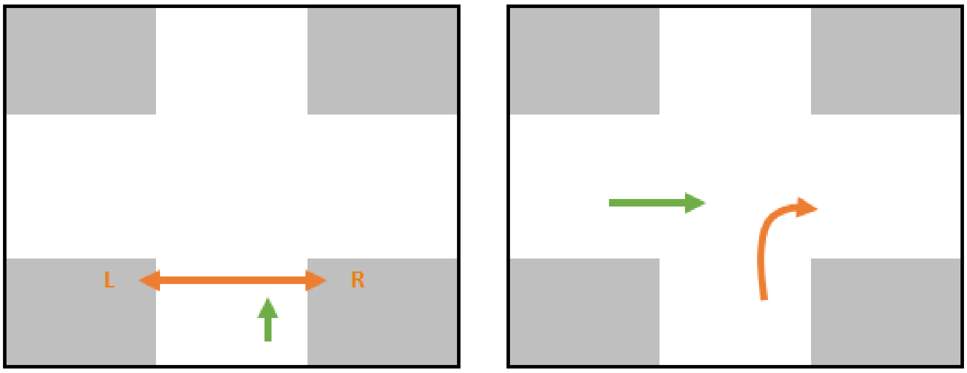


Figure 44: Manoeuvres 401 and 404.

The regulation and infrastructure for the bicyclists in the accidents are shown in Table 13 - 16.

Table 13: Regulation for bicycle.

Regulation	
Right hand rule	0,4%
Yield	3,3%
Signalized	5,3%
Unknown	88,9%
Irrelevant	2,1%

Table 14: Infrastructure upstream bicycle accident.

Upstream infrastructure	
Walk path	1,6%
Bicycle path	4,9%
Combined walk path and bicycle path	42,4%
Bicycle lane	0,4%
Carriageway	31,7%
Unknown	18,9%

Table 15: Type of crossing, bicycle accident.

Crossing	
Pedestrian only	0,4%
Bicycle only	9,1%
Combined	7,4%
Unknown	7,8%
Irrelevant	12,3%

Table 16: Infrastructure changes downstream.

Downstream infrastructure	
Bicycle path disappears	0,4%
Combined walk path and bicycle path appears	0,4%
Combined walk path and bicycle path disappears	0,4%
Bicycle lane disappears	0,4%
Carriageway lane decreases	0,4%
Same as upstream	19,3%
Unknown	78,6%

Some of the accidents happened at certain locations or under certain circumstances. For example one of the accidents happened at a bus stop and four on a parking lot. In five accidents there was an sight obstruction, however non of them had any similarities.

7.6 Mopeds

Of the analysed accidents, 58 involved mopeds. Forty percent of the accidents were single accidents. Of the single accidents 70 percent is missing information about the events of the accident. Seventeen percent is due to the moped slipping on either snow, ice or wet leaves. In 9 percent of the single accidents the moped have fallen because gravel, pits or other circumstances that has made the surface uneven and 4 percent has fallen because of the curb.

Looking at the manoeuvres leading to the accident the most common (single accident not included) in both cities combined is when the road users (at least one moped) are meeting in a crossroad from different directions and meeting in a crossroad were one is turning. Those manoeuvres are 403 and 304 and can be seen in Figure 45.

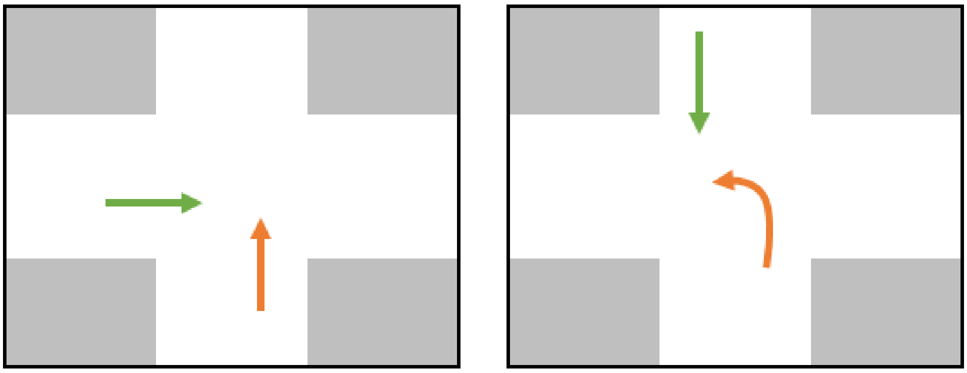


Figure 45: Manoeuvres 403 and 304.

The road user, mopeds are most in conflict with, is cars, followed by bicyclists (see Figure 46).

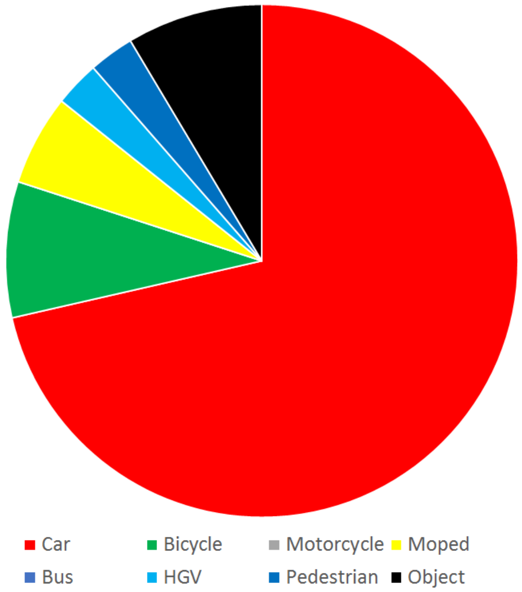


Figure 46: The road users which mopeds are most in conflict with.

Looking at manoeuvres divided after type of regulation gives that the most common accident manoeuvre in signalized intersections is manoeuvre 301 (see Figure 47):

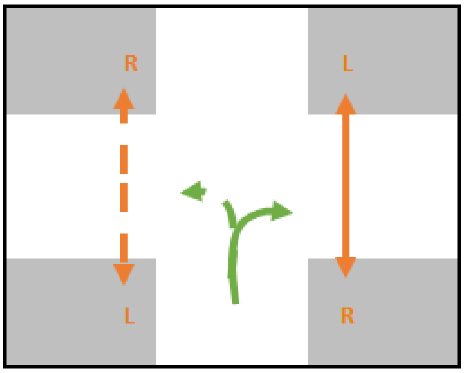


Figure 47: Manoeuvre 301.

The most common in roundabout is manoeuvre 403 (see Figure 48):

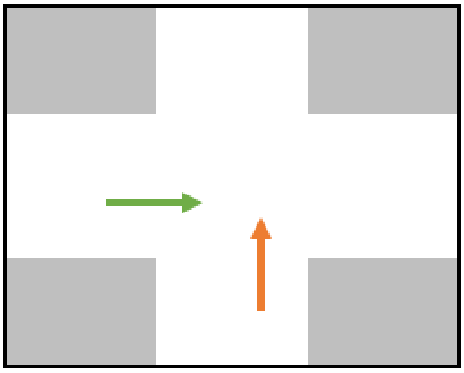


Figure 48: Manoeuvre 403.

If the regulation is yield the most common is manoeuvre 304 (see Figure 49):

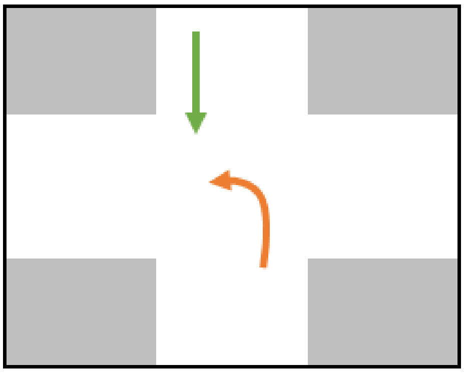


Figure 49: Manoeuvre 304.

7.7 Motorcyclists

Of the analysed accidents, 58 involved motorcyclists. Forty percent of the accidents were single accidents. Of the single accidents 78 percent is missing information about the events of the accident. In 13 percent of the single accidents the motorcyclist has fallen because gravel, pits or other circumstances that has made the surface uneven and 9 percent has fallen because of the curb. In opposite to the other vulnerable road user groups there is no accidents registered to have occurred because of snow, ice or wet leaves for motorcyclists.

Looking at the manoeuvres leading to the accident the most common (single accident not included) in both cities combined is when the road users (at least one motorcyclist) are meeting in a crossroad were one is turning, meeting in a crossroad from different directions and rear end accidents. Those manoeuvres can be seen in Figure 50.

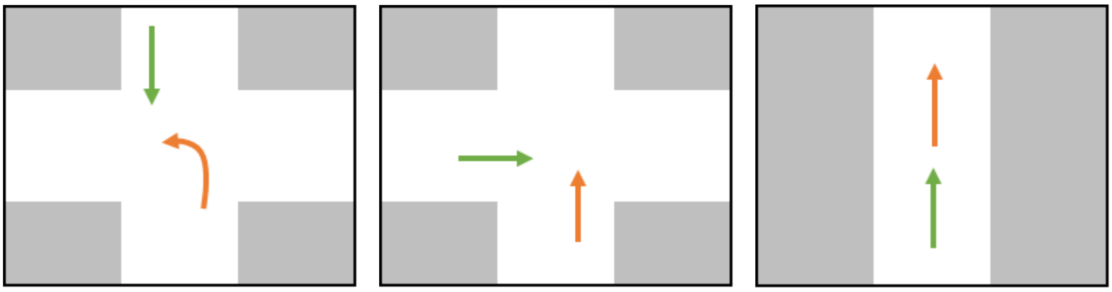


Figure 50: Manoeuvres 304, 403 and 203 for motorcycle accidents.

The road user motorcyclists are most in conflict with is cars, followed by buses (see Figure 51).

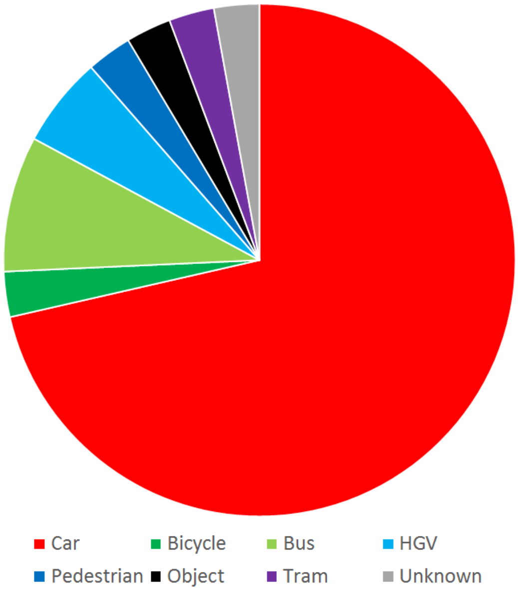


Figure 51: The road users which motorcyclists are most in conflict with.

Looking at manoeuvres divided after type of regulation gives that the most common accident manoeuvre in signalized intersections is manoeuvre 304 (see 52):

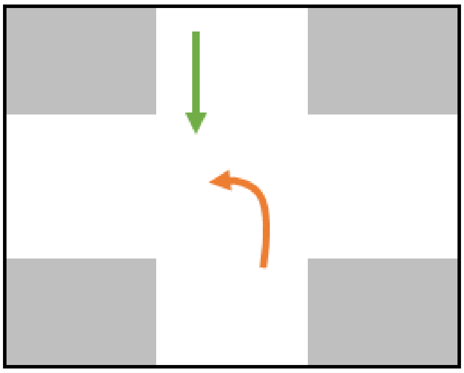


Figure 52: Manoeuvre 304.

The most common in roundabouts is single accidents and if the regulation is yield the most common is manoeuvre 403 (see Figure 53):

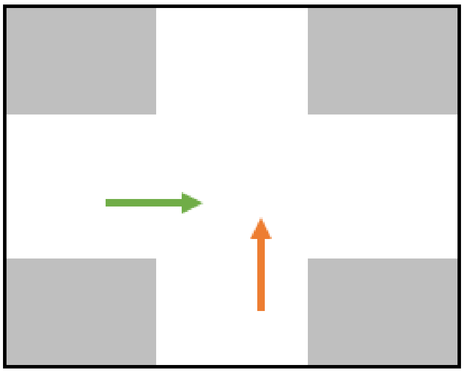


Figure 53: Manoeuvre 403.

7.8 Malmö versus Gothenburg

Separating the result from each city we can see some differences. There were 423 accidents in Malmö and 311 in Gothenburg and who registered the accidents can be seen in Figure 54 and 55. In Malmö the police reported accidents are 31,2 percent of the total number and in Gothenburg the police reported ones are 49,5 percent.

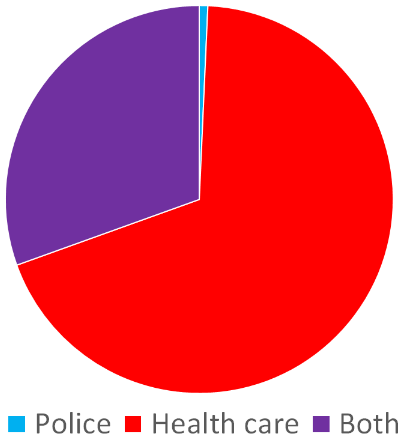


Figure 54: The distribution of the accidents by who reported them in Malmö.

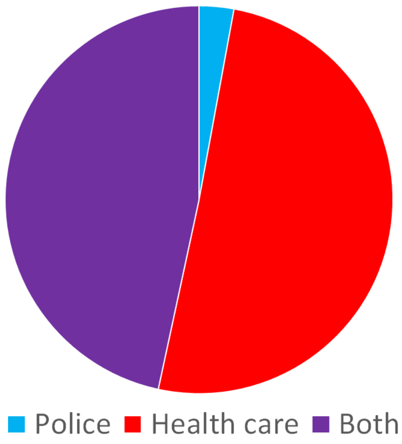


Figure 55: The distribution of the accidents by who reported them in Gothenburg.

In Malmö the manoeuvres 501, 401, 202 are the three most common ones (see Figure 56).

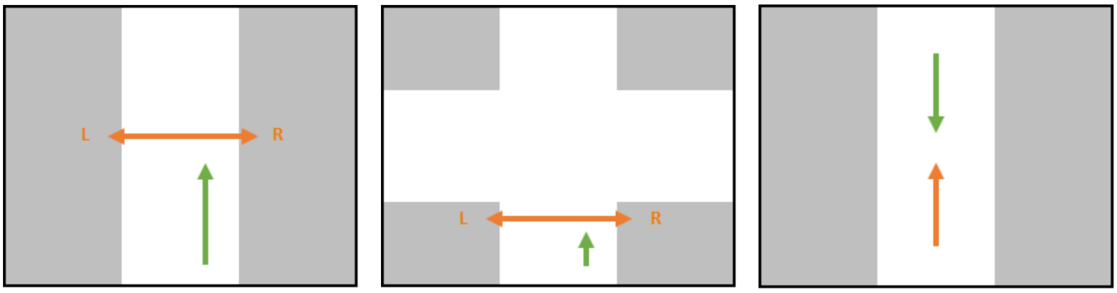


Figure 56: Manoeuvres 501, 401 and 202.

In Gothenburg the manoeuvres 501, 402, 401 are the three most common ones, same as when you combine the result (see Figure 57):

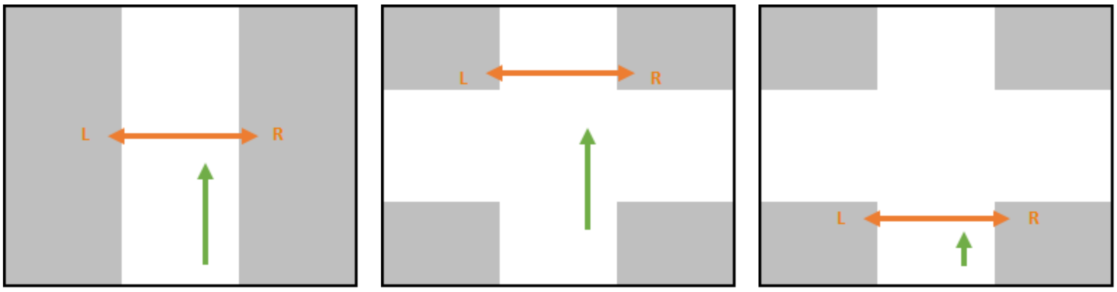


Figure 57: Manoeuvres 501, 402 and 401.

Looking in STRADA, there are some differences between the accident types found in the two cities. In Malmö there are three accident types that occur that cannot be found in the result from Gothenburg, A (turning motor vehicle), J (train) and V3 (tractor/snowmobile etc.). In Gothenburg there are two accident types that cannot be found in the result from Malmö, G6 (moped - pedestrian) and J (Tram).

7.9 The code system compared with STRADA classification

A comparison of the code system with STRADA should be done with caution since the systems have different ways of presenting the result. It is especially hard to find the corresponding result with the code since the aim was to find more information in STRADA that is not presented in an overall search. The result in STRADA, based on accident type, can be seen in Figure 58.

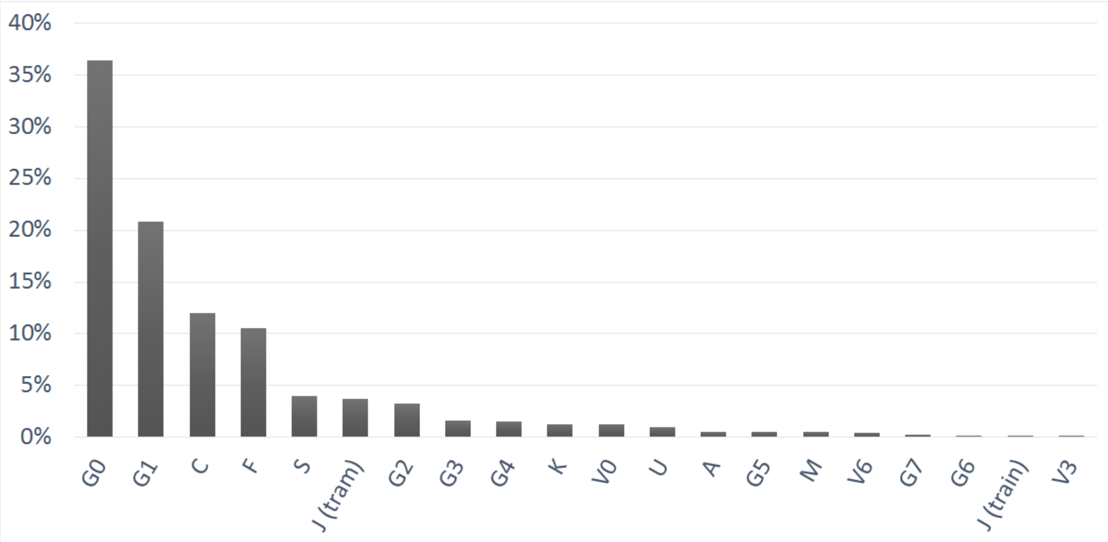


Figure 58: The distribution of accident types in STRADA.

It is important to know that the accident type more or less only refers to the road users in conflict and is not completely comparable with the manoeuvre type in the code system. However, the conflicting road users are possible to find in the code system.

Just like the code the single accidents (G0, G1, G2 and S) are the dominating. Of the 734 accident in the study according to STRADA there are 471 single accidents. According to the code there are also 471 single accidents, however there are only on 462 accident the code and STRADA agree. The nine accidents that STRADA classifies as single the code classifies as manoeuvres 201, 202, 303, 403, 601 and unknown and the other nine accidents that the code classifies as single, STRADA classifies as rear end with motor vehicle, bicycle/moped - motor vehicle or other.

The accidents in the three manoeuvres shown as the most common in the general result can in STRADA mostly be found under the accident type F or C, depending on if the vulnerable road user is a pedestrian or a bicyclist. Also worth noting is that for the accidents when the road users are meeting from different directions in a crossroad the accident type (F or C) mostly has an added attribute of a crossing, whereas the accidents when an unprotected road user is crossing the road without a crossroad have less attributes specified. However there is no information given on the type of crossing, for example if it is pedestrian only or a combined crossing. If the information is turned around the accident type F in STRADA has the most common manoeuvre as manoeuvre 501, followed by unknown, 401 and 402. For the accident type C in STRADA the manoeuvre 402 is the most common one, followed by 301.

Looking at accidents in intersections (including roundabouts) STRADA has 129 accidents, however that includes the single accidents. If they are excluded there are 90 accidents. With the code accidents in intersection are within the manoeuvre-code starting with 3 or 4. Single accidents are therefore not included. In this study, there are 129 accidents in intersections. If a search is made in STRADA for accidents in intersections the corresponding manoeuvre in the code system does then include manoeuvres like 201, 203, 204, 501 and 601 to a total of eight accidents (9%). If the search is turned around and one looks at manoeuvres in intersections (types starting with 3 or 4) of the corresponding accidents in STRADA only 62 percent is registered as an accident in an intersection. The rest of the accidents are manly classified as road (27%) or walk path and/or bicycle path (8%).

Looking at the accidents in roundabouts separately, there are 16 according to STRADA and 17 with the code. Most of the accidents can be found in both of the systems with a few exceptions. Three accidents that according to the code system are roundabout accidents, are in STRADA just accidents happening on the road. The other way around there are two accidents that STRADA has as roundabout accidents that in the code systems are a single accident with the regulation yield or a crossroad accident with unknown regulation. The roundabout accidents include the manoeuvres 101, 201, 203, 304, 401, 402, 403 and unknown.

Accidents in signalized crossroads are according to STRADA 48 and in the code system 41. However no account is taken of whether the signal did function or not. Thirty nine of the accidents are corresponding in both systems. The two remaining accidents that in the code system are signalized are in STRADA registered as unknown or have no notification at all. The accidents that in STRADA are signalized but not in the code system are in the code all unknown regulation or yield and include the manoeuvres 104, 201, 202, 204, 302, 304, 403, 501.

In STRADA, 115 accidents happen on a road. These accidents have in the code system been classified as the manoeuvres in Figure 59. Worth noticing is that manoeuvres starting with 3 or 4 is accidents that happen in crossroads and they make up 30 percent of the accidents that STRADA says happen on roads.

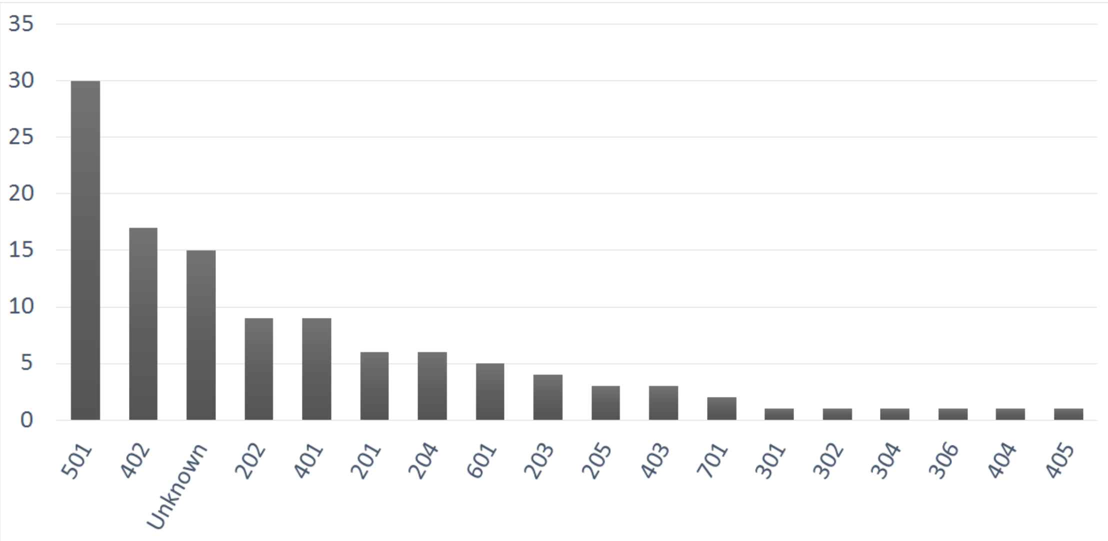


Figure 59: The distribution of accidents happening on a road by manoeuvres.

In the code system there are 102 accidents that belong to manoeuvres that classify as on a road. In STRADA, they have the attributes shown in Figure 60. Here, it can be seen that only 64 percent of the accidents that according to the code system happens on a road have the same attribute in STRADA.

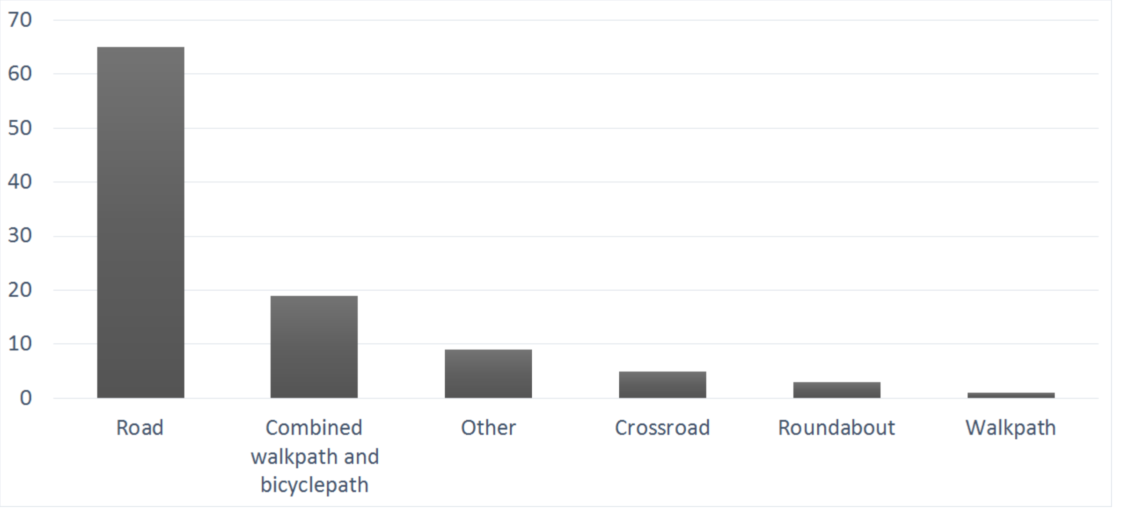


Figure 60: The attributes in STRADA to accidents happening on a road.

Accidents happening at a public transport stop are in STRADA 11 single accidents. The result from the study shows that except the 11 single accidents there are also 15 other accidents that happen, a total of 26 accidents. The manoeuvres for these 15 accidents are shown in Figure 61:

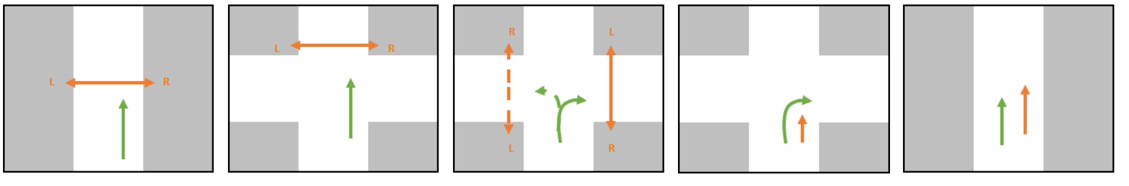


Figure 61: Manoeuvres 501, 402, 301, 302 and 201.

7.10 Accident analysis in Germany and Denmark

As part of the European research project InDeV (In-depth Understanding of Accident Causation for Vulnerable Road Users) a similar analysis based on the manoeuvre leading up to the accident has been made in both Denmark and Germany. The criteria for the accidents were that they were injury accidents where a vulnerable road user was involved as part 1 or 2 in urban areas. In Denmark, the accidents occurred between 2010-2014 and in Germany between 2009-2013. The single accidents are however excluded since information about those does not exist.

7.10.1 Pedestrians

The top three manoeuvres for fatal or seriously injured accidents in Denmark with pedestrians are shown in Figure 62:

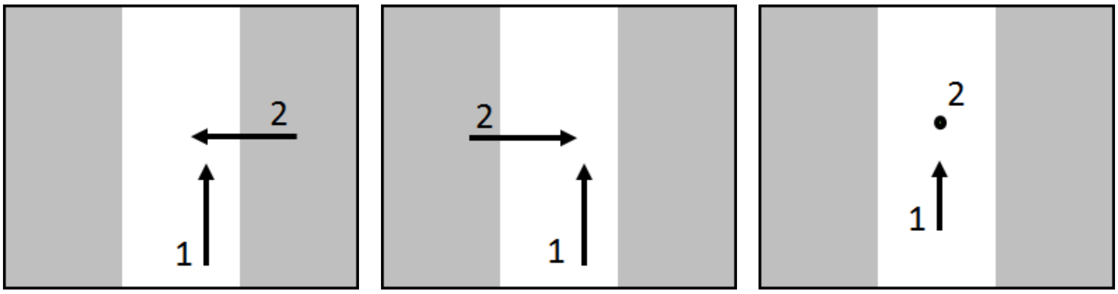


Figure 62: The most common manoeuvres for accidents with pedestrians in Denmark.

The two most common manoeuvres for fatal or seriously injured accidents in Germany with pedestrians are shown in Figure 63:

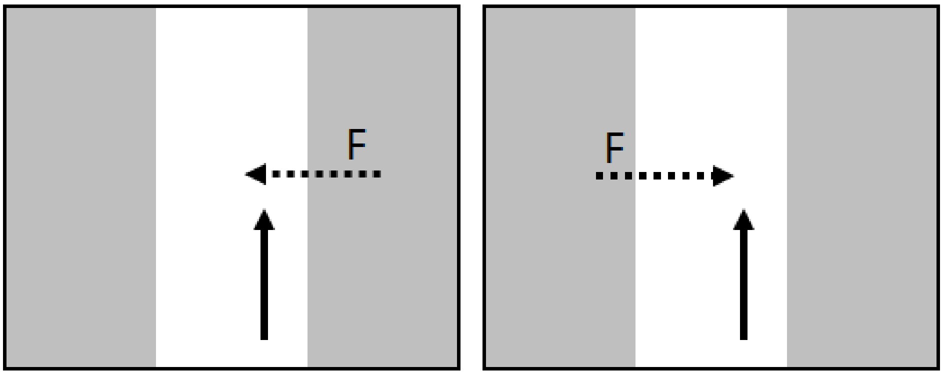


Figure 63: The most common manoeuvres for accidents with pedestrians in Germany.

The third most common accident is called ”all other accidents; type not specified”

The result in this study shows the manoeuvres for accidents with pedestrians presented in Figure 64:

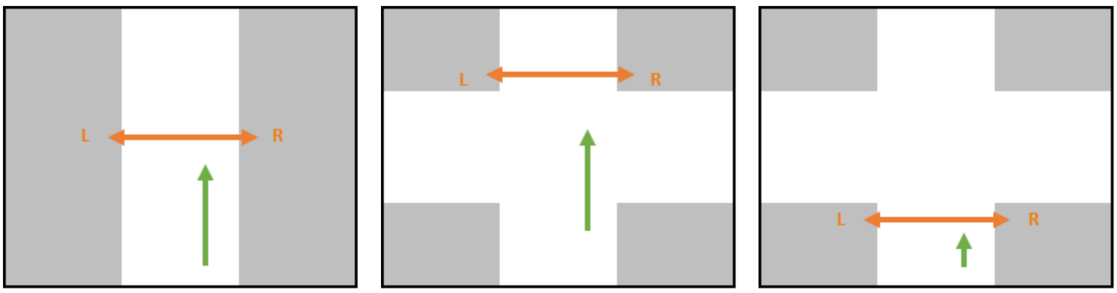


Figure 64: The most common manoeuvres for accidents with pedestrians in Malmö and Gothenburg.

7.10.2 Bicyclists

The top three manoeuvres for fatal or seriously injured accidents in Denmark with bicyclists are shown in Figure 65:

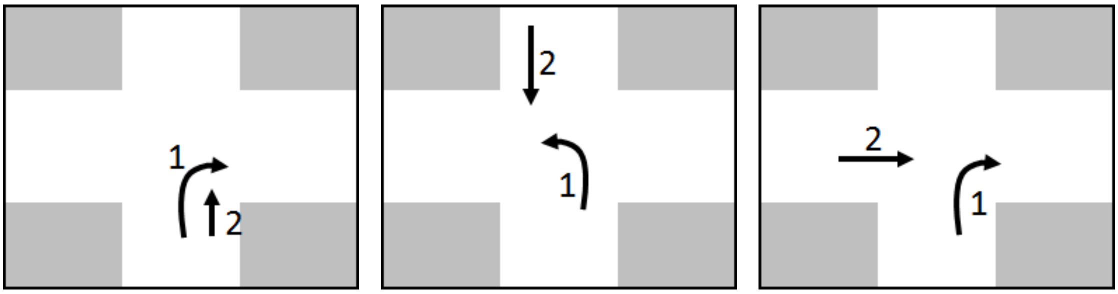


Figure 65: The most common manoeuvres for accidents with bicyclists in Denmark.

In Germany the most common manoeuvre for fatal or seriously injured accident with bicyclists is the type "all other accidents; type not specified", but the second and third most common manoeuvres however are the ones shown in Figure 66.

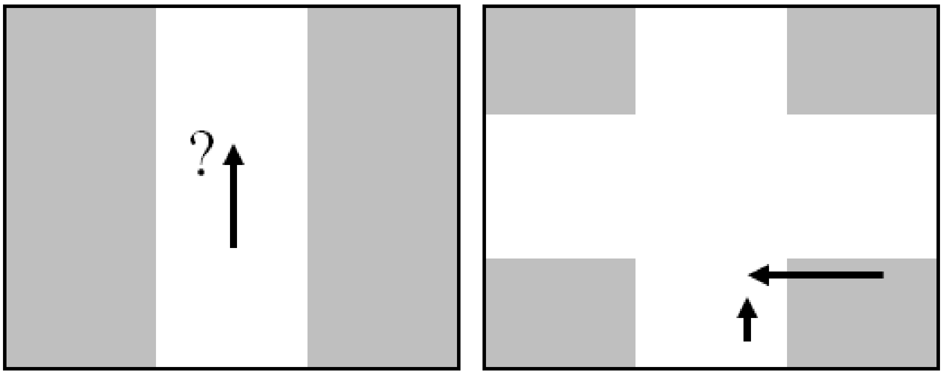


Figure 66: The second and third most common manoeuvres for accidents with bicyclists in Germany.

For bicyclist the result of this study shows the manoeuvres presneted in Figure 67:

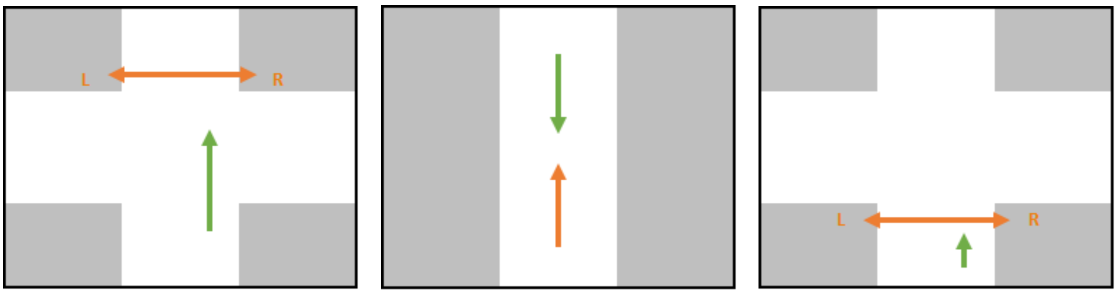


Figure 67: The most common manoeuvres for accidents with bicyclists in Malmö and Gothenburg.

8 Discussion

8.1 Accident classification

Looking at the history of the road accident statistics and the major changes a pattern can be seen regarding the accident type classification. Accident classification from 1955 was based on the direct cause of injury, for example a single accident or collision between two oncoming vehicles. In 1966 the change meant that it was rather the situation that provoked the accident that determined the accident type classification. The classification was therefore based the situations and manoeuvres which preceded the accident. In 2003, with STRADA, the classification just like before 1966 was based on the consequence of the accident rather than the event that led to the accident. The pattern shows a change back and forward of the classification based on the consequence of the accident or the event that led to the accident. If the code system is implemented, it would mean a similar approach as in the system from 1966. Since there have been changes between the different systems it seems like both approaches have their strengths and weaknesses. However it is unclear how the discussions and reasons for the changes of classifications went and why the changes between a consequence based system or not did take place in the first place. If any valid arguments exist on why a consequence based system is better it should be considered to make the accident coding system based on that instead. But it seems that the event leading to the accident is just as valid classification as the consequence. An introduction of the code system would as a result not necessarily mean that any information goes missing. It is just another approach to classify the accidents compared to STRADA today.

It is possible that more information about the classification systems before STRADA (the system from 1955 and 1966) is available. Most likely, there is information in the National Archives in Stockholm. However, it was not possible to visit the archives within the limits of this thesis and can therefore not be said for certain.

8.2 Accidents in Malmö and Gothenburg

Accident classification similar to CADaS gives another view of the safety problems. With the code it is possible to separate the accidents more and find out the reason behind them. However, going into too much disaggregation quickly results in very few accidents per type and become meaningless. The result shows some tendencies; like how much part the single accidents take. 63 percent of the accidents are single and much harder to analyse since much information is lacking. Of the accidents with the four different vulnerable road users, moped and motorcycle accidents seem to be the most similar. The accidents with pedestrians or bicyclist are different and general conclusions are harder to make.

The main part of the accidents, when single accidents are excluded, are accidents between a vulnerable road user and a car, something that intuitively is not particularly surprising.

Working through all 734 accidents it is been noted that some accidents are harder to classify than others. This is mostly due to some weaknesses in STRADA. For one accident there can be conflicting information in the reports from both police and health care about the events of the accident. There can also be conflicting information in a report, where the accident sketch and the written information does not add up. This makes it a matter of opinion how the accident should be classified.

Tram accidents are something that stand out in the compilation of accidents. Those accidents are accidents that only occurs in one of the two investigated cities (Gothenburg). Even so, the accidents are so many that tram accidents are the second highest for pedestrians in the result with both cities combined. If this is consistent or just a coincidence is hard to tell and would need more investigation. The result for tram accidents would probably not be as big if a study was made where all of Sweden is included since there are not so many cities that have tram as transport system. This makes the result a question of exposure. It is however safe to say that tram accidents are a big part of the accidents in Gothenburg and a big safety problem mainly for the pedestrians there.

For those accidents where there is a right or left option for the manoeuvre depending on where the vulnerable road user is coming from, most accidents tend to be from the right.

8.3 Applicability of the code extension

Much of the information for the code system lays in the accident sketch in STRADA, which makes it important that the sketch is correct and that it contains all necessary information. Today a lot of information is lacking. Some of it is probably due to the working process at the police and their limited resources, which is hard to do anything about. It does, however not matter if the information is in the sketch or in text for this result since ever accident has been handled manually, the only difference is that the information in the sketch can not be search for.

As a result from the code system some parts are worth mentioning. The infrastructure part of the code does not give that much information, although that depends on what is registered in STRADA today. A lot of infrastructure information is missing and therefore that part of the code become somewhat meaningless. It is the same with the sight obstruction part. If there is information about a sight obstruction the part can be good and meaningful, but in most cases there is nothing mentioned in STRADA and as a result the part is mostly unknown. If this part should be used a change of the information in STRADA needs to be done otherwise the infrastructure part could be left out since it does not give the complete information.

In terms of involved road users STRADA and the code gives pretty much the same information, but in terms of an overall search in STRADA it is not possible to get much more information of the event of the accident than the accident type. However, with the code it is possible to know the manoeuvre without going through every accident manually.

Regarding the manoeuvres there is a weakness that sometimes makes it hard to comprehend. The problem lies in the manoeuvre pictures and realising that some manoeuvres has a mirrored counterpart. This is a weakness since it can make it harder to translate the code to the actual situation and requires a bit of imagination.

8.4 STRADA - data quality

Hospital data contribute a lot to understanding the extent of the safety problems, since the dominating part of the accidents are single accidents. About 63 percent of the accidents are single and a majority of those only registered by the health care. But, in order to help understanding the conditions of the accidents there needs to be more information about the course of events, something that today is lacking. The only classification that has been possible to make is a distinction between accidents that happens because of snow, ice etc.; gravel, pits etc. or because the road user hit the curb. But, for the majority of the single accidents the events of the accident are still unknown. To make this better, a new form should be introduced where more questions are asked regarding the events of the accident instead of today where accidents mostly are described in a sentence.

It is also important to have in mind that the proposed coding system is based upon the information in STRADA and the result is only as correct as the information gathered. In some of the accident descriptions it can be questioned if the information is correct. In some cases the sketch tells one thing and the written text another and in other accidents the health care report says something completely different compared to the police report. This problem, however is not a problem with the code, rather a problem with getting the registration of accidents in STRADA as accurate as possible and is a problem that is already known.

8.5 STRADA versus the code system

A comparison between the code system and STRADA should be done with caution since the systems have different ways of presenting the data. The aim was to find a better way of finding more information in STRADA that is not presented in an overall search and therefore the code also presents this other information. The result is not always comparable. In STRADA, one can quite easily get the information about which accident types occur, meaning who is in conflict with whom. It is also possible to search on the location and get to know how many accidents happen in an intersection or on a street. But without the manoeuvre you know very little about the events of the accident. That is possible with the code. For example, the accident types in STRADA and the manoeuvre types are not the same thing. The most common in both cases was single accidents but if those are excluded, the dominating accident types are F and C. This, however does only tell that at least one of the road users involved in those accidents are either a pedestrian or bicyclist. The manoeuvre type is not based on the involved road users and include all the accident types in STRADA. The accident type is hence not lost since the road users is included in the code. The usefulness with the manoeuvre comes when it is possible to within the accident types tell which manoeuvre is the most common one. For pedestrian accidents it is when the pedestrian crosses the road.

The biggest difference with the code compared with STRADA apart from the extra information with the accident manoeuvre is in terms of the location type of the accident. For accidents in intersections the code have another classification in 9 percent of the accidents the STRADA has as intersection accidents, but turned around, 38 percent of the accidents the code has an intersection, STRADA has either road or something else. The same pattern can be seen looking at accidents happening on the road. Thirty percent of the accidents STRADA says happen on the road the code system classify as intersection. So why do the two systems only agree on two thirds of the accidents? A possible explanation can be because of the difference in information of the written information and the information in the sketch. The code is built up on information in the sketch, something that does not come up in an overall search. In the pictures below in Figure 68 accidents that STRADA says are accidents happening on the road link can be seen.

Figure 68: Accident sketches classified as on a road link in STRADA.

Those accidents are clearly happening at intersections but are still classified as on a road link. This shows weaknesses in STRADA, but where the information is getting wrong is unclear. Is it when the accident is registered or at any other point?

8.6 Comparison with Denmark and Germany in a European context

The top three most common manoeuvre accidents for pedestrians in all three countries are quite similar. It is possible that these tendencies are general and that the manoeuvre in this code system called 501 (see Figure 69) is the most common accident manoeuvre involving pedestrians.

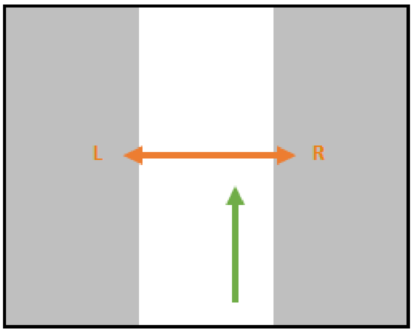


Figure 69: Manoeuvre 501.

With accidents involving bicyclist, however the results are not the same. If you look at more accidents than the top three manoeuvres, same manoeuvres exist in all countries but the top three differ. The German results seems a bit more like the Swedish than the Danish ones. This might be because of the differences in infrastructure for the bicyclists in the countries.

If a more detailed introduction of the CARE database is to be introduced in Sweden, changes needs to be done in STRADA. Today's system is not optimal for a manoeuvre based search like in Denmark or Germany and if it is decided that Sweden in the future should contribute more with similar data it should be considered to get a manoeuvre option included in STRADA.

9 Conclusions

- Accident classification in Sweden has been changed back and forth between systems based on reason for the accident or consequence of the accident. Both has their strengths and weaknesses.
- Accident classification similar to CADaS provides a much more versatile view of the safety problems
- However, going into more disaggregation quickly results in very few accidents per type and becomes meaningless.
- Much of the information can only be found in the accident sketch and makes it important to identify the contributing factors.
- A majority of the accidents are single accidents. That means that hospital data contributes a lot to understanding the extent of the safety problems, but not as much to understanding the conditions of the accidents.
- The code system and STRADA only agree on the location type (road or intersection) in about 60 percent of the accidents. Some accidents location can be questioned since the describing text and sketch contradict each other.
- The most frequent accidents for pedestrians in Sweden are similar to the most frequent accidents in Denmark and Germany, which makes it possible that it is a likely occurrence over all.
- The most frequent accidents for bicyclists in Sweden are similar to the most frequent accidents in Germany.

References

Hemdorff, M. S. (2004). *Parameters and values in the Danish road accident registration, Translation Danish - English.* Copenhagen: Road Directorate.

Larsson, J. (2007). *Olyckstypsklassificering Jämförelse i tid och rum.* Linköping: VTI.

Saurabh, V. (2013). *Directorate-General for Mobility and Transport Care database CaDaS.* European Commission.

Statistiska centralbyrån. (1954). *Vägtrafikolyckor.* Stockholm: Sveriges officiella statistik.

Statistiska centralbyrån. (1955). *Vägtrafikolyckor.* Stockholm: Sveriges officiella statistik.

Statistiska centralbyrån. (1968). *Vägtrafikolyckor med personskada.* Stockholm: Sveriges officiella statistik.

Statistiska centralbyrån. (1990). *Trafikskador.* Stockholm: Sveriges officiella statistik.

Statistiska centralbyrån. (2003). *Vägtrafikskador.* Stockholm: SIKA, Sveriges officiella statistik.

Trafik- och informationsbyrån. (1981). *Trafikolyckor i tätort, Metoder för redovisning.* Borlänge: Trafiksäkerhetsverket, statens vägverk.

Transportstyrelsen (2016a). *Bakgrund.*
`https://www.transportstyrelsen.se/sv/vagtrafik/statistik-och-register/STRADA-informationssystem-for-olyckor-skador/Bakgrund/`
[2016-04-10]

Transportstyrelsen (2016b). *Rapportörer och användare av statistik.*
`https://www.transportstyrelsen.se/sv/vagtrafik/statistik-och-register/STRADA-informationssystem-for-olyckor-skador/Rapportorer-och-anvandare/`
[2016-05-04]

Transportstyrelsen (2016c). *Exempel på uttag.*
`https://www.transportstyrelsen.se/sv/vagtrafik/statistik-och-register/STRADA-informationssystem-for-olyckor-skador/Exempel-pa-uttag/`
[2016-05-15]

Transportstyrelsen (2016d). *Sjukhusrapporterad statistik.*
`https://www.transportstyrelsen.se/sv/vagtrafik/statistik-och-register/Vag/Olycksstatistik/Sjukhusrappoterad-statistik/`
[2016-05-18]

Vägverket. (1996). *Vägtrafikens skade- och olycksstatistik, Regeringsuppdrag.* Borlänge.

Vägverket. (2007). *Nytt nationellt informationssystem för skador och olyckor inom hela vägtransportsystemet.* Borlänge.

Appendix A

The complete list of all the accident codes included in the study, by city and year.

CODES MALMÖ				
2013	2012	2011	2010	2009
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUS--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-UBU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--MOT-C-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U	101--B-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--MOP-U-BWUU--X-X-XXX--U	101--B-Y-UUU--X-X-XXX--U	101--P-U-BWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--MOP-U-CUU--X-X-XXX--U	101--MOT-C-CXS--X-XXX--U	101--P-U-BWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--MOT-U-CUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--P-U-BWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--P-U-BWUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U	101--P-U-UPU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--P-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX-U	101--P-U-WWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--P-U-UPU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	102--B-U-CUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	102--MOP-U-BWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	102--MOT-U-CXS--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	102--P-S-UPU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U	102--P-U-UUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--PARKINGLOT	102--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U--PARKINGLOT
101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	101--B-U-WWUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	102--MOT-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	102--P-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	101--MOT-C-CXU--X-X-XXX--U
101--P-U-WWUU--X-X-XXX--U	102--P-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U
102--B-U-CUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	102--B-U-CUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-BWUU--X-X-XXX--U
102--B-U-UUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	102--B-U-CUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-BWUU--X-X-XXX--U
102--B-U-UUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	102--P-U-BWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U
102--B-U-UUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U
102--P-U-WWUU-X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-UPU--X-X-XXX--U
103--B-U-BWUU--X-X-XXX--U	103--B-U-CUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	103--P-U-UPU--X-X-XXX--U	101--P-U-UPU--X-X-XXX--U
103--B-U-BWUU--X-X-XXX--U	103--MOP-U-CUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	103--P-U-UUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
103--B-U-BWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-UUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
103--MOP-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-UUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
103--P-U-UUU--X-X-XXX--U	104--B-U-BBBS--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
103--P-U-WWUU--X-X-XXX--U	104--B-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
103--P-U-WWUU--X-X-XXX--U	104--P-U-UCU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
104--B-U-CUU--X-X-XXX--U	104--P-U-UPU--X-X-XXX--U	104--B-U-UUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
104--P-U-UUU--X-X-XXX--U	104--P-U-UUU--X-X-XXX--U	104--B-U-UUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
104--P-U-WWUU--X-X-XXX--U	104--P-U-WWUU--X-X-XXX--U	104--B-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
201--B-U-CXU--C-U-CXU--U	104--P-U-WWUU--X-X-XXX--U	104--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U
202--B-U-BWUU--B-U-BWUU--U	201--B-U-BBUS--B-U-BBUS--U	104--P-U-WWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--BUSSTOP
202--B-U-BWUU--B-U-BWUU--U	201--B-U-CXCD--C-U-CXCD--U	104--P-U-WWUU--X-X-XXX--U	104--P-U-UUU--X-X-XXX--U--BUSSTOP	101--P-U-UUU--X-X-XXX--U--PARKINGLOT
202--B-U-UBU--B-U-UBU--U	202--P-U-UUU--HGV-U-UUU--U	201--B-U-CUU--B-U-CUU--U	104--P-U-UUU--X-X-XXX--U--BUSSTOP	101--P-U-UUU--X-X-XXX--U--PARKINGLOT
202--P-U-UUU--HGV-U-UUU--U--BACK	204--B-U-BWXU--BUS-U-CXS--U	201--MOT-C-CXS--C-C-CXS--U	104--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--PARKINGLOT
205--MOT-U-CNS--C-U-CNS--U	301.L--P-X-BWPS--BUS-Y-CXS--U--BUSSTOP	202--P-U-BWXS--B-U-BWXS--U	202--MOP-U-BWUU--MOP-U-BWUU--U	101--P-U-UUU--X-X-XXX--U--TRAINSTATION
301.R--MOP-S-BBCS--C-S-CXS--U	302--BUS-U-CBS--B-U-BBBCBD--NR--BUSSTOP	202--P-U-WWUS--C-U-WWUS--U--BACK,PED.STREET	204--B-U-CXS--C-U-CXS--U	101--P-U-WWUU--X-X-XXX--U
302--MOP-U-CXS--C-U-CXS--U	304--C-U-CXS--MOP-U-CXS--U	203--MOT-C-UUU--C-U-UUU--U	204--B-U-CXS--HGV-U-CXS--U	101--P-U-WWUU--X-X-XXX--U
304--C-Y-CXS--MOP-X-CXS--U	304--C-Y-CXS--MOP-X-CXS--U	203--P-U-BWBU--B-U-UUU--U	204--B-U-CXS--HGV-U-CXS--VS	101--P-U-WWUU--X-X-XXX--U
401.L--B-Y-UCU--C-C-CCU--VS	304--C-Y-CXS--MOT-X-CXS--U	301.L--P-S-BWPS--BUS-S-CXS--U	301.L--B-S-BBCS--HGV-S-CXS--U	101--P-U-WWUU--X-X-XXX--U
401.R--B-S-BBCS--MOT-S-CCCD--U	401.L--B-U-BWCS--HGV-U-CXS--U	301.R--B-U-BWBS--C-Y-CXS--U	301.L--B-U-UUU--C-U-CUS--U	101--P-U-WWUU--X-X-XXX--U
401.R--P-X-BWCS--MOT-Y-CCS--VS	401.L--P-X-BWCS--C-Y-CXS--U	301.R--P-X-BWPS--C-Y-CXS--U	304--C-S-CXCD--B-S-BBBBD--U	101--P-U-WWUU--X-X-XXX--U
401.R--P-X-BWPS--C-Y-CPS--VS	401.R--B-X-BWCS--C-Y-CXS--U	304--C-Y-CXS--B-X-CXS--U	306--B-Y-CXS--C-Y-CXCA--U	101--P-U-WWUU--X-X-XXX--U
402.L--B-S-BBCS--C-S-CCS--U	402.L--B-U-BWCS--C-C-CXS--U	306--C-S-CXS--MOP-S-CXCD--U	401.R--P-X-WWNS--HGV-Y-CXS--U	101--P-U-WWUU--X-X-XXX--U
402.L--P-U-BWPS--C-C-CPS--VS	402.R--B-U-BWBS--C-U-CXS--U	401.L--P-X-BWPS--C-Y-CXS--U	402.L--P-U-BWUU--B-U-CUU--U	101--P-U-WWUU--X-X-XXX--U
402.R--P-X-BWPS--C-Y-CPS--U	403--B-U-BWUU--B-U-BWUU--U	401.R--P-U-BWCS--C-U-CXS--U--BACK	404--C-Y-CXS--B-X-CXS--U	101--P-U-WWUU--X-X-XXX--U
402.R--P-X-BWPS--C-Y-CXS--U	403--MOT-U-CXS--BUS-Y-CXS--VS	401.R--P-X-BWPS--C-Y-CXS--U	U--C-U-UUU--MOP-U-UUU--U	101--P-U-WWUU--X-X-XXX--U
405--C-Y-CXS-MOT-X-CXS--U	501.L--P-U-BWNS--C-U-CNS--VO	402.R--B-S-BWCS--C-S-CXCD--U		101--P-U-WWUU--X-X-XXX--U
501.R--B-Y-BWCS--C-Y-CCS--U	501.R--P-X-WWNS--C-X-CNS--U	402.R--P-S-UPU--BUS-S-CXCD--U		101--P-U-WWUU--X-X-XXX--U
501.R--P-U-BWNS--C-U-CNS--U	601.R--B-X-CXS--C-X-CXS--U	403--MOP-X-CXS--C-STOP-CXS--U		101--P-U-WWUU--X-X-XXX--U
501.R--P-U-UNU--HGV-U-CXS-PR--BUSSTOP	U--MOP-S-CUU--C-S-CUS--U	404--B-Y-CUU--C-U-CUCA--U		101--P-U-WWUU--X-X-XXX--U
601.R--B-U-CXS--C-U-CXS--U	U--P-U-BWUU--B-U-BWUU--U	404--B-Y-CXBWA--BUS-X-CXS--U		102--B-U-BWUU--X-X-XXX--U
601.R--B-U-CXS--C-U-CXS--U		405--C-U-CNS--B-U-CXS--PR		102--B-U-CUU--X-X-XXX--U
701--MOP-U-UUU--X-X-XXX--U		405--MOP-STOP-CXS--C-X-CXS--U		102--P-U-BWUU--X-X-XXX--U
U--P-U-UUU--C-U-UUU-U		501.L--B-S-BWCS--C-S-CXS--U		102--P-U-BWUU--X-X-XXX--U
U--P-U-UUU--C-U-UUU-U		501.L--P-U-UNU--C-U-CXS--VS		102--P-U-BWUU--X-X-XXX--U
		501.R--B-U-UUU--C-U-CUU--U		102--P-U-UUU--X-X-XXX--U
		501.R--P-U-BWUS--HGV-U-CXS--U		102--P-U-UUU--X-X-XXX--U
		601.R--B-U-CXS--C-U-CXS--U		102--P-U-WWUU--X-X-XXX--U
		701--P-S-CUS--X-X-XXX--U		102--P-U-WWUU--X-X-XXX--U
		U--MOP-U-UUU--C-U-UUU--U		102--P-U-WWUU--X-X-XXX--U
		U--P-U-UUU--C-U-UUU--U--PARKINGLOT		102--P-U-WWUU--X-X-XXX--U
				103--B-U-BWUU--X-X-XXX--U
				103--P-U-BWUU--X-X-XXX--U
				103--P-U-CUU--X-X-XXX--U
				103--P-U-UUU--X-X-XXX--U
				103--P-U-UUU--X-X-XXX--U--PARKINGLOT
				103--P-U-WWUU--X-X-XXX--U
				103--P-U-WWUU--X-X-XXX--U
				103--P-U-WWUU--X-X-XXX--U
				104--B-U-CUU--X-X-XXX--U
				104--B-U-CUU--X-X-XXX--U
				104--P-U-BWUU--X-X-XXX--U
				104--P-U-WWUU--X-X-XXX--U
				104--P-U-WWUU--X-X-XXX--U
				104--P-U-WWUU--X-X-XXX--U
				104--P-U-WWUU--X-X-XXX--U
				201--B-S-CXS--C-S-CXS--U
				201--B-U-CUU--C-U-CUU--U
				202--MOT-U-CXS--C-U-CXS--U
				202--P-U-CUU--C-U-CUS--U--PED. STATIONARY
				202--P-U-UUU--C-U-UUU--U--BACK,PARKINGLOT
				203--B-U-CUU--C-U-CUU--U
				203--P-U-WWXS--B-U-WWXS--U
				204--C-U-CXU--B-U-CXU--U
				301.L--B-S-BWCS--C-S-CXU--U
				301.L--MOP-U-BBXS--C-U-CXU--U
				302--B-U-BWUU--MOP-U-UUU--U
				302--MOP-S-CUU--C-S-CUU--U
				304--C-S-CXU--MOT-S-CXU--U
				304--C-U-CXS--MOT-U-CXS--U
				304--C-U-CXU--MOP-U-CXU--U
				304--C-Y-CXCD--MOT-X-CXS--U
				305--MOP-U-CXU--C-U-CXU--U
				401.L--P-X-UCU--C-Y-CUU--U
				402.L--B-U-BWBU--C-U-CXS--U
				403--B-U-BWUU--B-U-BWUU--U
				403--C-U-CXS--B-U-BWBBWD--U
				403--MOP-C-CXS--C-C-CXS--U
				403--MOP-C-CXS--C-C-CXS--U

				403--MOP-U-CXU--C-U-CXU--U
				403--MOP-Y-CXU--C-X-CXU--U
				403--MOT-X-CXU--C-Y-CXU--U
				405--C-Y-CXU--B-X-CXU--U
				501.R--P-U-UNU--C-U-CXS--U
				501.R--P-U-UNU--C-U-CXU--U
				501.R--P-U-UNU--C-U-CXU--U
				501.R--P-U-UUU--BUS-U-CUS--U
				501.R--P-X-WWPU--C-Y-CXU--U
				601.U--MOT-U-CUU--C-U-CUU--U
				701--B-U-BWUU--X-X-XXX--U
				701--MOP-U-CXU--X-X-XXX--U
				U--P-U-UPU--C-U-UUU--U
				U--P-U-UUU--B-U-UUU--U
				U--P-U-UUU--B-U-UUU--U
				U--P-U-UUU--HGV-U-UUU--U--PARKINGLOT

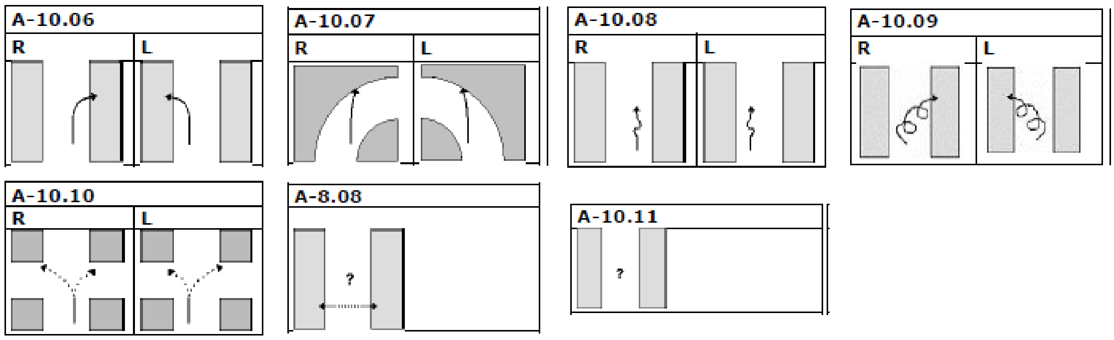
CODES GOTHENBURG				
2013	2012	2011	2010	2009
101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-CUU--X-X-XXX--U	101--B-U-UUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--MOP-U-BWUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-CUU--X-X-XXX--U	101--MOT-U-BWUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--B-U-UUU--X-X-XXX--U--PARKINGLOT	101--P-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--B-U-BWUU--X-X-XXX--U
101--MOP-U-BWUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U	101--MOT-C-CUU--X-X-XXX--U	101--B-U-CUU--X-X-XXX--U
101--MOT-U-CUU--X-X-XXX--U	101--P-U-UPU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--B-U-UBU--X-X-XXX--U
101--P-U-CUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--BUSSTOP	101--P-U-BWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--MOP-U-BWUU--X-X-XXX--U
101--P-U-UUU--X-X-XXX--U--BUSSTOP	101--P-U-UUU--X-X-XXX--U--BUSSTOP	101--P-U-CUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U
102--B-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U	101--MOP-U-CUU--X-X-XXX--U
102--MOP-U-CUU--X-X-XXX--U	102--B-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--BUSSTOP	101--MOP-U-CUU--X-X-XXX--U
102--P-U-BWUU--X-X-XXX--U	102--B-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-UUU--X-X-XXX--U--PARKINGLOT	101--MOP-U-CUU--X-X-XXX--U
102--P-U-CUU--X-X-XXX--U	102--B-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U
102--P-U-WWUU--X-X-XXX--U	102--B-U-UCU--X-X-XXX--U	102--B-U-UUU--X-X-XXX--U--PARKINGLOT	101--P-U-WWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U
103--B-U-BWUU--X-X-XXX--U	102--P-U-BWUU--X-X-XXX--U	102--MOT-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U	101--MOT-U-CUU--X-X-XXX--U
103--B-U-BWUU--X-X-XXX--U	102--P-U-UUU--X-X-XXX--U--BUSSTOP	102--P-U-WWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U--BUSSTOP	101--MOT-U-CUU--X-X-XXX--U
103--B-U-CUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	102--B-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U
103--B-U-CUU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U	103--B-U-CUU--X-X-XXX--U	102--B-U-UUU--X-X-XXX--U--PARKINGLOT	101--P-U-CUU--X-X-XXX--U
103--P-U-BWUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U
103--P-U-UPU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U	103--P-U-UUU--X-X-XXX--U--PARKINGLOT	103--MOP-U-CUU--X-X-XXX--U	101--P-U-CUU--X-X-XXX--U
103--P-U-UUU--X-X-XXX--U--PARKINGLOT	103--B-U-CUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	101--P-U-UPU--X-X-XXX--U
104--MOT-S-CUU--X-X-XXX--U	103--MOP-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U
104--P-U-BWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U
104--P-U-CUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-CUU--X-X-XXX--U	101--P-U-WWUU--X-X-XXX--U
104--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	104--MOP-U-CUU--X-X-XXX--U	103--P-U-UPU--X-X-XXX--U	102--B-U-BWUU--X-X-XXX--U
104--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U	104--P-U-UCU--X-X-XXX--U	103--P-U-UUU--X-X-XXX--U	102--B-U-BWUU--X-X-XXX--U
202--B-U-BWUU--B-U-BWUU--U	103--P-U-BWUU--X-X-XXX--U	203--MOT-C-CUU--C-C-CUU--U	103--P-U-UUU--X-X-XXX--U--BUSSTOP	102--P-U-BWUU--X-X-XXX--U
202--B-U-BWUU--B-U-BWUU--U	103--P-U-CUU--X-X-XXX--U	205--MOP-U-CXS--C-U-CXS--U	103--P-U-UUU--X-X-XXX--U--PARKINGLOT	102--P-U-WWUU--X-X-XXX--U
202--B-U-BWUU--MOP-U-BWUU--U	103--P-U-UUU--X-X-XXX--U	301.R--P-U-WWNS--BUS-U-CXS--U	103--P-U-UUU--X-X-XXX--U--PARKINGLOT	102--P-U-WWUU--X-X-XXX--U
203--C-U-CXCD--MOT-U-CXCD--U	103--P-U-WWUU--X-X-XXX--U	302--B-U-CXS--C-U-CXS--U	103--P-U-WWPU--X-X-XXX--U	102--P-U-WWUU--X-X-XXX--U
301.R--MOP-S-BWCS--HGV-S-CXS--U	104--B-U-BWBS--X-X-XXX--U	304--C-U-CXU--B-U-BBCS--U	103--P-U-WWUU--X-X-XXX--U	103--B-U-BWUU--X-X-XXX--U
304--BUS-S-CXS--MOT-S-CXS--U	104--B-U-CUU--X-X-XXX--U	304--T-U-CXS--MOT-U-CXS--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U
304--C-S-CXS--MOP-S-CXS--U	104--P-U-WWUU--X-X-XXX--U	401.R--B-U-BWBS--C-U-CXS--U	103--P-U-WWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U
401.L--B-S-BBCS--C-S-CXS--U	201--P-U-CXU--BUS-U-CXU--U--BUSSTOP	401.R--P-S-BWPS--C-S-CXS--U	104--B-U-BWUU--X-X-XXX--U	103--P-U-BWUU--X-X-XXX--U
401.L--P-U-WWUU--HGV-U-CUS--U	202--B-U-BWUU--B-U-BWUU--U	401.R--P-U-WWPU--T-U-CXS--U	104--P-U-WWUU--X-X-XXX--U	103--P-U-UPU--X-X-XXX--U
401.R--P-S-WWPS--C-S-CXU--U	301.R--B-S-BBCS--HGV-S-CXCD--U	402.L--B-S-BWCS--C-S-CXS--U	201--B-U-CXS--C-U-CXS--U	103--P-U-UUU--X-X-XXX--U
402.L--P-S-BWPS--C-S-CXS--U	301.R--B-U-BWBU--HGV-U-CXU--U	402.L--B-U-BWCS--C-C-CXS--U	201--P-U-UUU--T-U-UUU--U	103--P-U-UUU--X-X-XXX--U--BUSSTOP
402.R--B-U-BWPU--C-Y-CXS--U	401.R--P-S-BWCS--C-S-CXCD--U	402.L--B-U-BWCS--C-C-CXS--U	201--P-U-WWUU--T-U-CUU--U--BUSSTOP	103--P-U-UUU--X-X-XXX--U--PARKINGLOT
402.R--B-U-UBU--C-C-CXS--U	402.R--P-U-BWPS--C-Y-CXS--U	402.L--P-S-BWCS--T-S-CXS--U--BUSSTOP	202--B-U-BWXS--B-U-BWXS--U	103--P-U-WWUU--X-X-XXX--U
403--C-U-CXS--B-U-CXS--U	404--C-U-CXU--B-U-CXS--U	402.R--B-U-BBBU--MOP-U-CXU--U	202--B-U-CUU--P-U-CUU--U	103--P-U-WWUU--X-X-XXX--U
403--HGV-Y-CXS--MOT-X-CXS--U	405--BUS-Y-CXS--MOT-X-CXS--U	402.R--P-S-BWPS--C-S-CXS--U	203--C-U-CXS--MOT-U-CXS--U	103--P-U-WWUU--X-X-XXX--U
501.R--MOP-U-BWBS--C-U-CXS--U	501.L--P-U-UNU--T-U-CXS--U	404--C-Y-CXS--MOT-U-CXS--U	203--C-U-CXU--MOT-U-CXU--U	103--P-U-WWUU--X-X-XXX--U
501.R--P-U-CNU--HGV-U-CXS--VS	501.R--P-U-BWNU--C-U-CUU--U	405--C-Y-CXS--MOP-X-CXS--U	204--B-U-CXU--C-U-CXU--U	103--P-U-WWUU--X-X-XXX--U
501.R--P-U-UNU--C-U-CXS--U	501.R--P-U-UPU--C-U-CXS--U--BACK	501.R--P-U-UUU--T-U-UUU--U	204--MOT-U-CXS--C-U-CXS--U	104--B-U-UUU--X-X-XXX--U
501.R--P-U-UNU--C-U-CXS--VS--BUSSTOP	501.R--P-U-WWUU--T-U-CUS--U--BUSSTOP	501.R--P-X-UPU--HGV-Y-CXCA--U	205--B-U-CBXS--C-U-CXU--U	104--MOT-U-CUU--X-X-XXX--U
501.R--P-U-WWNU--B-U-BBXS--U	U--MOT-U-CUU--C-U-CUU--U	601.R--B-U-CXS--HGV-U-CXS--U	301.R--B-U-BWUU--C-U-CUU--U	104--P-U-UUU--X-X-XXX--U
501.R--P-U-WWPS--T-U-CXS--U	U--P-U-CUU--C-U-CUU--U	701--MOT-U-BWUU--X-X-XXX--U	301.R--P-S-WWCS--C-S-CXS--U	104--P-U-WWUU--X-X-XXX--U
701--B-U-BWUU--X-X-XXX--NU	U--P-U-UPU--T-U-CUU--U	U--B-U-UBU--C-U-CXU--U	303--U-U-CUU--MOT-U-CUU--U	104--P-U-WWUU--X-X-XXX--U
U--B-U-BWBU--U-U-UUU--U	U--P-U-UUU--BUS-U-CUU--U	U--P-U-UPU--C-U-CUU--U	304--HGV-S-CXU--MOT-S-CXU--U	202--B-U-BWUU--B-U-BWUU--U
U--P-U-BWUU--BUS-U-UUU--U	U--P-U-UUU--C-U-UUU--U--PARKINGLOT	U--P-U-UPU--C-U-CUU--U	401.L--B-U-BWBU--C-U-CXS--U	202--MOP-U-BWUU--MOP-U-BWUU--U
U--P-U-UUU--C-U-CUS--U	U--P-U-UUU--HGV-U-UUU--U	U--P-U-UUU--T-U-CUU--U--BUSSTOP	401.L--P-X-WWCS--C-Y-CXS--U	202--MOT-U-CXS--C-U-CXS--VS
U--P-U-UUU--C-U-UUU--U--PARKINGLOT	U--P-U-UUU--T-U-UUU--U	U--P-U-UUU--T-U-UUU--U	401.R--B-S-BWUU--C-S-CUU--U	204--P-U-BWUU--B-U-BWUU--U
U--P-U-UUU--HGV-U-UUU--U		U--P-U-UUU--T-U-UUU--U	402.R--B-S-UBU--C-S-CXU--U	205--MOT-U-CXU--C-U-CXU--VS
			402.R--P-U-BWPU--T-U-CXS--U	301.R--P-S-WWPS--T-S-CXS--U
			402.R--P-U-UCU--C-C-CXS--U	301.R--P-X-UPU--C-Y-CXU--U
			402.R--P-U-WWUU--T-U-CUU--U	304--C-Y-CXU--MOP-X-CXU--U
			404--C-U-CXU--MOT-U-CXU--U	401.L--P-S-UPU--T-S-CXS--U
			405--C-Y-CXU--MOT-X-CXU--U	401.R--B-Y-UBU--C-Y-CXU--U
			405--P-U-BWUS--B-U-BWUS--U	401.R--P-S-WWPS--C-S-CXS--U
			501.L--P-U-UNU--C-U-CXS--U--BACK	401.U--P-S-BWCU--C-S-CXU--U
			501.L--P-U-UUU--C-U-CUS--U	402.L--P-S-BWPU--C-S-CXS--U
			501.R--P-U-UUU--T-U-CUU--U	402.L--P-U-UPU--C-S-CXU--U
			501.R--P-U-UUU--T-U-UUU--U--BUSSTOP	402.L--P-X-UPU--C-Y-CXS--U
			501.R--P-U-WWUU--T-U-CUS--U--BUSSTOP	402.R--B-U-UBU--C-U-CXS--U
			U--B-U-BWUU--P-U-BWUU--U	402.R--P-U-UUU--C-U-CUU--U
			U--MOT-U-CUU--C-U-UUU--U	402.R--P-U-UUU--T-U-CUS--U--BUSSTOP
			U--P-U-UUU--HGV-U-UUU--U--PARKINGLOT	402.R--P-X-UPU--C-Y-CXS--U
			U--P-U-UUU--T-U-UUU--U	403--C-R-CXS--B-R-CXS--U
				403--MOP-R-CXS--C-R-CXS--U
				403--MOT-X-CXU--C-STOP-CXU--U
				403--MOT-X-CXU--C-Y-CXU--U
				501.L--P-X-UPU--C-Y-CXS--U
				501.R--B-Y-BWBU--C-Y-CXS--U
				501.R--P-U-BWUU--T-S-CXS--U
				501.R--P-U-UPU--BUS-U-CXS--U
				501.R--P-U-UPU--T-U-UUU--U
				501.R--P-U-UUU--T-U-CXS--U--BUSSTOP
				501.R--P-X-UPU--C-Y-CXS--U
				701--MOP-U-CUU--X-X-XXX--U
				U--B-U-BWUU--C-U-BWUU--U
				U--P-U-BWUU--MOP-U-BWUU--U
				U--P-U-CUU--T-U-CUU--U
				U--P-U-UUU--BUS-C-CUU--U
				U--P-U-UUU--BUS-U-UUU--U--BUSSTOP
				U--P-U-WWUU--C-U-CUU--U

Appendix B

The manoeuvre codes with pictures that has been used for the code system and their counterparts in the CADaS system. The first figure shows the manoeuvre in the code system. The smaller figures below show the corresponding manoeuvres in the CADaS system.

1. Single accidents

101	Fall: Unknown

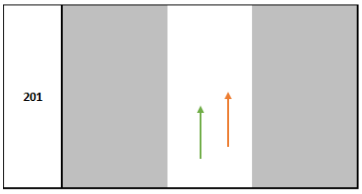


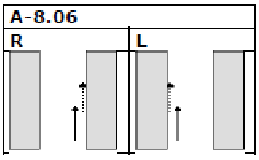
102	Fall: Gravel etc.

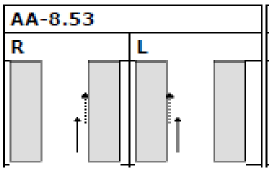
103	Fall: Snow, ice etc.

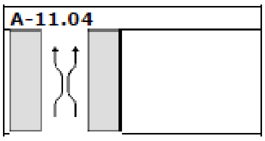
104	Fall: Curb

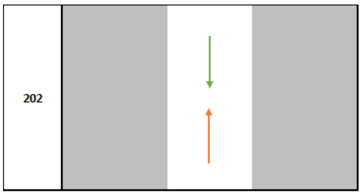
2. Accidents between road users travelling in the same or opposite direction

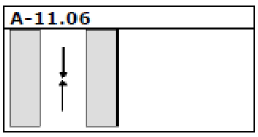


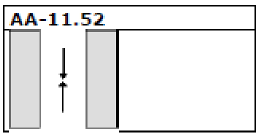


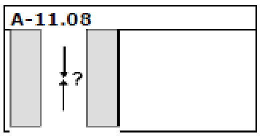


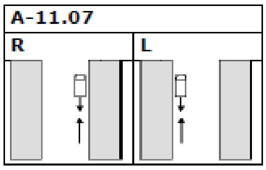


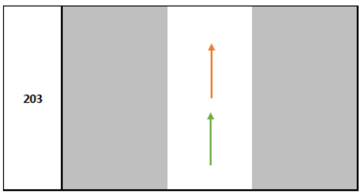


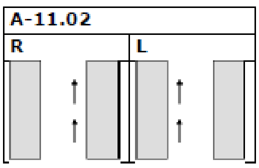


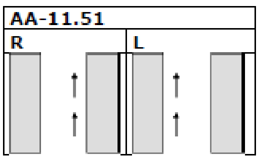


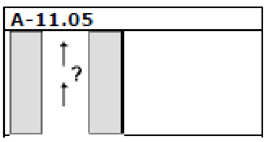


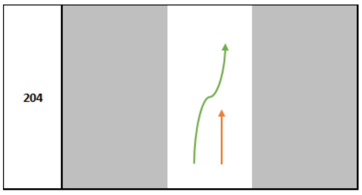


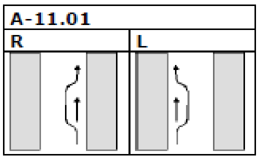


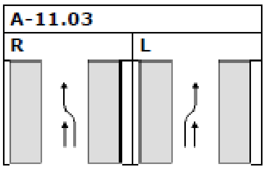


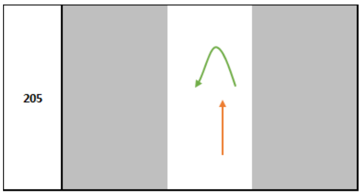


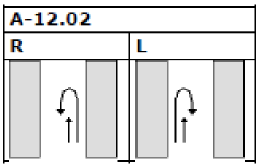


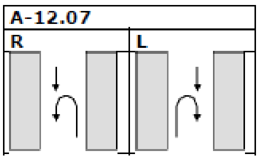

204


A-11.01
R
L

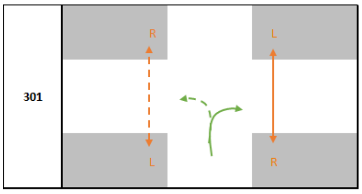

A-11.03
R
L

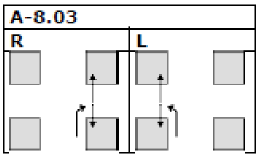

205

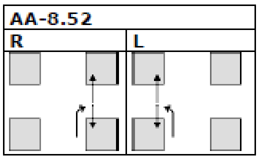

A-12.02
R
L

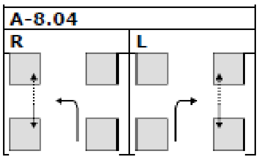

A-12.07
R
L

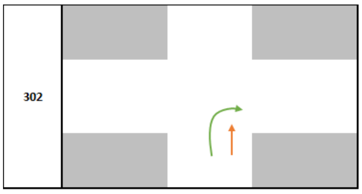
3. Accidents between road users travelling in the same or opposite direction into a crossroad

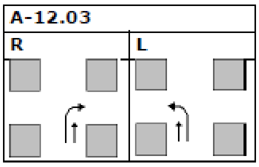


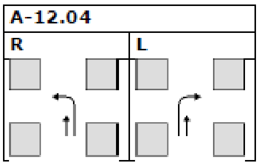


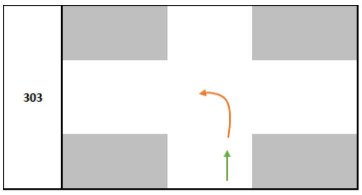


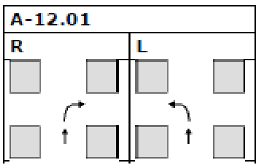


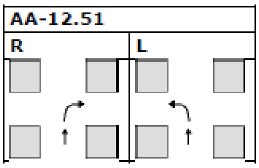


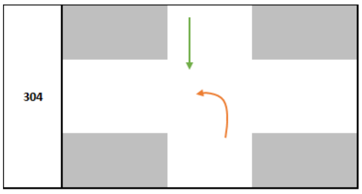


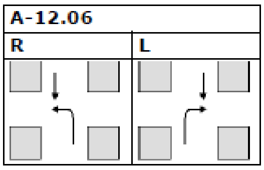


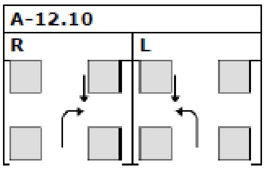


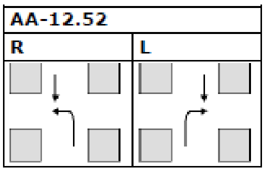


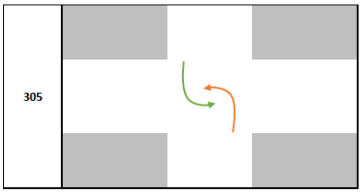


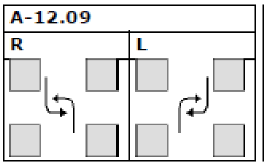

304

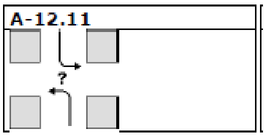

A-12.06
R
L

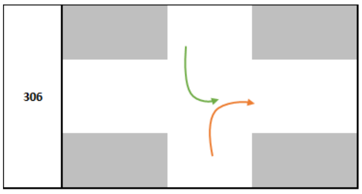

A-12.10
R
L

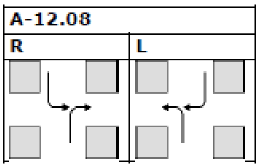

AA-12.52
R
L


305

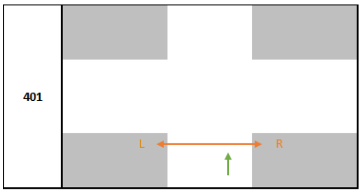

A-12.09
R
L

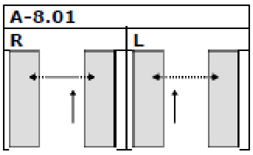

A-12.11
?

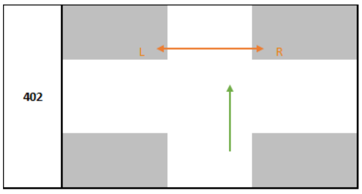

306

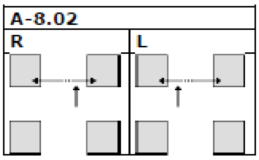

A-12.08
R
L

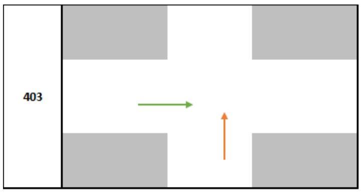
4. Accidents between road users meeting in a crossroad

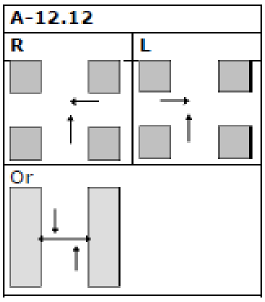


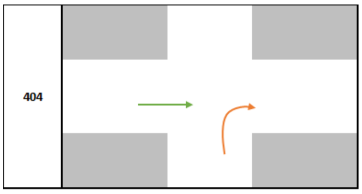


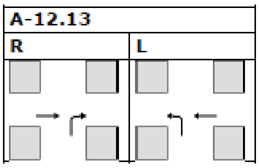


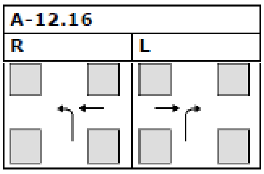


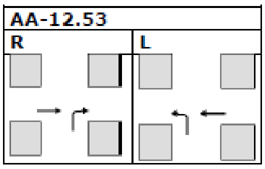


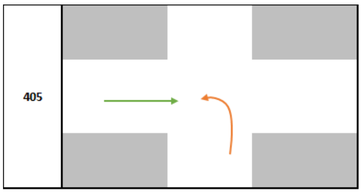


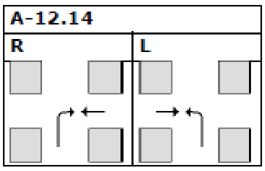

404

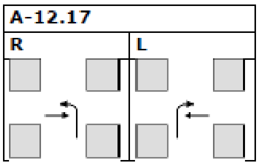

A-12.13
R
L

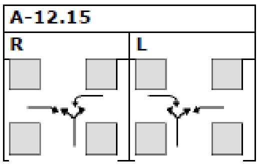

A-12.16
R
L


AA-12.53
R
L

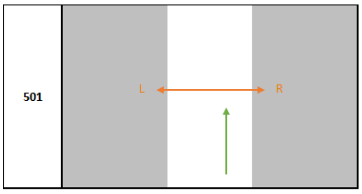

405

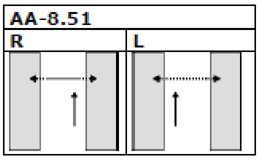

A-12.14
R
L

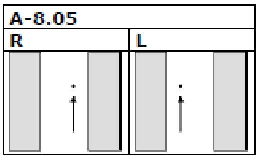

A-12.17
R
L


A-12.15
R
L

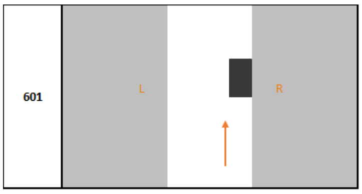
5. Crossing without crossroad

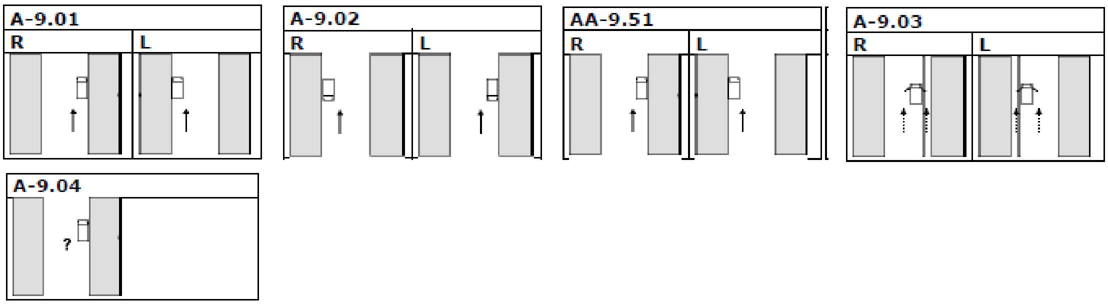


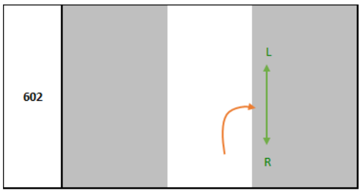


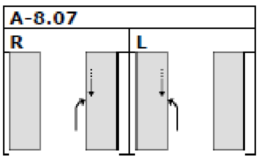


6. Accidents with parked vehicles









7. Accidents with obstacles