RED LIGHT RUNNING BY CYCLISTS

Which factors influence the red light running by cyclists?

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Which factors influence the red light negating cyclist?

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Preface

This report is written as master thesis for the study civil engineering, track “Transport & Planning”, at the Delft university of technology. In preparation for this thesis, I explored 3 topics for further research, as those appeared to have a strong impact on the rising numbers of seriously injured cyclists: a) the safety of electric cycling in relation to the infrastructure, b) the requirements for a forgiving road side for cyclists, and c) the determinants of red light running among cyclists. Based on this exploration “Red Light running’ was chosen because there were no ethical constraints preventing us to do an observation study, not many research was done in the recent past, it was common behavior and can lead to dangerous situations.

Several people have contributed academically, practically and with support during this period. Firstly I would like to thank Divera Twisk, who has been a great help finding the best topic for my thesis and reviewing the work in different stages of the project. I would also like to thank my “graduation committee”, Fred Wegman, Atze Dijkstra, Paul Wiggenraad and Arend Schwab, for reviewing my thesis and giving valuable comments on the work. I express my deep gratitude to Edwin Scharp from the Delft University of Technology, without whom the video observations would have not been possible.

Further I would like to thank SWOV for enabling me to do the research, all the colleagues, especially the other interns, for the pleasant time and help when needed.

Last but not least I would like to thank friends and family for their support, advice and interest in the subject during my research.

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Summary

In an ideal world there would be no crashes in traffic. Unfortunately the real world is far from ideal and over 20,000 people get injured in a crash in the Netherlands each year. Around 46,7% of these registered crashes, take place at intersections. To decrease the chance and number of conflicts, and therefore the chance of crashes, many intersections are controlled by traffic signal control, but these will only have effect when the signals are obeyed. In almost all traffic signal control systems the motorised streams are prioritised, because of the space and time needed for cars to cross the intersection. Therefore cyclists, who can cross in high numbers in a short time, have longer waiting times compared to motorized streams. As a result cyclists are possibly more likely to ignore the traffic lights and cross when seems safe to them. When they cross during the phase where the light is turned red, this is called red light running.

The purpose of the report is to give insight in the percentage of the red light running by cyclists in the Netherlands, the influence factors and the consequences for traffic safety. Through literature review an inventory of the different factors that influence red light running is made. The characteristics found that increased the percentage of red light running were: Male cyclists, young adults, experienced cyclists, bad weather, long waiting times, reduced credibility/low conflicting traffic flow, short crossing distance, herding (when there are other people violating the red light they are more likely to also violate the red light) and a low percentage of trucks and busses. Though most literature was over 25 years old and thus was not recent enough to form hypotheses. Thus the study got a descriptive and explanatory nature.

With the help of video observations on 5 different intersections, factors found in literature were analysed. The overall red light running was 27.4%. Factors that were found influencing red light running are:

- Gender: Men violated the red light 1.32 times more than women.
- Age: Young cyclist have a higher percentage of red light running, 1.63 times higher than adults and 1.78 time higher than elderly cyclists.
- Crossing distance: A longer crossing distance decreases the red light running
- Flow of the motorized streams: more traffic on the conflicting motorized streams lead to less red light running.

The vehicle composition of the conflicting stream seems to have an effect on the red light running. However, the number of observations for these factors was too low to statistically test them. Therefore further research, with observation of more intersections, is necessary. The other factors did not have an effect or the effect seen was not statistically significant. It is recommended to do further research on the factors that have an influence on the red light running. The number of the observations, number of intersections or number of cyclists crossing in this descriptive research are too low to conclude without a doubt the effect of these factors.

1. Introduction

In an ideal world there would be no crashes in traffic. Unfortunately the real world is far from ideal. In 2009 19,387 crashes, in which people got injured, took place in the Netherlands. 46.7% of these registered crashes, take place at intersections, the place where traffic streams from different directions cross. The different traffic streams use the same areas, when crossing an intersection, this can lead to conflicts. To decrease the chance and number of conflicts, and therefore the chance of crashes, many intersections are controlled by traffic signal control. Traffic signal control separates the conflicting streams, by allowing only certain streams to cross the intersection at the same time, by using red, yellow and green lights.

The reduction of conflicts only holds when the road users obey the signals. In almost all the traffic signal control systems the motorised streams are prioritised, because of the space and time needed for a car to cross the intersection (Dooren, 1985, Muller et al., 2011). Therefore the cyclists, who can cross in high numbers in a short time, have longer waiting times. As a result of these longer waiting times and many other factors, cyclists are more likely to ignore the traffic lights and cross when they think it is safe. When they cross during the phase when the light is turned red, this is called red light running. Violating the red light can lead to dangerous situations with the conflicting streams, but does it really? It may be a safe practice, as observations show that cyclists only violate a red light if the gap in the conflicting stream is big enough to avoid a possible collision(Mulders and Oude Egberink, 1984). On the other hand, 1 out of 10 crashes were caused by red light running and the crashes with red light running as the cause had more severe injuries(BRON: Bestand geRegistreerde Ongevallen in Nederland). Thus even though people tend to be more attentive while running a red light, still 11% of the crashes caused by cyclists are due to red light running.

The purpose of the report is to give insight in the percentage of red light running by cyclists, the influencing factors and the consequences for traffic safety. Through literature research an inventory of the different factors that influence red light running is listed. Through observation a closer look is taken at these factors. In this study we will only take into account intersection inside the urban area and where there is no infrastructure for public transport.

In chapter 2 the problem is analysed and provides answers to the questions: What is red light running? What is the extent of the problem? And what are the effects on traffic safety? Chapter 3 contains the results from the literature review. In chapter 4 the method of the observation study is presented. Chapter 5 contains the results of the data collection and in the data analysis be found. Chapter 7 holds the conclusions and chapter 8 the discussion and recommendations.

2. Problem analysis

In this chapter the specifics of red light running are explained. The question 'What is red light running?' will be answered in paragraph 2.1. Paragraph 2.2 will review the general occurrence of red light running, are there many people who violate the red light? Paragraph 2.3 will put red light running into the context of traffic safety. The last paragraph (2.4) will include respectively the purpose and research design.

2.1.What is red light running?

Red light running is when a cyclist starts crossing an intersection while the traffic signal is red. The red light running of cyclists is calculated by the number of cyclists that violate a red light. This can be calculated by dividing all cyclist that violate a red light by all cyclist that arrive at the intersection.

$$RLN = \frac{RR}{A} = \frac{number\ of\ cyclist\ that\ violate\ the\ red\ light}{number\ of\ cyclist\ that\ cross\ the\ light}$$

In order to compare the red light running between intersections with different intensity and cycle times, the number of red light running cyclists is divided by the number of cyclists that could have violated the red light, these are the cyclist who arrived at the intersection while the traffic light was red.

The formula of the red light running is stated below:

$$RLR = \frac{RR}{RA} = \frac{number\ of\ cyclist\ that\ run\ the\ red\ light}{number\ of\ cyclist\ that\ arrive\ at\ the\ red\ light}$$

The red light running cyclists can be divided into 3 different groups, with different level of risks, depending on when they violate the red light, late-, middle- and early-riders(Bureau Goudappel Coffeng, 1988).

-The late-rider is a cyclist that violates the red light directly after the yellow phase. This cyclist is cycling towards the intersection during the green phase, and has probably accelerated to cross before the light turns yellow/red. The late refers to the green phase; the cyclist is actually too late to cross in the green phase and therefore crosses in the first part of the red phase. The late-rider has a low risk because the cyclist uses the clearance time for the cyclists.
-The middle-rider is a cyclist that violates the red light during the green phase of the conflicting stream. For this group the probability of conflicts is the highest, because the conflicting streams have green and the probability of vehicles crossing is high.
-**The early-rider** is a cyclist that violates the red light, after the conflicting streams traffic light has turned red. The early-rider uses the clearance time of the conflicting stream to cross. The risk of the early riders is higher than that of the late-riders as around 80% of red light running for motorised vehicles takes place in the first seconds of their red phase (Bonneson et al., 2002).

To observe the different groups they need to be connected to a part of the red phase that can be observed. Therefore the red phase is divided into three parts: Begin red phase, Middle red phase and End red phase.

The **begin red phase** is the phase between the moment the traffic light turns red and the moment the first conflicting vehicle crosses the conflict area. The cyclists that violate the red light in this part of the red phase are the late-riders.

The **middle red phase** is the part of the red phase between the first and last passage of a vehicle in the conflicting stream. The cyclists that cross in this phase are the middle-riders.

The last part of the red phase is the **end red phase**. This is the period between the crossing of the last conflicting vehicle and the start of the green phase. The cyclists who cross during this part of the red phase are called the early-riders.

Figure 2-1 shows the different red phases during the cycle schematically.

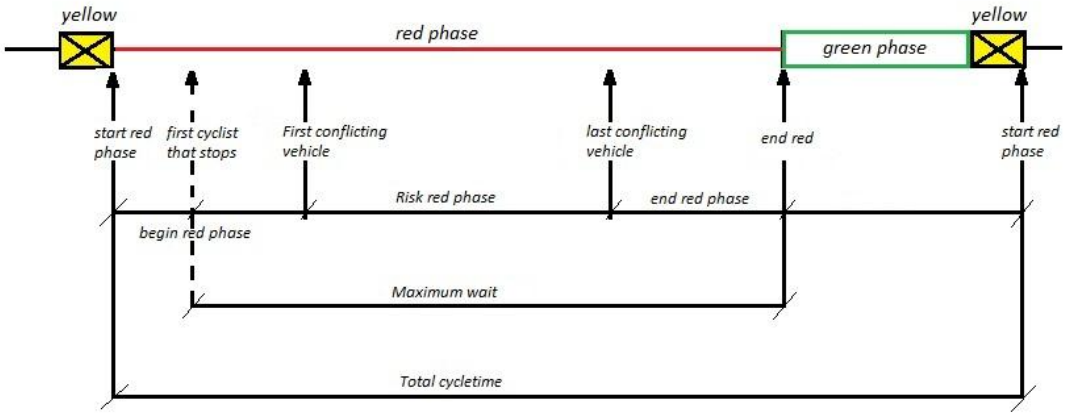

Figure 2-1 Traffic signal control cycle and red phases [in the figure the middle red phase is called 'risk red phase']

When calculating the red light violation per red phase you have to take in to consideration the cyclist arriving during the red phase and those already waiting for the red light. The cyclists that are already waiting for the red light can decide to violate the red light during the later red phases.

The formulas for the different phases are:

$Begin - redphase$	$RLR_b = \frac{RR_b}{T_b}$
$Middle - redphase$	$RLR_r = \frac{RR_m}{T_r + (T_b - RR_b)}$
$End - redphase$	$RLR_e = \frac{RR_e}{T_e + (T_m - RR_m) + (T_b - RR_b)}$

RLR_b, RLR_m, RLR_e: red light running in respectively begin-, middle- and end-red phase

RR_b, RR_m RR_e: Number of cyclist that violate the red light in respectively begin-, middle- and end-red phase

T_b, T_m, T_e: Number of cyclist that arrives at the intersection at respectively, begin-middle- en end-red phase.

2.2. The frequency of red light running

The extent of red light running by cyclist in the Netherlands is not known exactly. In 2007 research among 11-13 year old children using questionnaires 60-70% of these children reported to have violated a red light in their lives (Twisk et al., 2007).
A spread in red light running over different locations was found in research done in 1978 on 10 different intersections in the area of Hilversum and Utrecht. The average red light running over the intersections was 20%, but between the intersections there was a spread from 3% up to 48% red light running (Veilig Verkeer Nederland, 1978). Another observational study on 11 intersections, preformed in 1988, showed an average of 15% and a spread between 3 and 35% over the different intersections (Bureau Goudappel Coffeng).

The previous studies were all carried out in the Eighties of the last century and there are only a few recent studies. In 1996 van Lieshout, evaluated the "All directions green" –system, where the cyclists from all different directions get green at the same moment, see appendix B. During observation a spread in red light running from 3.1% - 18.8% was found (Lieshout, 1996). This percentages were just for intersections that use the "All directions green" and was not compared in a before and after study. A more recent study tested the effects of a weather dependent traffic signal control. The red light running was measured at only one intersection, but with changing traffic signal control. With cold temperatures (<10˚C), rain or a combination the cyclist light had two or three green realisations instead of one, when the weather was warm (>10 ˚C) and dry. Depending on the type of signal control red light running differed from 18% up to 50% (Harms, 2008). This shows that even on the same location the red light running differed, when other conditions change. An observation study in 2010 in Amsterdam showed a variation of 29 to 42% red light running depending on the different directions of an intersection. On two intersections the red light running was measured in order to determine, by pre-post measurements, the effect of communicative measures on red light running (de Rooij and van Dam, 2010).

2.3.Conflicts and casualties due to red light running

To give an overview of the influence of red light running on traffic safety two different groups are used to give an indication: Conflicts and casualties. A conflict is an event in which, if both vehicles would continue their path, a collision would occur. Casualties are in this case the people that got injured when a conflict ended in a crash. The conflicts are used to give an overview of the risks of certain actions. The casualties help quantify the actual safety.

Violating a red light can lead to risky situations, but not in all cases. A large group of cyclists states to only run a red light when they perceive the risk to get into a conflict to be low. Because of the lack in data on crashes with cyclists (low registration rate) in the Netherlands (SWOV) , it is difficult to get a full view of the impact of red light running on the traffic safety.

Research in 1980 in Norway on eight intersections for pedestrians stated that the number of injuries obtained during crossing is related to the number of crossings during respectively red or green. The higher the percentage of crossings during red, the more injuries (Aarden, 1980). On the other hand, multiple studies note that with an increase in red light running the number of conflicts reduced

relatively.(Aarden, 1980, Mulders, 1981, Mulders and Oude Egberink, 1984). A higher attention level of the pedestrian, who violates the red light was postulated as a possible explanation of this counter intuitive effect.

Explorative research in 1984 shows that 25-33% of the crashes one of the involved road users had violated the red light (Bureau Goudappel Coffeng, 1984). Another study by Goudappel Coffeng (1985) said that 40% of the crashes were caused by one of the parties involved violating the red light. There was no distinction made between the car or cyclist violating the red light. A Belgian report (based on German research) showed that 3.1% of the accidents with cyclist, were caused by red light running by the cyclist (van Hout, 2007). The number was said to be underestimated as people will not always confess they made a mistake.

2.3.1. Crash data

For the purpose of the present study we analysed the crash data for the Netherlands over the period 1993-2009. The data consists of all the registered crashes where a cyclist was the main cause of the crash. It was divided into two groups: The group where the cyclists violated the red light and the group with all the other crashes where the crash was caused by the cyclist.
The analyse showed that in the period 1993 to 2009, a total of 4.599 injured cyclists were registered as injured because of 'red light running' see Table 2-1. This was 11% of all the registered cyclist crashes of which the cause is known. On average crashes with red light running as the cause have more severe injuries ($\chi^2(4)=144.022$, $p<0.001$). The categories 'Dead', 'Severely injured' and 'Lightly injured' have a higher observed count than the expected count in case of the red light violation crashes. For the not injured and unknown the observed count is lower than the expected count. Thus crashes after red light running result in more severe injuries. The number of cyclists injured has decreased over the years. Starting with 370 injured by violating the red light in 1993 to 133 in 2009. For the other causes the number of injured was reduced from 2,984 in 1993 to 1,286 in 2009.

Table 2-1 Total, Mean and percentage of the crashes involving cyclist 1993-2009. N is the total number of cyclist in the category over 16 years. Mean is the number of cyclist on average per year. The percentages are first the vertical percentage (the total of all the red light running crashes divided per severity of injury) and second the horizontal percentage (percentage of dead over the total of cyclists died in crashes). The number of crashes are based on the same intersections for the red light running, which includes all cyclists running a red light, and all other causes, which includes all other crashes at the intersection of which the cause is known and is not red light running. [Source: BRON/SWOV]

Crashes involving cyclists	Red light running				All other crashes with known cause			
	N	Mean	Percentage of total red light running	Percentage of total per injury	N	Mean	Percentage of total	Percentage of total per injury
Dead	**140**	8	3.2%	***12.1%***	**988**	58	2,7%	***87,9%***
Severely injured (MAIS2+)	**1,159**	68	25.0%	***12.1%***	**8,406**	494	22,6%	***87,9%***
Lightly injured	**3,056**	180	66.3%	***11.4%***	**23,756**	1,397	63,5%	***88,6%***
Not injured	**224**	13	5.1%	***5.5%***	**3.829**	225	10.6%	***94,5%***
unknown	**20**	1	0.4%	***7.7%***	**210**	12	0,6%	***92,3%***
Total	**4,599**	271	100%	***11.0%***	**37,189**	2,188	100%	***89.0%***

Another reason red light running has an influence on traffic safety is that Red light running is said to be one of the most irritating traffic violations (Fincham, 2006, O'Brien et al., 2002). The frustration

that it causes for other road users can lead to dangerous situation at a location downstream of an intersection. However, this indirect effect is difficult to verify.

Thus a better understanding of red light running by cyclist leads to better measures and the reduction in red light running achieved with these measures would benefit traffic safety.

2.3.2.Sustainable safety

A method used in the Netherlands to reduce the number of casualties and conflicts is the sustainable safety. The goal of sustainable safety is to eliminate conflicts and where they cannot be prevented to reduce the severity of the crashes, by reducing the impact speed. To reach this goals five principles are used(Wegman and Aarts, 2005):

-Homogeneity
-Functionality
-Predictability
-Forgivingness
-State awareness

Homogeneity means that you separate the traffic modes with different speeds and masses. A collision between a high and low mass can be very severe. The same holds for traffic with high difference in speeds.
Functionality means that the roads should be mono-functional, have only one function, and all the roads together form a hierarchically structured road network.
The predictability of a road or road user behaviour, should be reached by recognizable road design. The behaviour of other road users and the design of the road support the expectations, via consistency and continuity in road design.
The forgivingness of the environment and of road users should limit the injuries and severity of crashes, by anticipation of the road users and forgiving road environment.
State awareness is focused only on the road user and is the ability to assess one's own task capability(Wegman and Aarts, 2005).

In case of red light running, the predictability and forgivingness are the principles that are affected. When cyclists violate the red light, the road users on the conflicting stream, with green light, will not expect them to cross and cannot anticipate beforehand.

In sustainable safety the aim is to prevent conditions that can lead to serious crashes and, if that cannot be done, limit the consequences. To prevent crashes the amount of conflicts should be limited to as little as possible. Less conflict points means less chance of a conflict. Therefore a roundabout is preferred above a controlled intersection. In figure 2-2 the conflict points of a roundabout and 4-way intersection are shown, only taken into account car traffic. An intersection has 24 conflict point and a roundabout has only four conflict points (Janssen, 2004). Adding cycle paths to both types will add twelve conflict points in both cases, see figure 2-3. This twelve extra conflict point are: eight conflict point between cyclist-car and four cyclist-cyclist. Besides the conflict points the speed on roundabouts is lower than on normal intersection which contributes to safer situations.

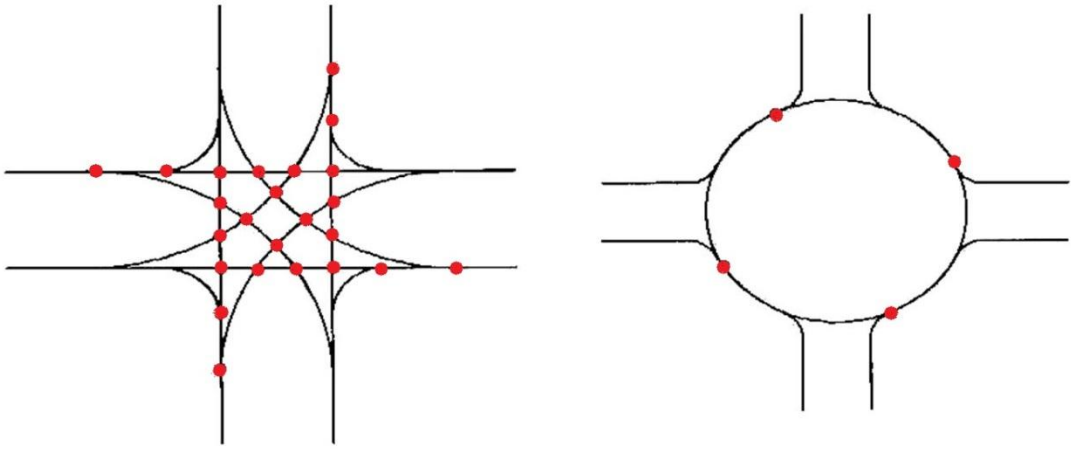

Figure 2-2 Conflict points for 4-way intersection and roundabout

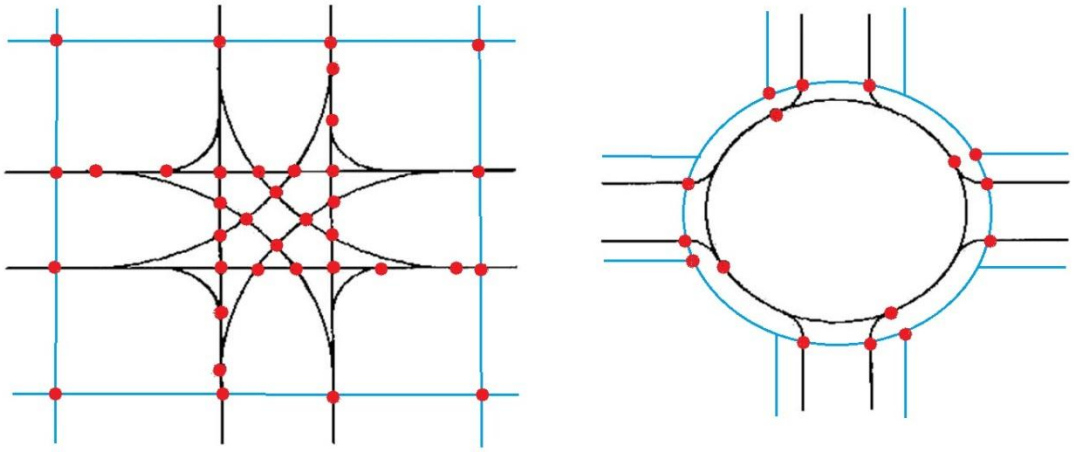

Figure 2-3 Conflict points for 4-way intersection and roundabout including cycle paths (blue)

Traffic lights are not sustainable safe unless:
1) They limit the driving speed of the traffic (<30km/h)
2) The Cyclists wait for the red light
3) The cyclists that do not wait, only cross when there is no conflicting traffic.

Number 2 and 3 cannot be regulated, because there will still be people violating the red light. There are different type of people: People who obey the rules because they been taught that's the thing to do (normative perspective), People obey rules when they think that they will ultimately benefit from them and People who do not think about the rules, either because they do not see the risk or just think they are above the law. This leads to people who will not run red lights at all, for example parents showing their children how they should behave.(SARTRE, 1995) The second group that will run the red light when waiting does not ultimately benefit them. This means that when the people think they can cross safely when the light is red, they are likely to violate the light, as waiting will not benefit them in their eyes. Waiting will 'cost' more than the chance of a fine or crash. And the last

group that will not pay attention to the light at all. In order to obey to rules it is important that the link with our own safety is clear and we sense that the rules are fair and neutral.
Thus in order for traffic lights to be sustainable safe they should reduce the speed of the motorized traffic (to <30km/h). In most traffic signal controlled intersection this is not the case and thus traffic lights are not sustainable safe.

2.4.Research question & design

The previous paragraphs show that little is known about the extent and effects on traffic safety of red light running by cyclists. Thus the research was descriptive and exploratory in nature. Red light running seems to vary per location and situation, but almost all the literature on red light running in the Netherlands is over 25 years old and in the meantime things have changed, e.g. mopeds are no longer allowed on the cycle paths and improved technology for (dynamic) traffic signal control. Therefore we state the following research questions:

- What is the occurrence of red light running?
- Who violate the red light?
- Which factors will influence the red light running by cyclists?

The purpose that comes with this research question is:
-To give more information and insight into the different factors that influence red light running.

The research was divided into two parts: a theoretical and an empirical part. In the theoretical part a literature review was done in order to answer questions about what is known about red light running by cyclists and what research has been done in the past.

In the empirical part an observational study was done. This was done to get insight in the current behaviour of cyclist, the effects of the infrastructure and other factors. The observational study was done on a few intersections, which are chosen on their characteristics.

3. The identification of influencing factors: a review of the literature

The literature is reviewed on the factors that can be of influence on red light running, listed in paragraph 3.1, and measures taken to reduce red light running, see paragraph 3.2.

The literature was found in the library of the TU Delft and SWOV and online databases TRID (Transport Research International Documentation). Search terms such as Red light, Red light running, red light negation, red light infringement, red light violation and these terms in combination with cyclist were used. The literature is based on research all over the world, of which not all can be generalised to the Netherlands, but it can give an indication of the factors that can be of influence. Because of the limited research on cyclists' red light running, also literature on red light running of other slow traffic, like pedestrians, is included.

3.1.Influencing factors

There are many different factors that influence red light running by cyclists. The influencing factors can be divided into two groups: the first a group of factors that cannot be influenced by traffic engineering measures and the second group which can be influenced by traffic engineering measures. The first group includes factors like, age, group pressure, weather conditions, experience and area. Part of the second group are Intersection geometry and signal control. Through dividing the factors into these two groups, the possibilities for measures become clear.

3.1.1. Factors that cannot be influenced by engineering measures

The factors that cannot be influenced by traffic engineers are personal characteristics and characteristics of region and culture.

Gender

In 1974 Retzko and Androsch found that the number of male pedestrians running a red light was higher than the number of red light running among female pedestrians (Retzko and Androsch, 1974). Mulders and Oude Egberink (1984) reached the same conclusion in their observation study for pedestrians 10 years later (male 49,6% vs. female 40,9%). A study with cyclists in 1985 showed that male cyclists violate the red light 9% more often(Bureau Goudappel Coffeng). More recent research on cyclists in Australia showed that 39.8% of the male participants violated a red light and 31.9% of the female participants did, but the number of men in the study was also twice the number of woman that filled in the questionnaires (Johnson et al., 2012b, Johnson et al., 2011). Wu found also a greater percentage of red light running for male cyclist in Beijing (male 59% vs. female 48%)(Wu et al., 2012). Thus male cyclists seem to have a higher red light violation than the female cyclists.

Age

The red light running in Australia was the highest in the age groups of the young adults (18-29 years old) and smallest in the age group of the elderly (>50 years) (Johnson et al., 2012a). Another study in Australia confirmed that the elder groups had less red light running (29.9%) than average (37.3%)(Johnson et al., 2012b). Also in China the young adults and adults had a higher percentage of red light running than the older cyclists (>50years) (56% and 60% vs. 23%). The age groups was said to be a significant factor in the prediction of red light running, where the younger age groups had an almost eight times higher chance to violate the red light (Wu et al., 2011).For pedestrians also the elder (>65 years) and younger (<14 years) age groups showed the least red light running . In this observation study of 32 different intersection the average red light running by elderly was 32% compared to the total average of 45% (Mulders and Oude Egberink, 1984). Thus most red light

running is seen among the young adults and adults and the least red light running is seen among the elder cyclists (>65years).

Haste

Haste is a factor named in the literature for cyclists and pedestrians (Dooren, 1985, Aarden, 1980). In Norway 36.1% of the pedestrian stated haste/not wanting to wait as the reason of their red light running. (Mulders, 1981) Three years later in a study in the Netherlands 19.9% of the participants stated haste as the reason of red light running (Mulders and Oude Egberink, 1984).
Although this factor can be found in questionnaire studies it is a factor that cannot be measured in observational studies. In Haren (Groningen, The Netherlands) the crossing speed of pedestrians was measured to indicate haste. The pedestrians where divided over a slow, normal and fast group. The slow group was left out of the analysis, because most pedestrians were not able to cross faster, even if they were in a hurry. The study did not found a significant result between the fast (69% red light running) and the normal group (68.7% red light running). A probable better way to measure haste is to look at the approach speed of the pedestrians. (Aarden, 1980)

Experience

Experience can be distinguished in two ways. The experience in cycling and the experience with a situation. An experienced cyclist will be able to estimate the risks better and perhaps sooner take the risk they deem acceptable. The same accounts for familiarity with the situation. The cyclist who travels the same route every day will know when it is safe to cross an intersection even when their light is red or they can predict the moment they will get green (by the order of the traffic control) and will start crossing just before the light actually turns green. The hypotheses of experienced cyclists violating more red lights was supported by a study in Australia.(Johnson et al., 2012a) The cyclist that travelled over 100km per week by bike had a higher percentage of red light running (39.3%) than cyclist that travelled less than 100km per week (34.7%). It did not say if the cyclists were also more familiar with the route and/or intersection where they violated the red light than the less experienced cyclists.

Herd mentality (behaviour of other cyclists)

Pedestrians tend to wait for a red light more often when there are other pedestrians waiting. Also the opposite effect has been seen, when there were people running the red light the pedestrians that arrived at the red light were more likely to violate the red light (Mulders, 1981, Mulders and Oude Egberink, 1984). Observational study in Beijing also showed that the number of people waiting at the traffic signal or already violating the red light was significant for the prediction of red light running (Wu et al., 2011).

Weather condition

The weather conditions are of influence on red light running and the cyclists' behaviour itself. People tend to use the car or public transport instead of the bicycle when the weather is bad, cold or raining. The people who do not have an alternative for their trip, besides using the bicycle, prefer not to wait in the rain, while car drivers, who sit warm and dry in their cars, get most of the green time. An evaluation study in Noord-Brabant showed that when the cyclists get a green light more than once per cycle, in bad weather, would decrease the percentage of red light running (Harms, 2008).

Location

A study in 1984 measured the red light running over different cities and found that the city in which the intersection was located also was a factor that influences the amount of red light running. There was a difference between intersections inside and outside the build-up area. (Bureau Goudappel Coffeng, 1984). Thus the location of the intersection has an effect on the red light running. This factor cannot be influenced, but it can be eliminated in an observational study by only looking at intersections in one area.

Attitude

Some cyclist think they know best when it is safe to cross the lights, and do not need the traffic lights. Mulders and Oude Egberink found that 64% of the survey participants orientated on the traffic to cross. They did not look at the traffic light at all and 29% of the participants did look at the traffic light before crossing.(Mulders, 1981) Attitude of cyclist might be influenced with parenting and education, but this is on the long term.

Conclusions

The factors that cannot be influenced by traffic engineers are gender, age, haste, experience, herd mentality, weather condition, location, and attitude.

- Male cyclists are found to have a higher violation of the red light than female cyclist.
- Under young adults and adults a higher percentage of red light running was found compared with elder cyclists.
- Haste can be of influence, but the studies done so far do not have significant results.
- Higher experienced cyclist violate the red light more often.
- People act like herds, when there are other people violating the red light they are more likely to also violate the red light.
- In bad weather there is more red light running.
- The location of the intersection has an influence on the red light running.
- The attitude of the cyclist can have a positive or negative effect on the red light running

There are more factors that can be partially influenced by traffic engineers. The traffic engineers can set up the rules and regulations, but the behaviour of the traffic, if these rules are obeyed, determine the effect, for example with speeding, or short cuts.

3.1.2. Factors that can be influenced by engineering

The factors that can be influenced by a traffic engineer contain the infrastructure, geometry of the intersection and the traffic signal control.

Waiting time

The time a cyclist had to wait at a traffic signal was perceived as an important influence factor for red light running (Mulders, 1981, Mulders and Oude Egberink, 1984, Bureau Goudappel Coffeng, 1985, Bureau Goudappel Coffeng, 1988). In literature the effects of the factor were often stated, but the claim was hardly ever substantiated. Klaassen concluded in his research in 1981 that the waiting time is not of influence at all, because high waiting times are caused by the high traffic volumes and complex cycles. The cyclist would not have a chance to cross safely (Klaassen, 1981). Mulders concludes that the waiting time is of influence, the longer the waiting time the more people will violate the red lights (Mulders, 1981). Also most current measures are focused on the waiting time,

see paragraph 3.2 for more information on the current measures. Thus a higher waiting time increases the red light running.

Credibility of the traffic signal control

Another factor that influences the red light running is the credibility of the traffic signal control. The lights are meant to prevent conflicts, but when there is no traffic on the conflicting stream, the chance to get into a conflict is zero. If the light was red when there was no conflicting traffic, the credibility of the traffic signal control decreases (Retzko and Androsch, 1974).With credibility is meant the feeling that people are not waiting whilst they could have crossed safely, no conflicting traffic. When the credibility of the traffic light is low the cyclists will be tempted to cross when they think it is safe. This impact is also possible with motorized streams when the lights are red for long times. The same effect can be found with speed limits for motorized traffic. The roads are constructed in a way that people feel the given speed limit is appropriate and will be more likely to have a maximum speed conform the speed limit (SWOV, 2012). Thus intersections where the light is often red when there is no traffic on conflicting streams have a higher percentage of red light running.

Crossing distance

The crossing distance depends on the number of lanes that need to be crossed and whether there is a median refuge. Together with the crossing speed, the crossing distance determines the time needed to cross: the crossing time. When the crossing distance is shorter, the crossing time will be shorter and the gap needed in the conflicting stream smaller. The gap time is bigger than the crossing time in case of a crossing without conflicts. Literature shows that the red light running decreased when the crossing distance increased (Bureau Goudappel Coffeng, 1985, Bureau Goudappel Coffeng, 1988), other literature shows that the crossing distance, divided into two groups: more than two lanes and two lanes and shorter, did not influence the red light running (Mulders and Oude Egberink, 1984). The existence of a median refuge resulted in an increase in red light running, because the crossing distance until the next “safe” point was about half of the total distance. Thus a shorter crossing distance leads to an increase of red light running.

Clarity of the intersection

In order to accurately evaluate the gaps in the conflicting stream it is important to be able to oversee the situation. To cross the road safely the cyclist needs to be able to see the gaps in the conflicting stream, when this is not possible the cyclist will have difficulties to assess the risks of crossing. It is not proven to be of influence on the amount of red light running, but it is of influence on traffic safety. If the cyclist will violate the light when he or she cannot oversee the situation the risk of an accident becomes higher.

Another point of clarity of the intersection is the location of the traffic signals. When the traffic signals are not clearly visible the cyclist could unintentionally violate the red light. No studies are found on the influence of the clarity of the intersection.

Intersection design

Besides the crossing distance and clarity of the intersection other characteristics of the intersection design can be of influence on the red light running. The presence of a median refuge could increase the red light running, as is discussed at the crossing distance. “de pressiegroep KINDEREN VOORRANG” (1994) reported speed reducing measures, like speed humps, raised intersections, etc.

had influences on the red light running. These factors have a greater impact on the red light running of motorized vehicles than cyclists.

Volume and saturation flow

Volume and saturation are two factors that are dependent of each other. The saturation is the quotient of the traffic (I (pce/u) or q (pce/s)) and the number of pce (passenger car equivalent) that can cross (green time * entry capacity, k (pce/u) or s (pce/s)) (Dooren, 1985). When the traffic volume is higher the degree of saturation will be higher. When the volume of the conflicting stream is high there are many cars crossing the intersection per hour and the gaps in the traffic are small. Cyclists violated the red light when the gaps in the conflicting stream were large enough to cross safely, without any conflicts. When the gap was smaller than the critical gap (the smallest gap that will be accepted) the cyclist waited. (Dooren, 1985).

Velocity of the conflicting traffic

The velocity of the conflicting stream has an influence on the red light running. The velocity has an effect on the gap time. When the traffic has a higher velocity the gap times become harder to interpret, which will decrease the possibilities for the cyclist to cross and when the cyclists get into a conflict, the injuries will be more sever.

Composition of the conflicting traffic

The composition of the conflicting traffic is a possible influence on the red light running (Dooren, 1985). When the percentage of trucks in the conflicting stream was higher, the cyclist might perceive crossing as a higher risk than when the percentage of trucks was lower, because of the size and mass of the lorries compared with passenger cars.

Conclusions

The factors that can be influenced by traffic engineers are waiting time, credibility of the traffic signal control, crossing distance, clarity of the intersection, intersection design, volume, velocity and composition of the conflicting traffic .

- A longer waiting time increases the red light running.
- Reduce of credibility increases the red light running.
- A longer crossing distance results in a reduction of the red light running.
- The influence of the clarity of the intersection on the red light running is not clear.
- The different aspects of the intersection design can have a reducing or increasing effect on the red light running.
- A higher volume and velocity of the conflicting streams reduces the red light running.
- A higher percentage of trucks and busses has a positive effect on the red light running.

3.2. Measures

For both slow and motorized traffic there are measures taken to reduce the red light running. The measures taken to prevent cyclists from violating the red light mostly have waiting time as leading factor. Cyclist experience waiting for traffic signals as uncomfortable and in some city the delay even adds up to 45 second per kilometre (Hendriks, 2010). The substantiation of why the waiting time is chosen is in almost all cases weak. The measures described in this paragraph are waiting time predictors, weather dependent traffic signal control, communicative intervention and enforcement.

Waiting time predictors

Waiting time predictors need to help the cyclist to accept the waiting times. Next to the traffic signal there is another light with LED-lights and the word “wait” in red on it. The lights symbolise the time you have to wait before the light turns green. When the last light goes out the traffic signal will turn green (CROW), see figure 2-1. Research showed us that the waiting time predictor had the effect of, instead of decreasing the red light running, a shift to another point in the cycle. (Tijssen, 2008) The amount of early-riders increased, because a lot of cyclist started crossing when there were only a few lights left. This can cause dangerous situations as about 80% of the red light running by cars takes place in the first phase of the red (Bonneson et al., 2002), late riders, they ignore the light when it just turned red, which is the moment just before the bicycle light turns green. No research was found on the effect of waiting time predictors on the traffic safety.

Figure 3-1 waiting time predictor

Weather dependent signal control

Another measure is a cyclist friendly traffic signal control or weather dependent traffic signal control, which will provide more green phases for the cyclist when it rains or is cold (<10 $^{\circ C}$). A test in the province of Noord-Brabant showed that the red light running decreased when there were more green phases, and the waiting time became less. There was also an influence of the flow and decrease of red light running visible The rain had the biggest influence. Temperature does not seem to have a large influence on red light running.(Harms, 2008).

Communicative intervention

In Amsterdam was tried to reduce the red light running with communicative intervention. Signs, see figure 3-2, on the traffic signal posts should stop people from violating the red light. The signs need to change the behaviour of the cyclist unconsciously. Without consciously knowing why the cyclist stop at the red light when there is a sign, where they would not stop if the sign was not there. In the same study was found that the amount and type of people already waiting for the traffic light is of influence on the red light running (de Rooij and van Dam, 2010, Swankhuisen, 2010)

Figure 3-2 Examples of communicative intervention signs in Amsterdam

Enforcement

Visible enforcement has a positive influence on the red light running. Not much research has been done on the enforcement and cyclists. For motorized vehicles there has been done a lot of research on the effect of enforcement on the red light running. Most of this research has been done on the effects of red light cameras for motorized traffic. The factsheet "police enforcement" of the SWOV showed that the red light cameras helped decrease the amount of red light running .(SWOV, 2011). Other studies showed that it also had a positive effect on the traffic safety (Pauw et al., 2012, Dobbenberg, 2006). Oei and Varkervisser (1997) studied the effect on intersections in Amsterdam from 1994 till 1997 and came to the conclusion that the red light running was decreased, but the decrease was different over the different locations. The red light cameras will not be a good measure to reduce red light running by cyclists, as they do not have a license plate to identify them from the camera. Enforcement for cyclist, that can have an effect, will be having a police officer at the intersection. Another factor is the chance people get caught. A study showed that the chance a cyclist got caught was more important than the height of the fine they were facing. When the fee was very high but the chance you had to pay it was very low, people were less effected than when the chance you had to pay is higher, but the fine lower (Goldenbeld, 1994)

Conclusions

The measures presented in this paragraph are all measures that focus on reducing the behaviour of red light running, without looking at the actual cause of the red light running. Apart from the waiting time predictor, the measures cause a reduction of the red light running.

4. Method

This chapter contains the methods used for data collection and analyses of the data. In paragraph 4.1 the data collection and in paragraph 4.2 the method for the data analyses is explained.

4.1.Observations

The observations took place in two phases. First a group of 21 intersections was observed and red light running per cycle was measured by hand (Hand observations). From these 21 intersection a selection of 6 intersections was observed in more detail, with the help of cameras (Video observations). This helped to get a better and more accurate impression of red light running and the influences of different factors, but took more time than observations by hand. Therefore only a selection of the intersections were observed with cameras.

4.1.1.Research locations

For the research locations intersections in the build-up area of the municipality of the Hague were taken into account. The municipality of the Hague contains 255 traffic light controlled intersections and therefore a selection needed to be made. Doing the observations over all intersections will cost a lot of time and include many variables. This study limits to an observation of 21 intersections and therefore the group of intersections had to be brought down by using selection criteria.

The intersections used for observation are 4-legged intersections. The 3 and 5 or more legged intersections were taken out to get a uniform set of intersections. When all the intersection have the same number of legs there are also the same number of streams. The pedestrian crossings were also taken out, because a possible conflict between a car or a pedestrian is not valued the same. These intersection, with more or less than four legs, accounted for 89 intersections. Another selection criteria was the public transport. On many intersections public transport has priority on other traffic streams in the traffic signal control. This can lead to differing situations over time and will make it more difficult to distinguish effect of other variables. To limit the complication and the number of variable to take into account all the intersections with a bus or tram lane with priority, 97 intersections, were also left out of the selection. Another 17 intersections were not taken into account because they lay far away from the build-up area or in suburbs of the municipality of the Hague. The location was said to be an influence on the red light running and in this way is minimalized. At last a few intersections that remained were not on the main cycle routes and therefore might not be used by a sufficient amount of cyclist. The total of intersection that were taken out is 208, see Table 4-1, so after selection 47 of the 255 intersections remain.

Table 4-1 Number of intersection per selection criteria

2	Not identifiable
41	2-legged or pedestrian crossings
40	3-legged intersections
8	More than 4-legged intersections
97	4-legged intersections with public transport facilities (bus/tram lane)
17	Intersections in Pijnacker/Nootdorp/Ypenburg/Scheveningen
3	Intersection not on main cycle routes
208	

The 21 intersections used for Hand observations were randomly selected from the group of 47 intersections that was left after applying selection criteria. The 21 selected intersections, see appendix C, were observed for half an hour (not during rush hour) for one direction of cyclists. After collecting this half hour of data on red light running, the group was reduced to 6 intersections, which were part of the video-data-collection. The selection of the 6 intersections for the video observation was done by taking into account the number of cyclist and the amount of red light running during the first observations and if it was possible to place the cameras. The number of intersections was limited by the number of hours available for video observation, the camera and van could only be used for 24 hours.

4.1.2. Video coding / variables

For six intersection a video observation was done. The video observations were made with a camera on top or in front of the TU Delft measurement van, see figure 4.1. The video recordings were made between 7 am and 11 am. This time is choosing because it showed the red light running during rush hour and after rush hour. During the filming also hand observations were made to compare with the filmed data and see how accurate the hand observations were. All observations took place during dry weather.

Figure 4-1Video observation van with camera on top

The video recordings were analysed, where the different variables were coded:

- Date
- The moment a cyclist arrived and if this was at red or green
- The gender of the cyclists
- The age group the cyclists belong to (young, adult or old)
- The mean of transportation (bicycle or moped)
- All cyclist that crossed the stop line (per direction and with a group that had and a group that had not stopped before crossing) divided in four different periods:
    - From start red till the first crossing vehicle (late-riders, begin red phase)

- From first crossing vehicle till the last crossing vehicle (middle-riders, middle red phase)
- From last crossing vehicle – start of the green phase (early -riders, end red phase)
- Start of green – start of red (green phase)

- Number of vehicles that crossed the conflict area.
- If the cyclist arrived at the intersection as part of a group or
- If the cyclist was the first one to stop or there were already others waiting

4.2.Analysis

The analysis of the data was primarily descriptive, because of the little research done on red light running in the Netherlands over the past years. With the help of the programs MatLab and SPSS the descriptive statistics, like number of a certain group and percentages of red light running were calculated.

According to the literature study and a brainstorm, with six researchers in the traffic safety field, a list of factors was composed. The factors were said to have a certain influence on the red light running, for example most studies showed a higher percentage red light running for male cyclists and elderly were least likely to violate the red light. In the analysis these influencing factors were compared to the results found in the observations. The factors were divided into 4 groups: Human, Infrastructure, conditions and social.

For the categorical observations, like: gender, age group, vehicle choice, the correlation between these factors and red light running is tested with either a Chi-squared test or a Fishers exact test. The fishers exact test is used when more than 20% of the cells have a count below N=5 (Field, 2009). More information and results of the statistical tests can be found in appendix E.

5. Results

In this chapter the results of the hand observations are gathered. Paragraph 5.1 gives a quick overview of the results of the hand observations and paragraph 5.2 contains the results of the video observations. In the video observations more details could be observed and the results are therefore more extensive.

5.1. Selection of intersections based on Hand observations

In the period of the 3rd-17th of April the hand observations have taken place. An overview of the results can be found in table 5-1. For all intersections one direction was observed for half an hour, during peak hours. The first observations were done for an hour, but half an hour was sufficient to get an image of red light running on the intersections. The weather condition during the observations was dry, sunny and cold (for the time of year).

The red light running was calculated in two ways. The first is the way as used in the literature, with only cyclist arriving during red, and the second is including all cyclist, also the cyclist that arrive at green, the black list of red light running in table 5-1.

$$RLR = \frac{RR}{RA} = \frac{number\ of\ cyclists\ that\ violate\ the\ red\ light}{number\ of\ cyclists\ that\ \ arrives\ at\ the\ red\ light}$$

This is done because the cyclists that arrived during the green phase were not counted separately for all the intersections. The number of cyclists arriving during green are estimated for these intersections, based on the memory of the observer. The red columns in table 5-1 are the (estimated) arrival during green and the calculation of the red light running with only cyclists who arrived during red.

The hand observations were used to give a general overview of the red light running and select the intersections for the video observations. The results were not be analysed in detail.

The intersections used for the video observation are selected on the number of red light running. Preferably the intersection selected should both include intersections with large number of red light running and intersection with small percentages of red light running Also there should be enough cyclist crossing the intersection to get the best possible results. All intersection with an average flow of less than 50 cyclist per hour were excluded. Another selection criteria is the possibility to do the video observations. At the chosen intersection there should be enough room to park the TU Delft van. This lead to the group of intersections that are underlined in Table 5-1.

Table 5-1 Results hand observations. The first column shows the NR the intersection has at the municipality of the Hague. The columns 'street 1' and 'street 2' show streets that cross at the intersection. The column 'Cycle path' indicates whether the cyclists have a cycle path Yes [Y] or No [N]. Direction indicates the direction that is counted. The date and duration list the dat at which the observation is done and the duration for how many hours the observation took place. 'Green' is the number of cyclists that crossed during green. 'Arrived during green' is the number of cyclists that arrived during green, the column is red, because at some of the intersections the figure is an estimation. The arrival during green was not listed for these intersections. Column 'Red' is the total number of cyclists violating the red light, and the columns [begin], [middle] and [end] show the distribution over these red phases. The red light running is calculated in two ways, as shown in paragraph 2.1. The red column shows the red light running with only the cyclists arriving during red. The black column shows the red light running with all cyclists. The last column indicates the number of cyclists per hour.

NR	Street 1	Street 2	Cycle path	Direction	date	Duration [h]	Green	Arrived during green	Red $[\sum i]$	[begin] $[i_1]$	[middle] $[i_2]$	[end] $[i_3]$	Red light runing		Flow of cyclist per hour
58	Erasmusweg	Betje Wolffstraat	Y	22	17-apr	0.5	34	7	1	1	0	0	3.6	2.9	70
61	Wassenaarseweg	van Alkemadelaan	N	28	3-apr	0.5	31	19	2	1	1	0	14.3	6.1	66
64	Erasmusweg	Anna Bijnslaan	Y	28	17-apr	0.5	5	0	2	0	1	1	28.6	28.6	14
69	Laan van NOI	Benoordenhoutseweg	Y	24	3-apr	1	104	30	8	2	5	1	9.8	7.1	112
96	Binckhorstlaan	mercuriusweg	Y	26	2-apr	1	32	3	7	2	2	3	19.4	17.9	39
148	Loevestijnlaan	Hengelolaan	Y	26	7-apr	0.5	52	8	6	1	3	2	12.0	10.3	116
150	Mauritskade	Frederikstraat	N	11	4-apr	0.5	39	28	22	1	11	10	66.7	36.1	122
160	Groot Hertoginnenlaan	Valeriusstraat	N	24	17-apr	0.5	42	3	5	2	3	0	11.4	10.6	94
179	Machiel Vrijenhoeklaan	Savorin Lohmanlaan	N	8	17-apr	0.5	28	5	1	0	1	0	4.2	3.4	58
184	Machiel Vrijenhoeklaan	Kijkduinsestraat	Y	28	7-apr	0.5	23	2	1	0	1	0	4.5	4.2	96
198	Erasmusweg	Berensteinlaan	Y	22	17-apr	0.5	4	0	1	0	1	0	20.0	20.0	10
201	Bezuidenhoutseweg	hofzichtlaan	Y	28	8-apr	0.5	8	0	2	0	2	0	20.0	20.0	20
229	Sportlaan	Daal en Bergselaan	N	8	17-apr	0.5	69	8	4	1	0	3	6.2	5.5	146
237	Appelstraat	Thorbeckelaan	Y	26	7-apr	0.5	47	19	12	7	2	3	30.0	20.3	118
250	Maanweg	Regulusweg	Y	26	2-apr	1	76	10	17	7	10	0	20.5	18.3	93
304	Bezuidenhoutseweg	Prins Clauslaan	Y	22	3-apr	0.5	29	2	15	4	10	1	35.7	34.1	88
306	Prinses Beatrixlaan	Schenkkade	Y	22	16-apr	0.5	4	0	6	0	6	0	60.0	60.0	20
308	Prinses Beatrixlaan	Prinses Marijkestraat	Y	28	16-apr	0.5	22	11	10	1	4	5	47.6	31.3	64
404	Raamweg	Wassenaarseweg	Y	28	4-apr	0.5	39	7	10	2	8	0	23.8	20.4	98
405	Raamweg	Carel van bylandtlaan	Y	28	4-apr	0.5	56	18	24	1	23	0	38.7	30.0	160
708	President Kennedylaan	Aert van der Goesstraat	Y	2	8-apr	0.5	25	6	14	1	3	10	42.4	35.9	78

5.2. Video based assessment of the proportion of red light running on 5 location

The video observations were carried out at 6 different intersections, only 5 of the intersection resulted in usable data. The sixth intersection had only 5 cyclist crossing the light in the first hour and was therefore not filmed for the full four hours and left out of the results. The low number of cyclists was probably caused by the weather prediction and the fact that the observation took place on the Friday before a holiday weekend (Whitsunday).

All intersections are placed in the Hague and have four legs. The intersection that were chosen do not have dedicated public transport lanes, intersection 5 (Raamweg-Wassenaarseweg) is connected to a public transport crossing, but the influence of this public transport lane is minimal on the red light running in the direction observed, because of the distance between the observed crossing and the public transport lane. The other intersections might have a detector that will ensure priority for the direction the public transport is coming from. The conflicting streams on all intersections have a speed limit of 50km/h.

The number of cyclists on intersection 3 and 5 is low in comparison with the other intersections, probably caused by a unexpected holiday week for the schools in the Hague at the moment of filming.

The overall red light running (for all 5 intersections combined) is 27.4%.

Intersection	**1**	**2**	**3**	**4**	**5**
Crossing distance	5	5	3	2	4
Median refuge	Yes	No	No	Yes – Long	No
Cycle traffic light	Yes	Yes	No	Yes	No
Direction observed	28	24	2	21-22 and (25-26)	11-12
Cycle time	92.7	87	57.8	68	132.2
RLR – straight ahead (total, if different)	4.9%	20.4%	21.1% (44.3%)	46.8%	40.0% (50.0%)

1- Laan van NOI – Benoordenhoutseweg (69)
2- Groothertoginnenlaan (160)
3- Sportlaan – Daal en Bergselaan (229)
4- Appelstraaat – Thorbeckelaan (237)
5- Raamweg – Wassenaarseweg (404)
6- Prinses-Beatrixlaan – Prinses Marijke straat - Number of cyclist not sufficient

5.2.1. Intersection 1: Laan van NOI – Benoordenhoutseweg

The first intersection was observed in direction 28. This is the direction of the black arrow in Figure 5-1. The crossing has 3+5 lanes, because of the median refuge the longest crossing distance is 5 lanes. An impression of the video images can be found in Figure 5-2. In Table 5-2 the number of cyclist arriving at green, waiting for green and negating the red light are stated. The Red light running was calculated per hour and on average. The average red light running for this direction is 4.9%. The last column shows the average number of cyclist per hour. The average overall waiting time for this intersection is 30.9s (including cyclists arriving at green) with a standard deviation of 26.6s, see appendix E. Table 5-3 shows the number of male and female cyclists over the whole period the intersection is observed. The last column shows the red light running per category, the red light running of all the man who arrived at red and the red light running of the woman that arrived at red. Table 5-4 and Table 5-5 show respectively the age group the cyclist belong to and the type of transport they used. The age groups were divided into young (<20 years), adult (20-65 years) and elderly (>65 years). The elderly had a percentage of red light running of 0%, there were no elderly people who violated the red light at this intersection.

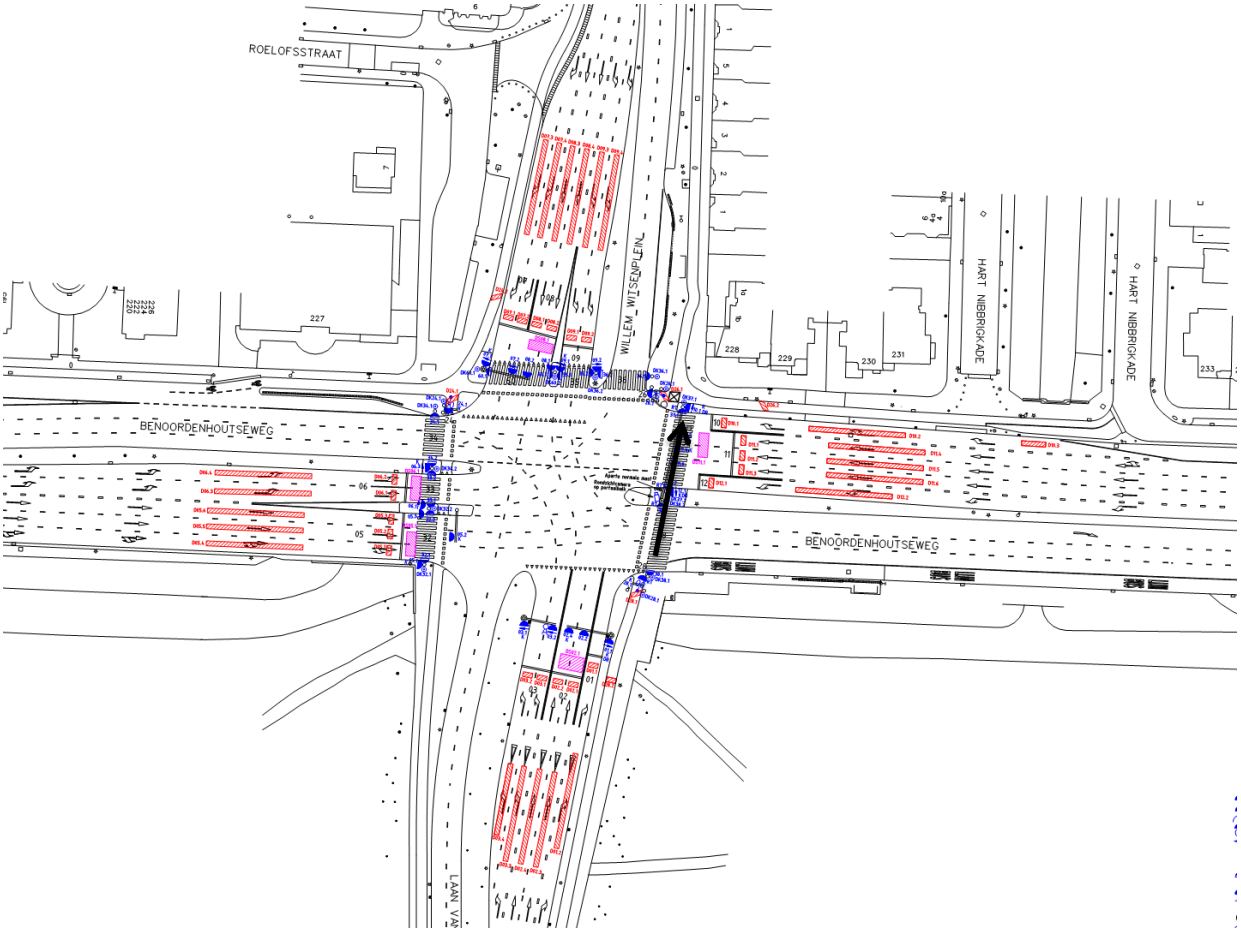

Figure 5-1 Intersection Laan van NOI- Benoordenhoutseweg

Figure 5-2 Video still of intersection 1

Table 5-2 Intersection 69: Laan van NOI - Benoordenhoutseweg

Time:	7:00	8:00	9:00	10:00	Total	average/h
Red	3	11	4	3	21	5.25
Wait for green	112	179	75	38	404	101
Green	28	37	20	9	94	23.5
Total:	**143**	**227**	**99**	**50**	**519**	**130**
Red light running	**2.6%**	**5.8%**	**5.1%**	**7.3%**	**4.9%**	**4.9%**

Table 5-3 Intersection 69: Laan van NOI - Benoordenhoutseweg

Gender	Amount	Percentage	RLR(per category)
Male	287	55.3%	7.0%
Female	232	44.7%	2.6%

Table 5-4 Intersection 69: Laan van NOI - Benoordenhoutseweg

Agegroup	Amount	Percentage	RLR(per category)
Young	99	19.1%	5.2%
Adult	388	74.8%	5.3%
Elderly	32	6.2%	0.0%

Table 5-5 Intersection 69: Laan van NOI - Benoordenhoutseweg

Type of transport	Amount	Percentage	RLR(per category)
Bicycle	475	91.5%	4.4%
Moped	44	8.5%	11.4 %

5.2.2. Intersection 2: Groothertoginnenlaan-Valeriusstraat

The second intersection was observed in direction 21, see Figure 5-3. The crossing has 2+3 lanes, because there is no median refuge the crossing distance is 5 lanes. See Figure 5-4 shows a video still of the intersection. In Table 5-6 the number of cyclist arriving at green, waiting for green and negating the red light are stated. The average red light running for this intersection in direction 21 was 20.4%. The average overall waiting time for this intersection was 13.4s (including cyclists arriving at green), with a standard deviation of 11.0s, see Appendix E. Table 5-7 shows the number of male and female cyclists over the whole period the intersection is observed. The last column shows the red light running per category, the red light running of all the man who arrived at red. There were more female cyclists on this intersection, but a bigger part of the male cyclist violated the red light. Table 5-8 and Table 5-9 show respectively the age group the cyclist belong to and the type of transport they used. For this intersection there was not a big difference in red light running between the young and elderly, but the adults had the highest percentage of red light running. This was also the biggest group, this was not a surprise as the group was taken over the most years (45 years (20-65) instead of ±20 (<20 and >65). At this intersection the penetration of mopeds was very low (only 2%).

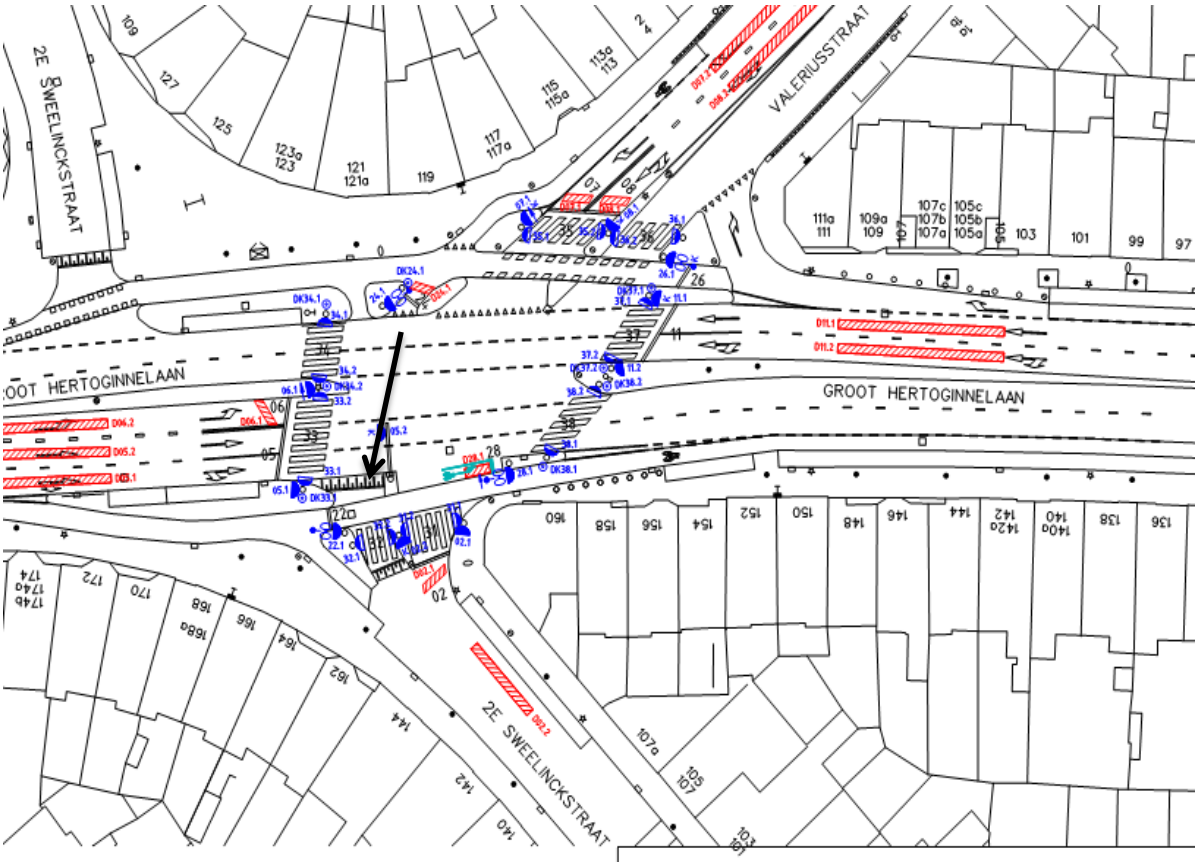

Figure 5-3 Overview intersection 160

Figure 5-4 Video still of intersection 2

Table 5-6 Intersection 160 number of cyclists

Time:	7:00	8:00	9:00	10:00	Total	average/h
Red	8	10	7	3	28	7
Wait for green	16	50	27	16	109	27,25
Green	0	9	1	3	13	3,25
Total:	**24**	**69**	**35**	**22**	**150**	**38**
Red light running	**33.3%**	**16.7%**	**20.6%**	**15.8%**	**20.4%**	**20.4%**

Table 5-7 Intersection 160 gender distribution

Gender	Amount	Percentage	RLR(per category)
Male	55	36.7%	24.0%
Female	95	63.3%	18.4%

Table 5-8 Intersection 160 age distribution

Age group	Amount	Percentage	RLR(per category)
Young	44	29,3%	18.4%
Adult	94	62.7%	21.6%
Elderly	12	8.0%	18.2%

Table 5-9 Intersection 160 vehicle choice

Type of transport	Amount	Percentage	RLR(per category)
Bicycle	147	98.0%	20.7%
Moped	3	2.0%	0.0%

5.2.3. Intersection 3: Sportlaan – Daal en Bergselaan

The third intersection was observed in direction 2, see Figure 5-5. The crossing has 2+1 lanes, because there is no median refuge the crossing distance is 3 lanes. Figure 5-6 shows a still from the video images. In Table 5-10 the number of cyclist arriving at green, waiting for green and violating the red light are stated. The last column shows the average number of cyclist per hour. The average red light running was 44.3%. In this direction the cyclists share the traffic light with the car traffic and can go either Left, right or straight ahead. In Table 5-11 the red light running per direction is shown. The right turning cyclist violate the red light more often than the other direction, this is because there are less conflicts between the cyclists and other traffic streams. The right turning traffic was left out of the rest of the results to get an image of the red light running at the intersection that can be compared with the other intersections. The average overall waiting time for this intersection was 15.7s (including cyclists arriving at green) and a standard deviation of 15.8s, see appendix E.

Table 5-12 shows the number of male and female cyclists over the whole period the intersection was observed. Table 5-13 and Table 5-14 show respectively the age group the cyclist belong to and the type of transport they used. The red light running by the young and adult group is much higher than the red light running by the elderly.

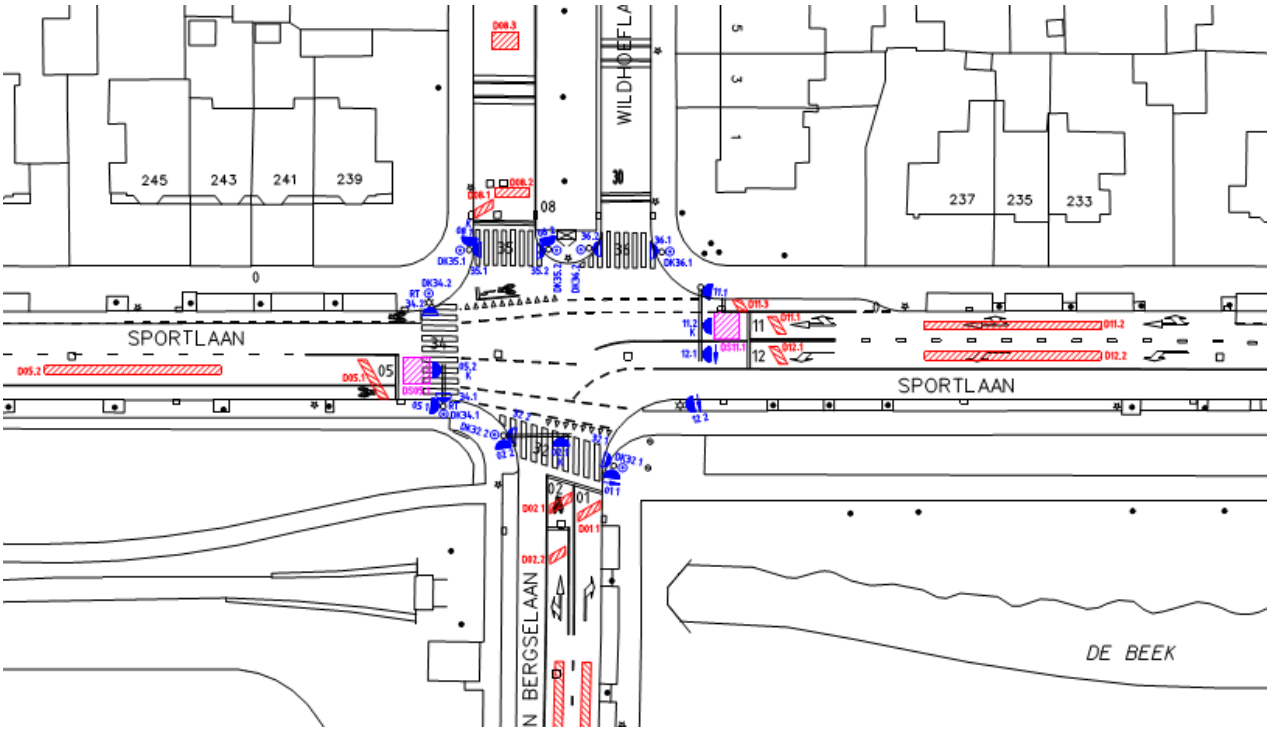

Figure 5-5 Overview intersection 229

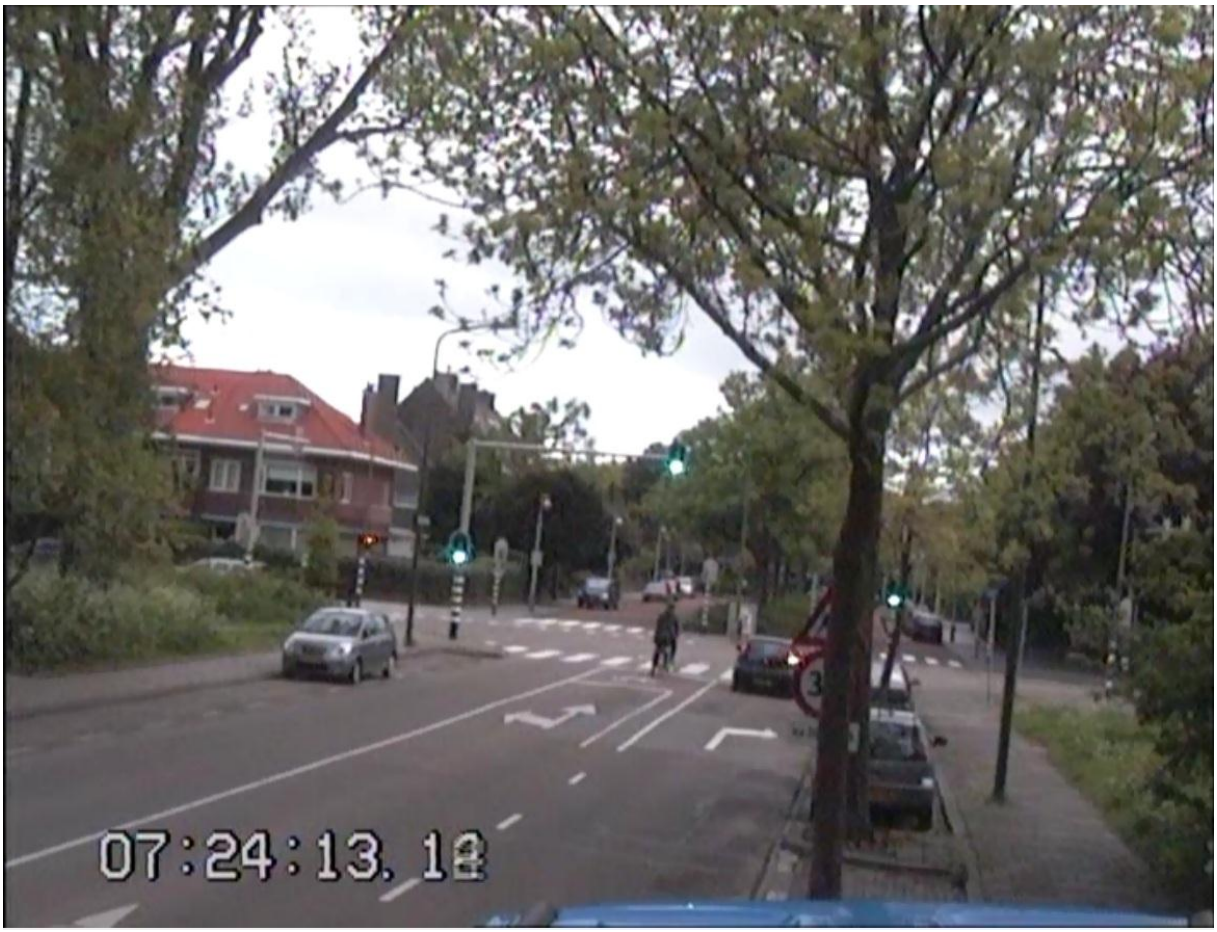

Figure 5-6 Video still of intersection 3

Table 5-10 Intersection 229:Number of cyclists

Time:	7:00	8:00	9:00	10:00	Total	average/h
Red	5	14	8		27	6.75
Wait for green	6	17	11		34	8.5
Green	7	5	7		19	7.75
Total:	**18**	**36**	**26**		**80**	**20**
Red light running	**45.5%**	**45.2%**	**42.1%**		**44.3%**	**44.3%**

Table 5-11 Intersection 229: Divided per direction

Direction	Amount	Percentage	RLR(per category)
Right	32	40.0%	85.7%
Straight ahead	46	57.5%	21.1%
Left	2	2.5%	0.0%

Table 5-12 Intersection 229: Gender distribution

Gender	Amount	Percentage	RLR(per category)
Male	26	54.2%	23.8%
Female	22	45.8%	15.8%

Table 5-13 Intersection 229: Age distribution

Agegroup	Amount	Percentage	RLR(per category)
Young	16	33.3%	23.1%
Adult	28	58.3%	20.8%
Elderly	4	8.3%	0.0%

Table 5-14 Intersection 229: Vehicle choice

Type of transport	Amount	Percentage	RLR(per category)
Bicycle	47	97.9%	20.5%
Moped	1	2.1%	0.0%

5.2.4. Intersection 4: Appelstraat – Thorbeckelaan

The fourth intersection was observed in direction 21-22 and 25-26, see the direction of the black arrow in Figure 5-7. The crossing has 2+2 lanes, because of the median refuge the crossing distance is 2 lanes. The median refuge in this intersection is very long, see Figure 5-8. In Table 5-15 the number of cyclist arriving at green, waiting for green and violating the red light are stated. The average red light running at this intersection was 46.8%. The average overall waiting time for this intersection was 9.5s (including cyclists arriving at green) and has a standard deviation of 13.7s, see Appendix E. Table 5-16 shows the number of male and female cyclists over the whole period the intersection was observed. The last column shows the red light running per category. Table 5-17 and Table 5-18 show respectively the age group the cyclist belong to and the type of transport they used. The biggest age group for this intersection were the young cyclists.

The direction observed for this intersection has a very long median refuge. Therefore the red light running can also be separated in if they only violate one of the two red lights or both. Table 5-19 shows the number of cyclist that violate the red light at only the south crossing (1), only the north crossing(2) or both (3). The last column shows how many of the red light running happened when the pedestrian light, parallel to the cycle path, was green.

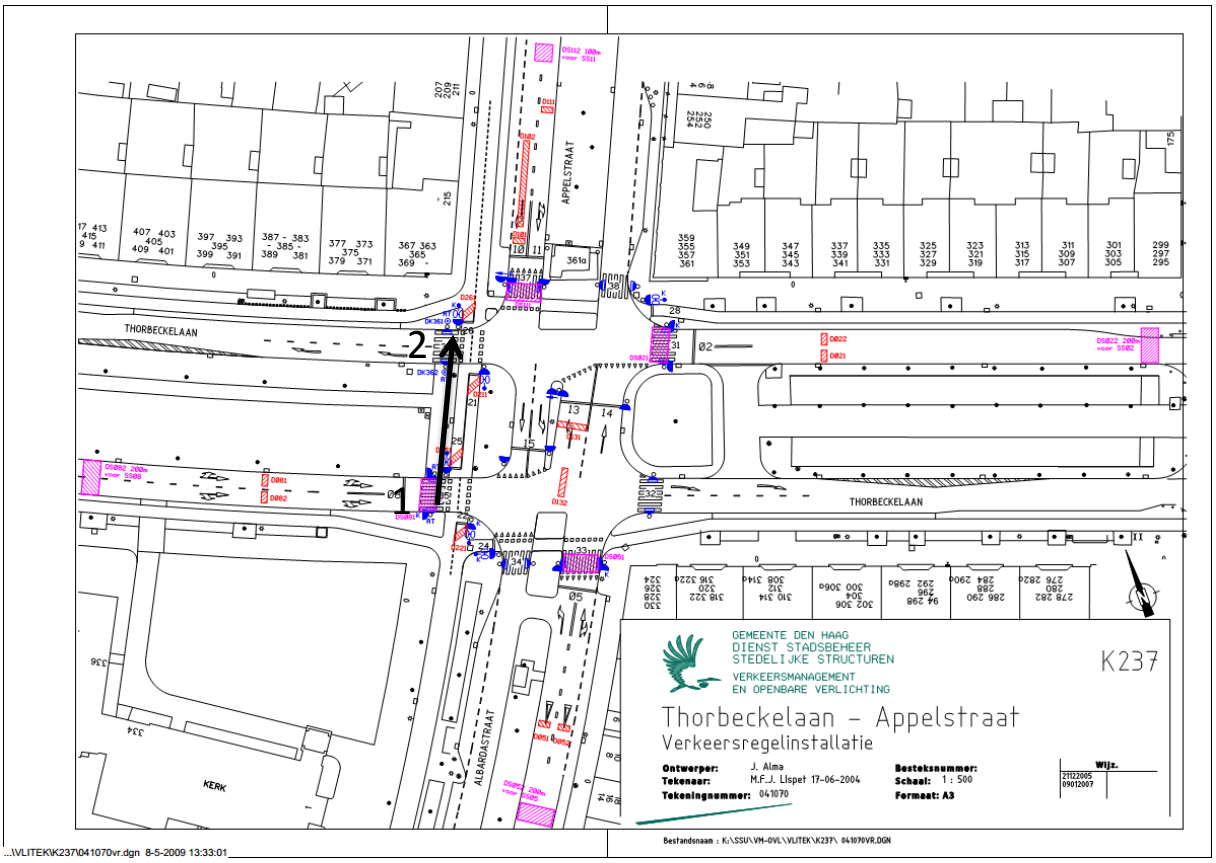

Figure 5-7 Overview Intersection 237

Figure 5-8 Video still of intersection 4

Table 5-15 Intersection 237: Number of cyclists

Time:	7:00	8:00	9:00	10:00	Total	average/h
Red	70	119	52	18	259	64.75
Wait for green	77	118	65	34	294	73.5
Green	91	142	64	34	331	82.75
Total:	**238**	**379**	**181**	**86**	**884**	**221**
Red light running	**47.6%**	**50.2%**	**44.4%**	**34.6%**	**46.8%**	**46.8%**

Table 5-16 Intersection 237: Gender distribution

Gender	Amount	Percentage	RLR(per category)
Male	459	51.3%	49.7%
Female	436	48.7%	42.2%

Table 5-17 Intersection 237: Age distribution

Agegroup	Amount	Percentage	RLR(per category)
Young	430	48.0%	46.3%
Adult	397	44.4%	47.8%
Elderly	69	7.7%	35.0%

Table 5-18 Intersection 237: Vehicle choice

Type of transport	Amount	Percentage	Rper category)
Bicycle	822	92.0%	47.9%
Moped	72	8.0%	29.2%

Table 5-19 Intersection 237: Crossing

Type of crossing	Amount	Percentage	Pedestrian light
1	86	39.4%	37.2%
2	0	0.0%	0.0%
3	132	60.6%	56.9%

5.2.5. Intersection 5: Raamweg – Wassenaarseweg

The fifth intersection was observed in direction 11, see the direction of the black arrow in Figure 5-9. The crossing has 2+2 lanes. There is no median refuge which makes the crossing distance 4 lanes. See Figure 5-10 for a video still of the intersection. In Table 5-20 the number of cyclist arriving at green, waiting for green and negating the red light are stated. The average percentage of red light running was 50.0%.

In Table 5-21 the red light running per direction is shown. The right turning cyclist violate the red light more often than the other direction, this is because the conflicts between the cyclists and other traffic streams are very low. The right turning traffic was left out of the rest of the results to get an image of the red light running at the intersection that can be compared with the other intersections.

The average overall waiting time for this intersection was 47.3s (including cyclists arriving at green) with a standard deviation of 36,5s. Table 5-22 shows the number of male and female cyclists over the whole period the intersection was observed. There were more male cyclists observed on this intersection, but the red light running by the female cyclists was higher. Table 5-23 and Table 5-24 show respectively the age group the cyclist belong to and the type of transport they used. The red light running by young and elderly at this intersection was fairly high.

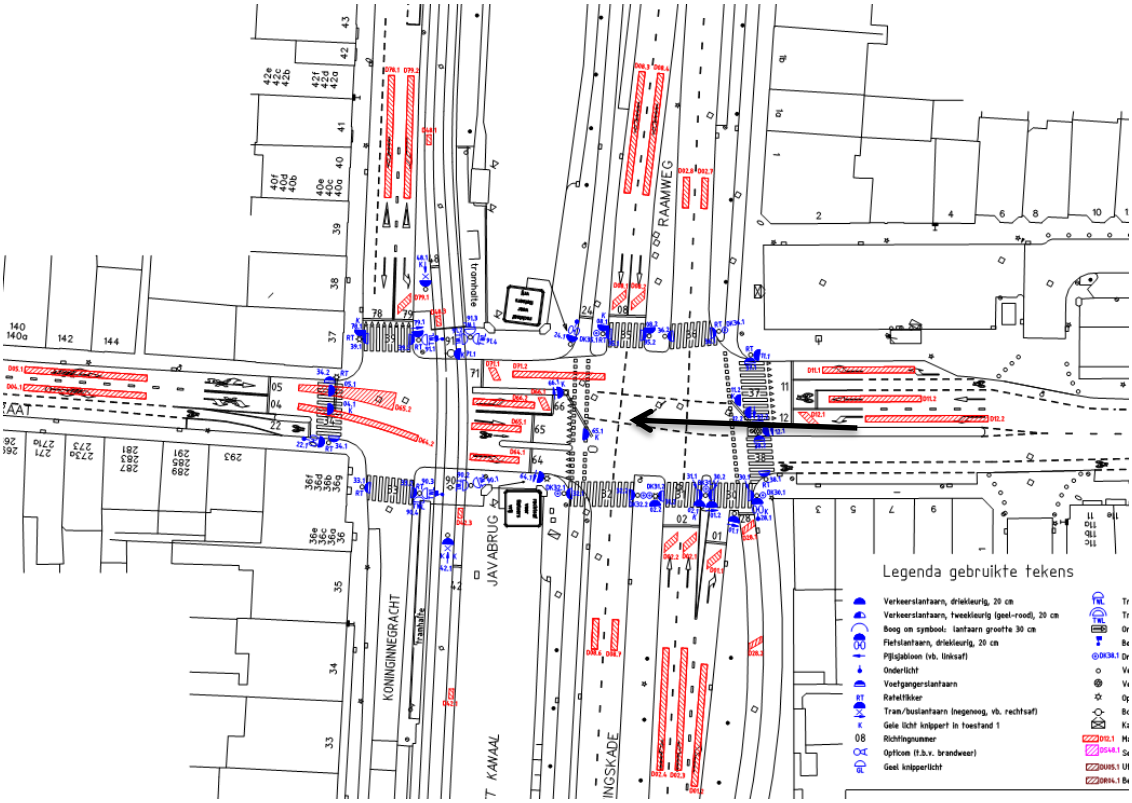

Figure 5-9 Overview Intersection 404

Figure 5-10 Video still of intersection 5

Table 5-20 Intersection 404: Number of cyclists

Time:	7:00	8:00	9:00	10:00	Total	average/h
Red	13	14	10	3	40	10
Wait for green	7	19	13	1	40	10
Green	0	7	4	0	11	2.75
Total:	**20**	**40**	**27**	**4**	**91**	**23**
Red light running	**65.0%**	**42.4%**	**43.5%**	**75.0%**	**50.0%**	**50.0%**

Table 5-21 Intersection 404: Red light running per direction

Direction	Amount	Percentage	RLR(per category)
Right	20	22.0%	100.0%
Straight ahead	42	46.2%	40.0%
Left	29	31.9%	32.1%

Table 5-22 Intersection 404: Gender distribution

Gender	Amount	Percentage	RLR(per category)
Male	43	59.7%	31.6%
Female	29	40.3%	44.0%

Table 5-23 Intersection 404: Age distribution

Agegroup	Amount	Percentage	RLR(per category)
Young	2	2.8%	50.0%
Adult	64	88.9%	33.9%
Elderly	6	8.3%	60.0%

Table 5-24 Intersection 404: Vehicle choice

Type of transport	Amount	Percentage	RLR(per category)
Bicycle	64	88.9%	40.4%
Moped	8	11.1%	14.2%

5.3.Human factors: gender, age and vehicle mode

The human factors are factors that are characteristics of humans, like age, gender, haste, experience with the situation, distraction, attitude etc. The two main factors that were measurable were gender and age. Also the vehicle choice was placed in the group human, it is a characteristic of the population observed. The choice of vehicle might have an influence on red light running. A summary of all the statistical test and tables with the expected and observed counts per factor can be found in Appendix D.

5.3.1.Gender

The male cyclists have a higher red light running overall 30.0% compared to 24.6% for female cyclists, see Table 5-25. The male cyclists also have a higher percentage of red light running on all intersections except for intersection 5. The groups of male and female cyclists are around the same size, resp. 896 and 839. When we combine all the observations of all the intersection the dependence between gender and red light running is statistically significant, with a confidence level of 95% ($p \leq 0.05$) ($\chi^2(1)=5.174$, $p=0.023$). The odds a man violates the red light is 1.32 times higher than the odds a woman violates the red light. The Chi-square test performed per intersection, shows that only for the first intersection there is a dependence between red light running and gender ($\chi^2(1)=4.335$, $p=0.037$). The others have a $p>0.05$, which indicates that the relation is not significant.

Table 5-25 Proportion of red light running per gender and intersection

Gender\intersection	1	2	3	4	5	Overall
Male	7.0%	24.0%	23.8%	49.7%	31.6%	30.0%
Female	2.6%	18.4%	15.8%	42.2%	44.0%	24.6%

5.3.2.Age

In our observation the age groups were divided into young (<20), adult (20-65) and elderly (>65). The results, see Table 5-26, show that the elderly have the lowest percentage of red light running on most intersections apart from the last intersection, intersection 5. The overall scores seem closer to each other than the scores on the different intersections, this was mainly caused by the number of cyclists per group. The group of elderly was small (125 cyclists) compared to the adults (1000 cyclists). The red light running might therefor be almost similar but the absolute number of red light running cyclists was far apart. If you combine the observations of all the intersections the age is statistically significant ($p<0.001$) . The odds a young cyclist violates a red light is 1.63 times higher than the odds an adult violates the red light and 1.78 time higher than the odds an elderly cyclist violates the red light. A Chi-square test per intersection showed that the red light running was not dependent of age (all have a $p>0.05$), note that the number of observations for some groups on some of the intersections were very low.

Table 5-26 Red light running per age group and intersection

Age\intersection	1	2	3	4	5	Overall
Young	5.2%	18.4%	23.1%	46.3%	50.0%	34.7%
Adult	5.3%	21.6%	20.8%	47.8%	33.9%	24.3%
Elderly	0.0%	18.2%	0.0%	35.0%	60.0%	21.6%

5.3.3.Comparison between cyclists and moped riders on red light running

The moped riders often have a higher speed than cyclist and for cyclist stopping will cost more energy. The observations on the five intersections show that cyclists have a higher percentage of red light running in 4 of the 5 intersections. Also the overall red light running by cyclists was higher. The number of cyclists arriving at red (1117) is much higher than the number of mopeds (93). The vehicle choice is only statistically significant for the red light running in intersection 4 ($\chi^2(1)=6.751$, $p=0.009$). When all the observations of the intersections are combined the relation between vehicle choice and red light running is not statistically significant ($\chi^2(1)=0.715$, $p=0.398$).

Vehicle	1	2	3	4	5	Overall
Bicycle	4.4%	20.7%	20.5%	47.9%	39.3%	28.0%
Moped	11.4%	0.0%	0.0%	29.2%	14.2%	20.4%

5.3.4. Multi variable analysis: Human factors

A Four-way log linear analysis, including gender, age, vehicle choice as predictors and red light running as dependent variable, produced a final model that retained the interactions: gender X red light running, age X red light running and gender X vehicle choice. The likelihood ratio of this model was $\chi^2(14)=12.453$, $p=0.570$.The gender x red light running interaction was significant, $\chi^2(1)=5.174$, $p<0.05$. This indicates that the ratio of red light running was higher for man then for woman. The odds that a man violates the red light is 1.32 times higher than those odds for woman. The age x red light running interaction was significant, $\chi^2(2)=15.204$, $p<0.01$. This indicates that the odds of red light running was different for the age groups. The young cyclist have higher odds (36.9:63.1) than the two other groups (adult(26.4:73.6) and elderly(24.7:75.3)). The gender x vehicle choice interaction was significant, $\chi^2(1)=8.499$, $p<0.01$. This indicates there is a difference between vehicle choice for man and woman. The odds a moped driver is man is 1.8 times the odds of the driver being female.

The multivariate analysis showed the same relations as the above paragraphs. Man are more likely to run red lights than females and younger cyclists have higher odds to run red lights than cyclists of an older age.

5.3.5. Red phase

The phase of the red light, begin, middle or end gives an indication of the safety risk for the cyclist. The red phase a cyclists crosses in was listed for the intersections 1,2,3 and 5. For intersection 4 the data was not listed. Intersection 4 could not be scaled by the same standards, as the pedestrian light would be green in what would be the middle-red for the cyclists, see paragraph 2.1 for the explanation of the red phases.

Most of the cyclists (69.4%) are middle-riders, they cross during the middle red phase. The percentage of early and late riders is respectively 13.4% and 17.2%, see Table 5-27. The red light running per red phase (all intersections except no.4) is not significantly different for male or female cyclists. Overall there are more male cyclists in all categories, but this is caused by the fact that the red phase was listed for a higher number of male red light violators. The fishers exact test indicates that the age groups have a different ratio of red phase, which means that the different age groups have a different spread of violation over the red light phases. In Figure 5-11 can be seen that the number of elderly cyclists is very low and none have violated the light at the begin red phase. Young cyclist violated the light more often in the begin phase and least in the end phase, while adult cyclist

have the least red light running in the begin phase and most in the end phase. This can be a sign that adult cyclist have a better understanding of the cycle and can predict when the light will turn green. For the young cyclist the explanation can be that they accelerate to cross during green.

Table 5-27 Red light running per red phase

Red phases\red light running	Number of Cyclists	Percentage of Cyclists
Begin Red	23	17.2%
Middle Red	93	69.4%
End Red	18	13.4%
Total	134	100%

Table 5-28 Gender x Red phases

Red phases\red light running	Number of Male Cyclists	Number of Female Cyclists
Begin Red	14	9
Middle Red	54	39
End Red	11	7
Total	79	55

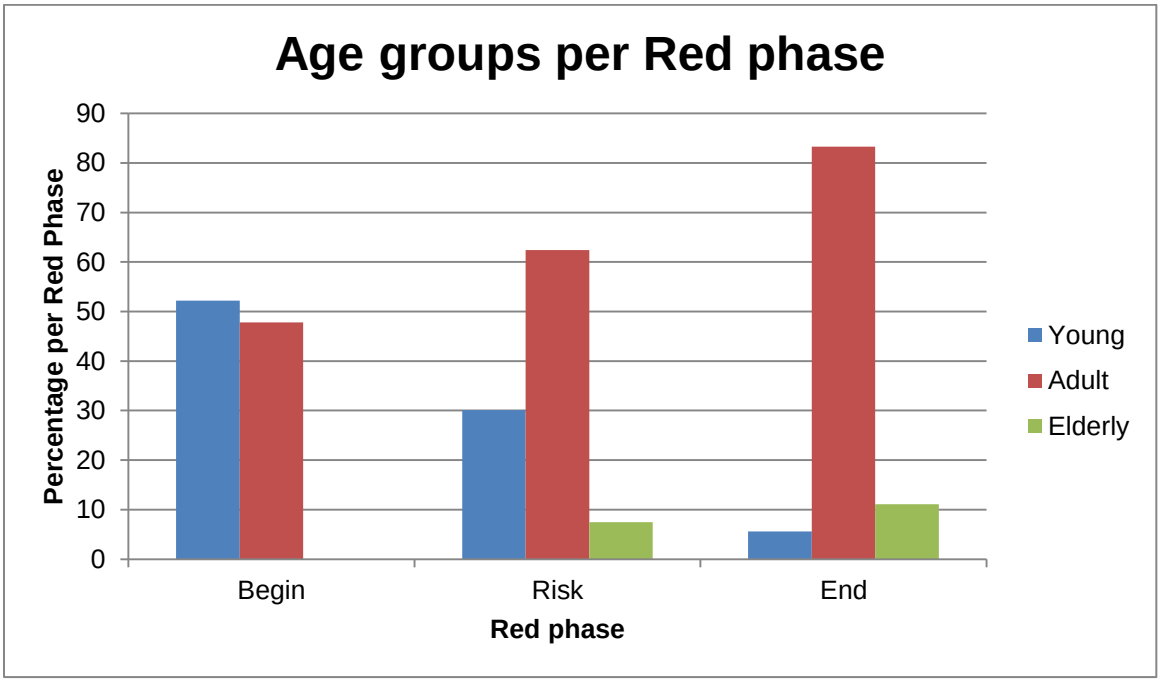

Figure 5-11 Distribution over Red phases per age group

5.4. Infrastructure: intersection design and light cycle

The infrastructure holds several factors that can be of influence on red light running. In the literature the crossing distance, median refuge, cycle and waiting time were listed as factors with an influence. In this paragraph the results are analysed and hypotheses based on the literature research are tested.

5.4.1.Crossing distance

The crossing distance is the length of the crossing. This was determined by the number of lanes the cyclists had to cross at the intersection before they could make a safe stop. The intersection that have a median refuge will therefore have a shorter crossing distance, as a safe stop is possible at the median refuge. A crossing with 2 times 2 lanes and a median refuge will have a crossing distance of 2 lanes, while for a crossing without a median refuge the crossing distance will be 4 lanes.

Literature states that an increase in crossing distance, results in a decrease of red light running. In Figure 5-12 can be seen that the intersection with the smallest crossing distance had the highest percentage of red light running. Also the lowest percentage of red light running was at an intersection with the longest crossing distance. The data points are showing a decrease in red light running when the crossing distance becomes larger. The results are consistent with the hypotheses from the literature, but the number of observation is not high enough for statistical tests.

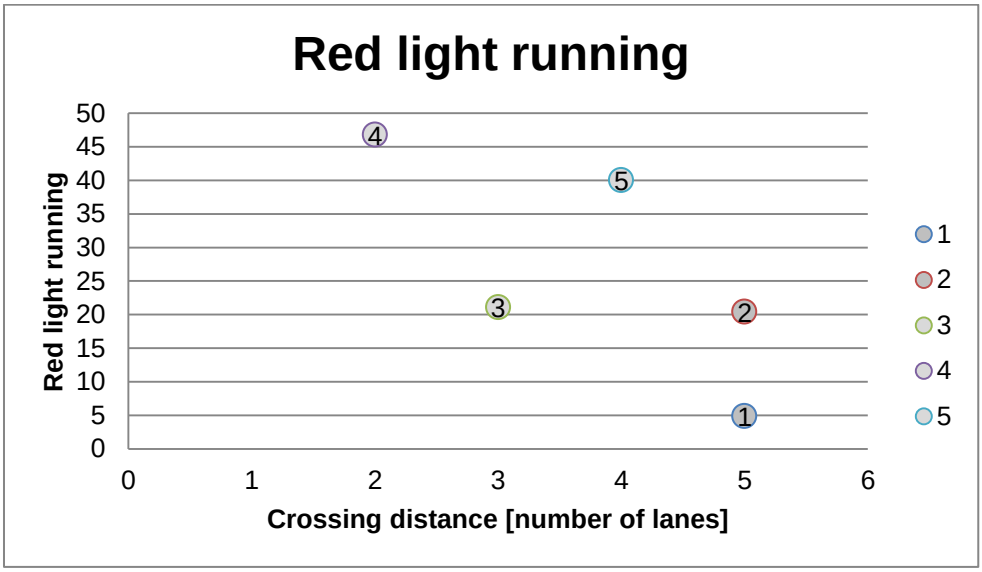

Figure 5-12 Crossing distance compared to red light running

5.4.2.Median refuge

Two out of the five intersections have a median refuge. These are the intersection with the highest and the one with the lowest red light running. The median refuge on intersection 1 is fairly small and the median refuge of intersection 4 is fairly large. The crossing distance between the two intersection also differs a lot. With this results we cannot say that the median is of influence on the red light running. But the median refuge does play a big role in the crossing distance, as the crossing distance is reduced when there is a median refuge.

5.4.3. Waiting time

In almost all of the literature the waiting time was said to be an important factor for red light running. A longer waiting time would increase red light running, although none of the claims are supported by numbers or otherwise substantiated. One study concluded that the waiting time was not a big influence on the red light running, as a higher waiting time came from a more complex intersection which people are less likely to cross at red light, because of the high flow or obscurity. The results, see Figure 5-13, indicate a longer waiting time lead to a higher percentage of red light running. Intersection 4 is an outlier in this case. Intersection 4 has a pedestrian light that is green, while the light for the cyclists is red. The high red light running is partly due to cyclists crossing during the green pedestrian light. In Appendix F all the distribution graphs for the waiting time and cycle time are gathered. For a higher cycle time can also be said that the red light running increases with higher cycle times.

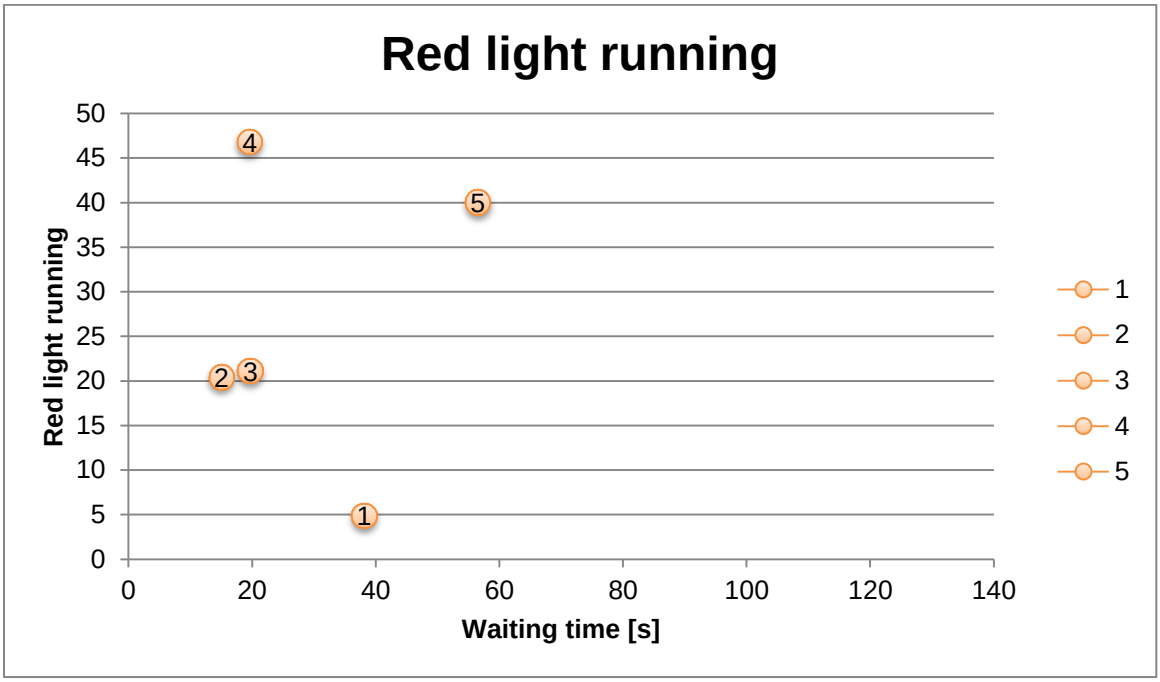

Figure 5-13 Waiting time & cycle time

5.5. Conditions: car and cyclist flow

The conditions that are of influence on red light running are weather conditions, cycle, speed, flow of cyclists, flow of cars, police patrols. The factors that were measured are the flows of the cyclists and the cars. The weather conditions are somewhat similar in during all the observations.

5.5.1. Flow

The flow is the number of vehicles passing a reference number in time. The brainstorm and literature named the credibility and car flow as factors that influence red light running. A lower flow would increase the number of red light running, as the credibility would decrease. The credibility of an traffic signal control is based on the amount of time a cyclists is waiting without crossing traffic.

The flow shown in Figure 5-15 to Figure 5-20 was calculated per 5 minutes. In each figure the flow for cars, cyclists and cyclists who violate the red light is shown. The correlation between the car flow

and red light running is statistically significant (p<0.001) when the data of all intersections are combined. In Figure 5-18 can be seen that during the first two hours, where the traffic volume is low, the red light running is higher than in the last two hours, where the traffic volume has increased. In Figure 5-14 can also be seen that the red light running decreases as the flow of the motorised traffic increases. The red light running percentages were only calculated for time periods with at least 5 cyclists arriving, because one individual in a small group has a big influence on the percentage. The Pearson Correlation (r=-.406, p<0.01) also shows the negative relationship, if the motorized flow increases the red light running decreases. R=1 means a complete positive relationship, if x increases, y also increases, R=-1 means that there is a complete negative relationship, when x increases, y decreases. The two outliers, at 80% red light running, are all situated at intersection 4, which has the highest percentage of red light running. The both outliers where in a situation with 5 cyclists arriving and 4 violating the red light.

The correlation between the flow of cyclists and the number of cyclists that violate a red light is statistically significant (p<0.01). This is not a surprise as the red light running cyclists are part of the group of cyclists, when the cyclist flow rises, also the number of people that might violate a red light in that period of time increases. The Pearson Correlation, r=0.807, p<0.01, which shows a strong correlation between the two groups. When the number of cyclists increases it is likely that the number of red light running cyclists also increases.

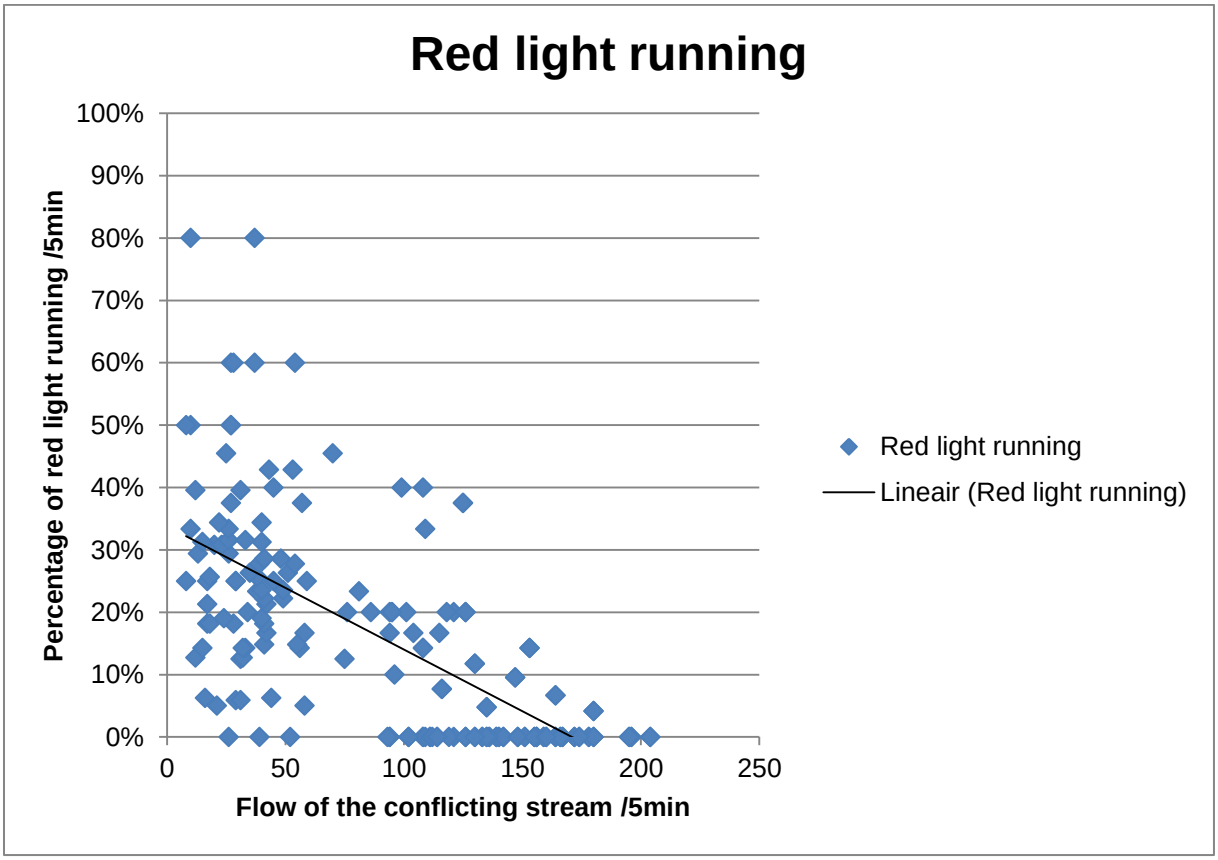

Figure 5-14 Red light running compared with flow

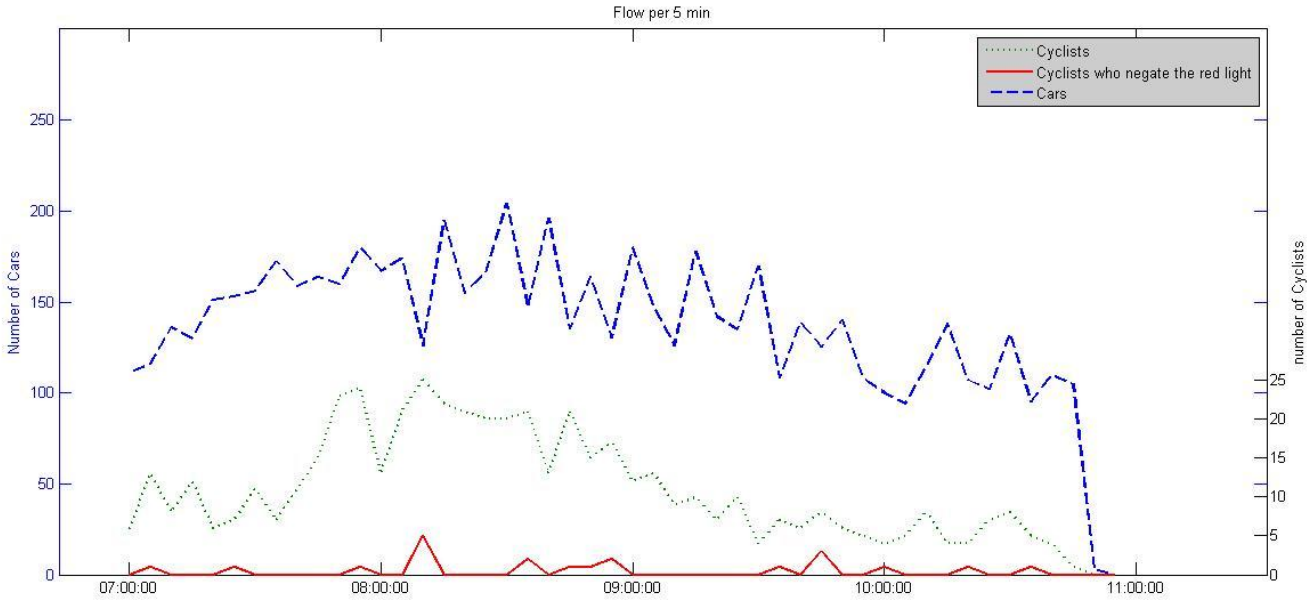

Figure 5-15 Intersection 1 flow cyclists, cars and red light violating cyclists

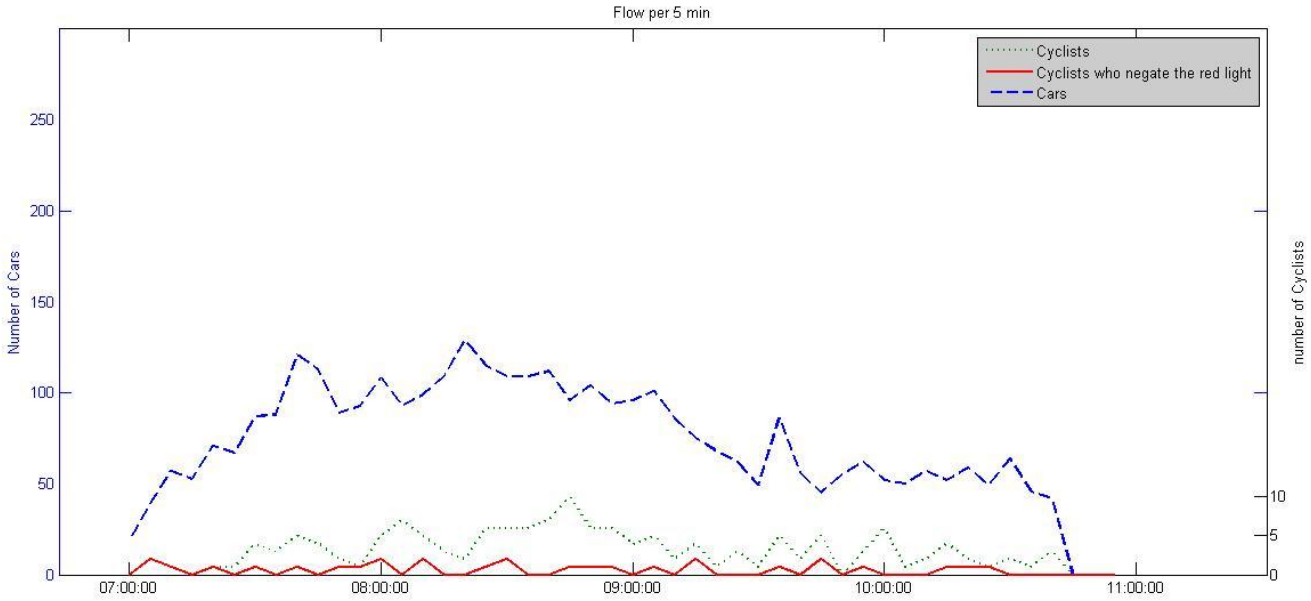

Figure 5-16 Intersection 2 flow cyclists, cars and red light violating cyclists

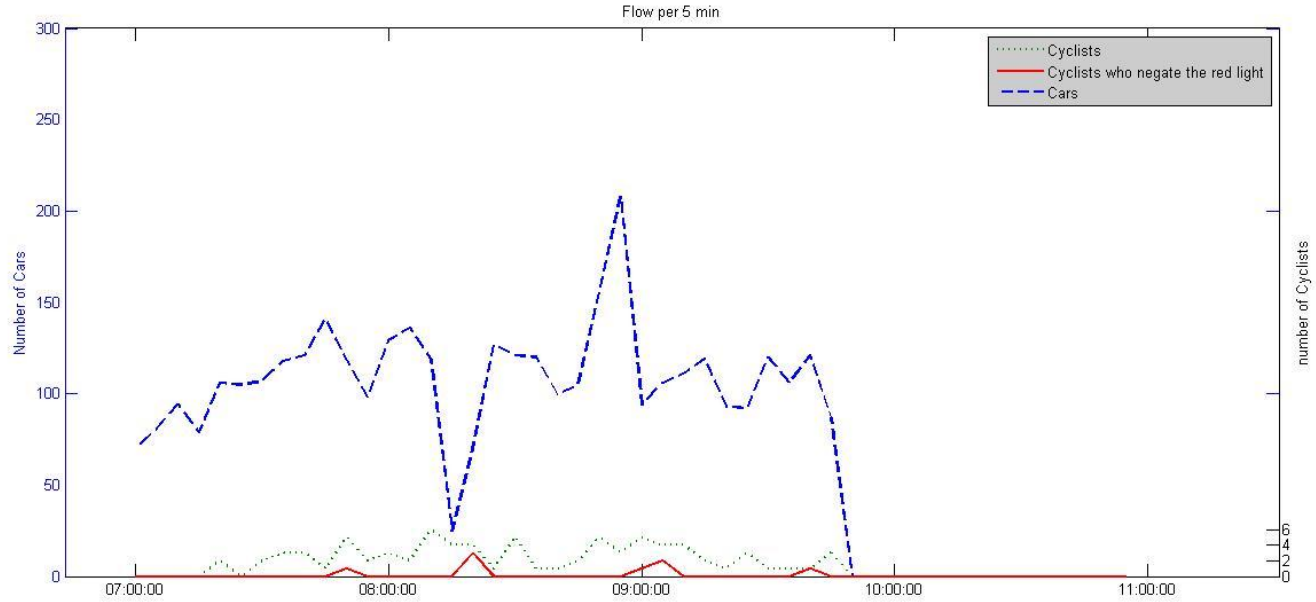

Figure 5-17 Intersection 3 flow cyclists, cars and red light violating cyclists

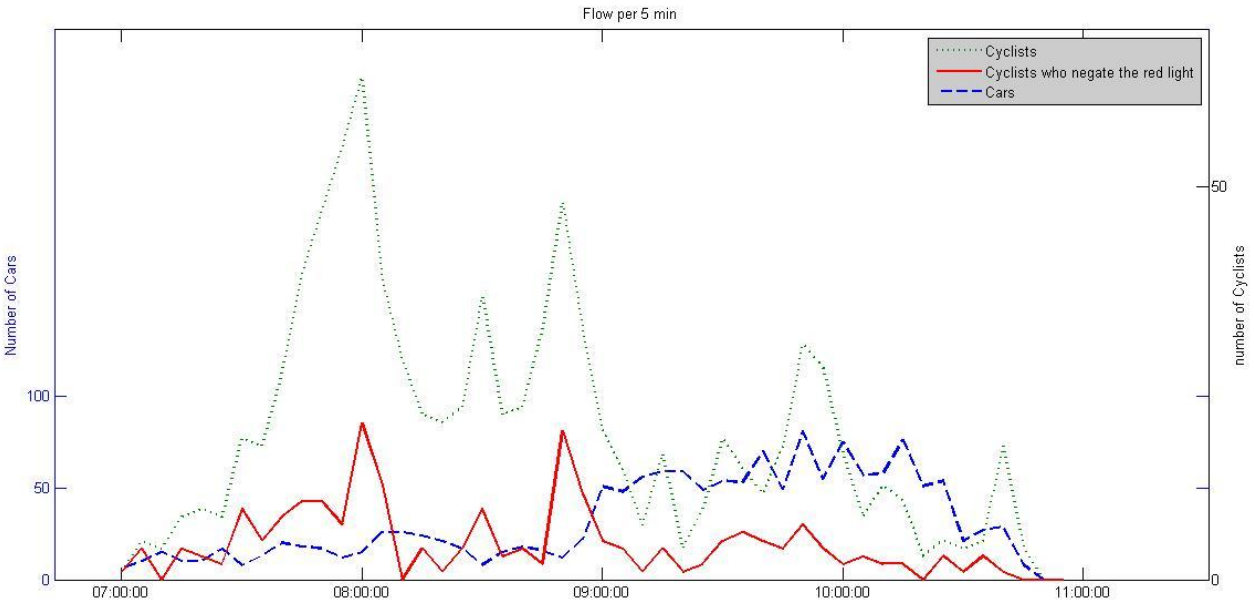

Figure 5-18 Intersection 4.1 flow cyclists, cars and red light violating cyclists

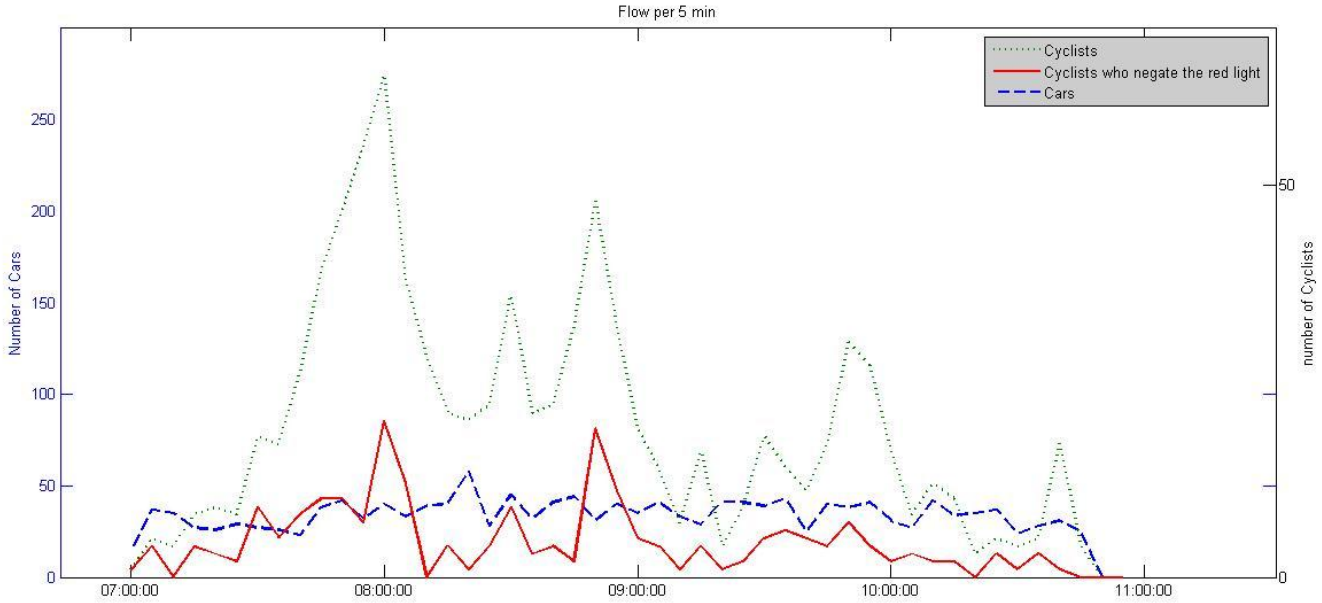

Figure 5-19 Intersection 4.2 flow cyclists, cars and red light violating cyclists

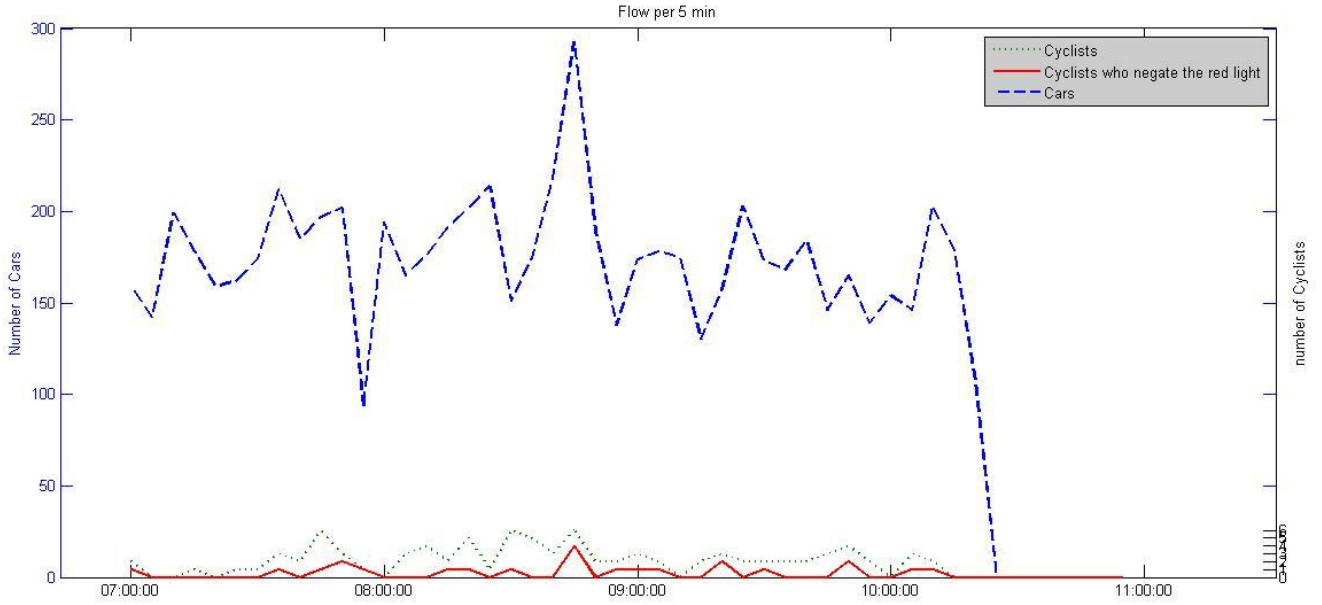

Figure 5-20 Intersection 5 flow cyclists, cars and red light violating cyclists

5.5.2. Composition of conflicting streams

The composition of the conflicting streams is another factor with a possible influence on the red light running. Streams with a high number of trucks and busses are less likely to have high red light running then streams where the number of trucks and busses is low. Figure 5-21 shows the composition of the conflicting streams, The category 'other' holds motorbikes, agricultural vehicles and mopeds. Intersection 1 has the highest share of trucks and lowest of person cars, this is also the intersection with the lowest red light running. Intersection 4 has the highest red light running but a much lower share of cars and higher share of trucks and busses than the intersection with a lower red light running. The composition of the conflicting streams might have an influence on the red light running, but with only the five intersection it is not possible to say if it is significant and the differences in traffic composition are small.

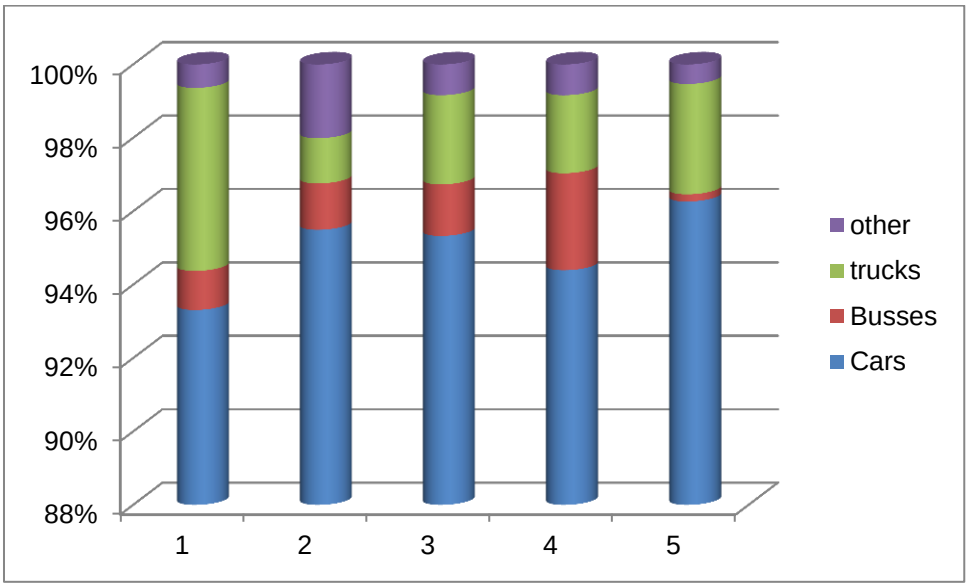

Figure 5-21 Composition of conflicting streams per intersection. Note: y-axes from 88 to 100%.

5.6. Social factors: herding, modelling and group pressure

The social factors are those that have to do with the other cyclists on the intersection, of which the behaviour might influence the observed cyclists. A commonly named factor that might reduce the red light running is young children, another is group pressure. In this paragraph both factors are analysed. In this analysis the intersections 3 and 5 were left out. The low number of cyclists on these intersections resulted into none or very little observations describing the social factors.

5.6.1. Herd mentality

People tend to act as a herd, when the first violates the red light others will follow and when there are already people waiting for the light to turn green, they are more likely to wait as well. The herd mentality was analysed by looking at the people who violated the red light. The red light running was divided into two groups: People who violated the red light when there was someone waiting and people who violated the red light when there were no other cyclists waiting for the red light.

Table 5-29 shows that for all three intersections there were more cyclist violating the red light when there were no other cyclists waiting. This is likely not solely caused by herd mentality. When there

are a lot of people already waiting at the intersection there might not be enough space to violate a red light. The cyclists are likely to block the whole cycle path if there are already a few cyclists waiting and this would contribute to a higher percentage of red light running when there is no one waiting.

Table 5-29 Number of cyclist negating red light with or without people waiting

	People waiting	No one waiting
1	5 (23.8%)	16 (76.2%)
2	1 (3.6%)	27 (94.4%)
4	101 (40.1%)	151 (59.9%)
Total	116 (37.4%)	194 (62.6%)

5.6.2. Modelling and the presence of Children

Young children were said to influence the red light running in a positive way. People feel that they should set a good example for the young children and are therefore less likely to violate the red light. Parents with children are also less likely to run a red light, in this observation none of the parents that had children with them, either on their bike or beside them on a children's bike, violated the red light. Another thing is that the cyclist would not want to risk the children following them violating the red light (because they think it is time to cross, as other people do it).

The analysis of this factor was done by counting the number of people that wait and the ones that violated the red light while there was a young child waiting at the light. The percentages are compared to the overall percentages of the red light running of the intersection. In this analysis only the data of intersection 4 is taken into account. As can be seen in Table 5-29, the other intersections do not have a high number of red light running by cyclists while there were other cyclists waiting.

Table 5-30 shows the number of cyclist that arrived at the red light while there was a young child waiting and their action, waiting or violating the red light. The overall red light running on this intersection was 46.8%. The red light running when there was a child on its own bike waiting was slightly higher than the overall red light running and when the child is on mom's or dad's bike slightly lower. Fishers exact test on the data does not show a statistical significance between the mode of transportation and the red light running, so there is no relation found between if the children are on their own bike or on the bike with mom and dad and the action of other cyclists (p=0.433). Also no statistical significant relation is found between the behaviour of the cyclist in case there are children waiting or not (p=0.571).

Table 5-30 Effect of waiting children

	waiting	Running red light
Own bike	10 (43.5%)	13 (56.5%)
On the bike with mom/dad	5 (62.5%)	3 (37.5%)
No waiting children	286 (54.1%)	243 (45.9%)

5.6.3. Group pressure

The group pressure can have a negative or positive influence on the red light running. It depends on the group dynamics and the opinion of the dominant actor in the group.

The group pressure was analysed as the proportion of cyclists violating a red light in relation to the size of the group that arrived at the intersection. These percentages were compared to the overall percentages of red light running for that intersection. For this factor the same holds as for the children, we will only look at the data of intersection 4.

Table 5-31 shows the number of groups that either waited or violated the red light. The results show that the red light running for groups with a size of 2 was lower than the overall red light running on the intersection. Travelling in pairs would reduce the red light running but for groups of 3 this was not the case. The groups consisting of 3 cyclist had a 50/50 distribution between the two options. We only observed one group of 4 cyclists, which waited for the light to turn green, but this does not mean that groups with a size bigger than 3 will wait more often, there are not enough observations to make such a claim. Fishers exact test (p=0.544) resulted in no statistically significant relation between group size and violating the red light.

Table 5-31 Influence of group pressure

Group size	waiting	Running red light
1	256(54.0%)	218(46.0%)
2	23 (63.9%)	13 (36.1%)
3	5 (50%)	5 (50%)
4	1 (100%)	0

6. Conclusions

Red light running is the situation were cyclists cross while the traffic light is turned red. This is a common activity for cyclists and can cause dangerous situations. The injuries obtained in crashes caused by violating the red light by cyclist leads to more severe injuries than crashes with another cause. In the past years there has been done research into ways to reduce red light running, but research on the factors that influence red light running has not been done for the Netherlands in the past 25 years.

This study used video observations, of 5 different intersection in the Hague, to identify the effects different factors have on red light running. Not all factors that have an influence on red light running could be observed. The factors can be separated into four groups: human, infrastructure, conditions and social. For the human factors gender, age and vehicle choice were analysed. The infrastructure factors hold the crossing distance, median refuge, cycle and waiting times. Conditions are the flow on the cycle path and of the conflicting stream and the composition of the conflicting traffic. The last group of social factors consists of herd mentality, children and group pressure.

The red light running was on average 27,4%, the spread between the different intersection was between 4,9% and 46,8%. The spread between the intersection is correlated with the differences between the intersections. Factors that influence the red light running:

Factors that cannot be influenced by measures:

- Gender: Men violated the red light 1.32 times more than women.
- Age: Young cyclist have a higher percentage of red light running, 1.63 times higher than adults and 1.78 time higher than elderly cyclists.

Explaining factors that can be influenced by measures:

- Crossing distance: A longer crossing distance decreases the red light running
- Flow of the motorized streams: more traffic on the conflicting motorized streams lead to less red light running.

For the vehicle composition of the conflicting stream , waiting time, and median refuge an effect can be seen but the number of observations/intersections is not high enough to statistically test the effect, further research is necessary. The other factors, vehicle choice, herd mentality, group pressure and the presence of children, did not have an effect or the effect seen was not statistically significant.

7. Discussion and recommendations

The overall percentage of red light running was 27.4%. Between the intersection the red light running differed from 4.9% to 46.8%. This spread and average was also found in most of the literature.

All the observations took place in the Hague. The population of the Hague was that of a normal population. The Hague does not have a large percentage of students or more children than other cities. The intersection are selected with both high and low red light running percentages. Thus the data could be generalised to the whole of the Netherlands, but research on more intersection will give a better result.

Recommendation: *In order to generalise the results further research should be done on randomly selected intersections spread over the whole of the Netherlands.*

7.1. Human factors:

The literature showed that the male cyclists have a higher rate of red light running than the female cyclists and Elderly cyclists had a lower percentage of red light running. This was also confirmed in the analysis. Men violated the red light 1.32 times more often than female cyclists. Also the Younger cyclists violated the red light more often than elderly cyclist.

The number of early, late and middle riders was found to be resp. 13.4%, 69.4% and 17.2%. This is almost the same as the percentages van Dooren found in 1985 (resp. 17%, 68% and 15%). The literature did not include the red phases per age group or vehicle choice. In the observations younger cyclists violated the light more often in the begin red phase and adult cyclist violated the most in the end red phase. The younger cyclists are likely to try to cross during the last bit of the green light and accelerate to reach that goal, while the adult cyclist seemed to know when the light turned green. The vehicle choice did not give a higher percentage of red light running for either mode, at least not statistically significant.

Recommendation: *The human factors were all registered from video observations. This results in large age groups and an estimation of the actual human factors (e.g. age, gender). Because the video observations were coded by only one researcher, this may have added false interpretations to the data. In order to improve the reliability of the data, the video observations in further research should be coded by two or more researchers individually.*

7.2. Infrastructure:

For the infrastructure factors the crossing distance, median refuge and waiting time were of interest. The number of intersection, only 5, was too low for statistically testing the factors.
Recommendation: *The effects of the different factors should be researched in a study which includes more intersections*.

An intersection with a longer crossing distance has a lower percentage of red light running than intersections with shorter crossing distances. In the literature this effect was not found or could not be proven.

Two of the five intersections had a median refuge. This are the intersection with the highest (46.8%) and the intersection with the lowest (4.9%) red light running. Because of the low number of

intersections with a median refuge the effect of the median refuge cannot be ruled out. The differences in crossing distance or intensity between the two intersections with median refuge could also be the cause of the spread between the two intersections. Also the fact that many median refuges are mainly build for pedestrians, might have an influence on the behaviour of the cyclists. The median refuges that are mainly meant for pedestrians are smaller and the cyclists cannot see when their light is green for the second part of the crossing.

The literature apart from Klaassen(1981), state that a longer waiting time increases the red light running. This same effect was found in the observations. The expectation would be that the longer people have to wait the more tempted they are to violate the red light. A longer waiting time under the same conditions (e.g. same crossing distance, flow of conflicting traffic) will probably increase the red light running.

Recommendation: *For this factor also the number of intersections should be increased in order to be able to reject or accept the hypothesis. Also the intersection or observations that are considered should have the same conditions (e.g. same crossing distance, median refuge and flow of the conflicting stream)*.

7.3.Conditions:

In this study the weather conditions are not taken into account. The effect of rain or cold weather on the red light running should be studied. The conditions that were analysed are the flow of the conflicting stream and the composition of traffic.

The higher the flow of the conflicting stream the lower the percentage of red light running. This was also stated in the literature. With a higher flow the gaps in the traffic are smaller and the cyclists would have less chances to cross safely.

7.4.Social factors:

To the social factors belong: herding, modeling and the presence of children and group pressure. The cyclists in the observation were violating the red light less, when there was already someone waiting. This was also found by Goudappel in 1985.

The group pressure was stated, by Goudappel (1985), to increase with larger group sizes. The bigger the group, the more group pressure, whether this group pressure had a positive or negative effect was not listed. The cyclists who arrive in pairs in the observation stopped more often than cyclists who were on their own. For the groups larger than 2 cyclists there were not enough observations.

Recommendation: *Further research for the bigger group sizes is needed to confirm the effect larger group sizes have on red light running.*

Most people say that they wait for the red light, when there is a child waiting. The observations could not confirm this. All parents do try to give a good example for their kids and no parent traveling with children violated the red light. Other cyclists did not seem to be influenced by a waiting child. An opinion of the cyclists could be that the young child will see this as ‘bad behaviour’ and discuss it with the parent, if present, but would not copy the behaviour.

Recommendation: *It could be possible that teenagers are more influenced by other people violating the red light. Further research is needed to see if young children or teenagers are affected by the red light running of others.*

7.5.Interaction

The study showed that four variables influenced red light running. Two were related to the cyclist, namely gender and age, and the other two were characteristics of the intersection, namely traffic flow and crossing distance. Statistical analysis of the data showed that the cyclist characteristics did not interact with the intersection characteristics. That is, male and young cyclists violated the traffic lights more frequently than female and older cyclists. This pattern occurred , on four of the five intersections , irrespective of intersection design. The fifth intersection did not have significant results. No further analyses were therefore carried out, to study whether certain intersection characteristics would generate more violations given cyclist characteristics: for instance long crossing distances generate more violation among males than among females, whereas short crossing distances would generate more violations among females, while males would obey the lights on those intersections.

However, on traffic flow and crossing distance, statistical analyses did suggest that an interaction may be present, in that long crossing distances mainly suppress violations at high traffic flows, and not at relatively low traffic flows. Unfortunately for methodological reasons, the study design, especially the selection of intersections, has limited our possibility to statistically test this interaction. First, we have studied the variation in volume within each intersection, whereas statistical techniques such as ANOVA and Regression demand the observations to have been independent. This design should therefore not only been tested using a time-series models but should also have included a much larger number of intersections that should have differed to a greater extent on crossing distances. A rough rule of thumb is that for each predictor 10 units (here intersections) should have been studied, thus a total of 20.

Recommendation: *To be able to analyze the interaction between the factors more data is needed , more intersection.*

7.6.Limitations

The limitations of this study are partly the selection of the intersections. In the selections the choice was made to only take into account intersection in the build-up area, with 4 legs and without public transport infrastructure. And only the behavior and effect of factors is known for good weather condition. All observations took place in dry weather, because of cyclist behavior and the quality of video images.

Recommendation: *The influences of weather are a factor that can be studied in further research. A different approach to do this research is recommended as the quality of the video goes down when it is raining.*

No distinction was made between cyclists on a normal, carrier tricycle or electric bicycle. The only division is made between cyclists and moped riders. The main difference between the groups is the speed at which is travelled, which is also the main difference with electric bicycles. The results showed that between the cyclists and moped riders there were no significant difference.

Recommendation*: To be able to give a full view on the red light running the factors deliberately left out of this study should be studied. For example the fact that the location (within or outside the build-up area) is of influence on the red light running and traffic safety.*

7.7. Implications

A longer crossing distance decreases red light running. Though building only intersections with very long crossing distance would not benefit traffic safety. There will still be people violating the red light and these people will have higher risks of a crash. Also the space is not always sufficient to build very large intersections. Another way to reduce red light running would be banning men and young cyclists from the road, but this is not a realistic option and will only relocate the problem. Men will for example drive more cars and cause dangerous situation there. It is better to try and reduce red light running by influencing the decision of the cyclists by altering the surroundings or the traffic signal control.

For example, when the flow of the conflicting streams decreases the amount of cyclists that violate the red light increases. It could be an idea to have waiting green, green when there is no demand on other streams, for cyclists. In the current situation this green state is mostly used for the motorised streams to have a high service capacity, but when the flow is very low, changing the waiting green from the motorised streams to the cyclists stream might decrease red light running with a minimal impact on the service capacity. Another option would be to have lights at request. When the flow is low the lights will be flickering orange, which means they are not in use. The moment a cyclist arrives which would like to cross with the help of the crossing light it can push the button and the lights will switch on, to ensure a safe crossing.

In order to use the results for modelling red light running another study with more and randomly selected intersection should be done. Using the outcomes in for example a discrete choice model could give the weight the different factors have in the decision of the cyclists to violate the red light, which is important to model red light running.

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Appendix

A. Traffic Signal Control (TSC)

Traffic signal control (TSC) are meant to smooth the process of crossing at intersections . The conflicts should be minimal and the time divided fairly over the different streams. There are different types of TSC. The biggest difference between the types is the “fixed control” and “dynamic control”. Fixed control depends on a fixed cycle which it continues over and over again. The times the traffic lights turn green are programmed. Dynamic control adjusts the cycle and green times to the demand. The busier streams will get longer green times and streams with no demand can be skipped.

The traffic streams on an intersection have a standard coding, see figure 0-1. Starting in the northeast evolving clockwise. The motorized streams get numbers 1 to 12, cyclist 21 to 28, pedestrians 31 to 38 and public transport has numbers 41 to 52. Intersection that have a follow up light the number of the follow up light is the number of the original stream +60, so stream 2 would go to light 62, as can be seen in figure 0-1.

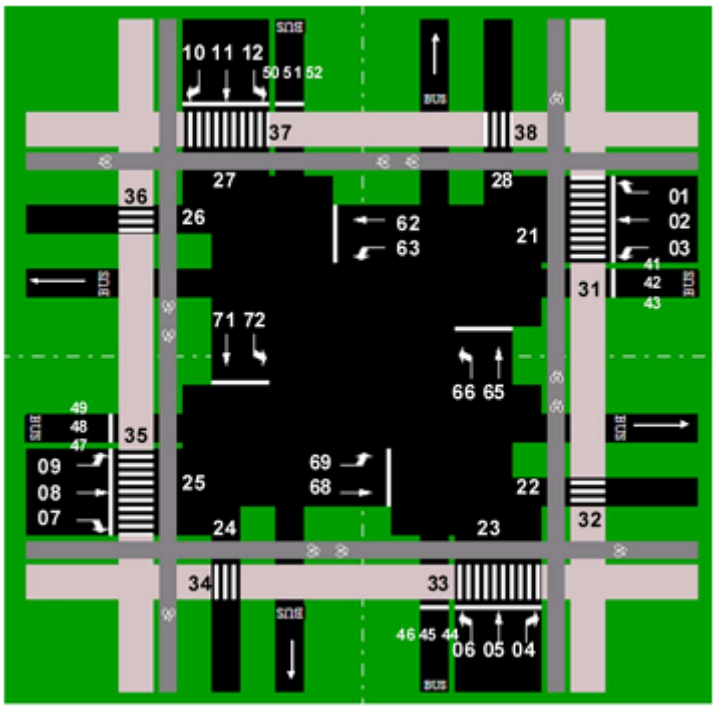

Figure 0-1 Standard coding for traffic signal control (Muller et al., 2011)

The different phases of the cycle are made up of different streams that do not have conflict or only permitted conflicts . In order to find the streams that can be green in the same phase, a conflict matrix could be made. The conflict matrix shows which groups can and cannot be put together.

B. Selected intersections

In this appendix the selected intersections for the hand observations are listed. The hand observations were done for half an hour. During these observations the cyclists arriving during red or green at the intersection and the cyclist that violated the red light were counted. Table 0-1 shows the 21 randomly selected intersections for the hand observations, from these intersections 6 were selected for video observations. Figure 0-2 shows where these intersections are situated in the city of the Hague. The dots resemble the intersections. Green dots are intersection used for both the video and hand observations and the red dots are only used for hand observation.

Table 0-1 Selected intersection

NR	Street 1	Street 2	Cycle path	Direction
58	Erasmusweg	Betje Wolffstraat	Y	22
61	Wassenaarseweg	van Alkemadelaan	N	28
64	Erasmusweg	Anna Bijnslaan	Y	28
69	Laan van NOI	Benoordenhoutseweg	Y	24
96	Binckhorstlaan	Mercuriusweg	Y	26
148	Loevestijnlaan	Hengelolaan	Y	26
150	Mauritskade	Frederikstraat	N	11
160	Groot Hertoginnenlaan	Valeriusstraat	N	24
179	Machiel Vrijenhoeklaan	Savorin Lohmanlaan	N	8
184	Machiel Vrijenhoeklaan	Kijkduinsestraat	Y	28
198	Erasmusweg	Berensteinlaan	Y	22
201	Bezuidenhoutseweg	Hofzichtlaan	Y	28
229	Sportlaan	Daal en Bergselaan	N	8
237	Appelstraat	Thorbeckelaan	Y	26
250	Maanweg	Regulusweg	Y	26
304	Bezuidenhoutseweg	Prins Clauslaan	Y	22
306	Prinses Beatrixlaan	Schenkkade	Y	22
308	Prinses Beatrixlaan	Prinses Marijkestraat	Y	28
404	Raamweg	Wassenaarseweg	Y	28
405	Raamweg	Carel van bylandtlaan	Y	28
708	President Kennedylaan	Aert van der Goesstraat	Y	2

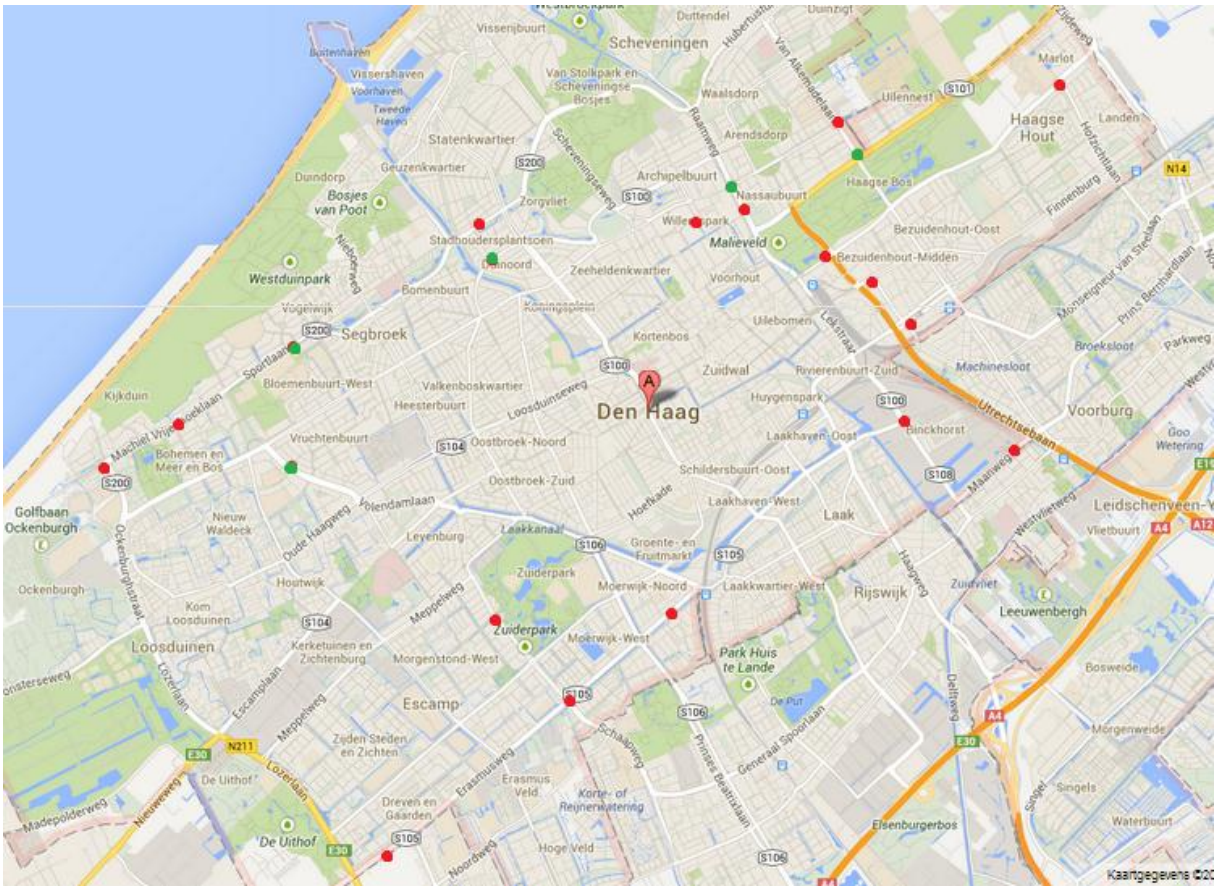

Figure 0-2 distribution of selected intersections (green=video and hand observations, red= only hand observations)

C. Brainstorm

In order to complement the little literature found on the subject a brainstorm with experts in the field of traffic safety was organized. After showing the group, consisting of 6 researchers in the traffic safety field, a recording of an intersection the brain storm thought of factors that are of influence on the red light running by cyclists. During the brainstorm a division was made into 4 categories: Human, Infrastructure, Conditions and Social. In Table 0-2 the factors are shown per category. These are all the factors that came up in the brainstorm, no pre selection made. The highlighted factors are the factors of which the effect might be found in the recordings, which was an outcome of the brainstorm.

Human	**Infrastructure**	**Conditions**	**Social**
Age	*Dedicated traffic light*	Motivation of the trip	Group size
Gender	Clear view	Length trip	Herd Mentality
Haste	Crossing distance	Flow	(Negative) Group pressure
Familiarity with the situation	Median refuge	Weather	Credibility
Type of cyclist (leisure or work)	Complexity of the intersection	Arrival speed	Culture
Vehicle choice	Cycle time	Parents with children	Parents with children
Distraction	Waiting time	Traffic jam on the conflict area	
Assessment skills	Origin & destination within the intersection	Enforcement	
Attitude	Turning lanes	Flow of cyclists on the cycle path	
	Bicycle light relative to pedestrian light (green on the same time or not)	The presence of conflicting traffic at arrival at the intersection	
	Road type		
	Speed of the conflicting streams		
	Distance between cycle path and road		

Table 0-2 Brainstorm factors

D. Statistical tests

In order to statistically test the correlation between red light running and the factors gender, age and vehicle choice the chi-squared test or Fisher's exact test is used. The chi-square test has a limitation when small sample sizes are used. The Pearson's chi-squared test sampling distribution has an approximate chi-square distribution, for small sample sizes this approximation is inaccurate. In these cases the Fisher's exact test is used, when 20% or more of the cells expected count is less than 5. The Fisher's exact test is a method that computes the exact probability of the chi-square statistic. This method can also be used in larger sample sizes, but will cost a lot of time computing and the approximation of the chi-square test is accurate for large samples. In table 0-3 for each intersection and factor the type of test and degrees of freedom (Df) are listed and also the result (p). The hypotheses are tested with a 95% accuracy, which means $p \leq 0.05$. The boxes that are green are the test that showed a significant dependence between the factor and red light running.

In table 0-4 till 0-7 the observed and expected counts for the factors (gender, age and vehicle choice) are listed. With the observed and expected counts the chi-square test value can be computed.

Table 0-3 Statistical tests [green indicates a significant result]

Intersection	Gender			Age			vehicle choice		
	test	Df	*p*	test	Df	*p*	test	Df	*p*
1	χ^2	1	0,037	Fishers	2	0,613	Fishers	1	0,084
2	χ^2	1	0,433	χ^2	2	0,943	Fishers	1	0,632
3	Fishers	1	0,698	Fishers	2	1,000	Fishers	1	1,000
4	χ^2	1	0,910	χ^2	2	0,355	χ^2	1	0,009
5	χ^2	1	0,237	Fishers	2	0,299	Fishers	1	0,241
Overall	χ^2	1	0,023	χ^2	2	0,000	χ^2	1	0,398

Table 0-4 The observed and expected count over all intersection for Gender x Red light running

Gender * Red light running					
			Crossing		Total
			Red	Green	
Gender	Male	Count	213	442	655
		Expected Count	*194,6*	*460,4*	*655,0*
	Female	Count	161	443	604
		Expected Count	*179,4*	*424,6*	*604,0*
Total		Count	374	885	1259
		Expected Count	*374,0*	*885,0*	*1259,0*

Table 0-5 The observed and expected count over all intersections for Age x Red light running

Age * Red light running					
			Crossing		Total
			Red	Green	
Age	Young	Count	151	258	409
		Expected Count	*121,5*	*287,5*	*409,0*
	Adults	Count	201	560	761
		Expected Count	*226,1*	*534,9*	*761,0*
	Elderly	Count	22	67	89
		Expected Count	*26,4*	*62,6*	*89,0*
Total		Count	374	885	1259
		Expected Count	*374,0*	*885,0*	*1259,0*

Table 0-6 The observed and expected count over all intersections for Vehicle choice x Red light running

Vehicle choice * Red light running					
			Crossing		Total
			Red	Green	
Vehicle	Bicycle	Count	348	811	1159
		Expected Count	*344,3*	*814,7*	*1159,0*
	Moped	Count	26	74	100
		Expected Count	*29,7*	*70,3*	*100,0*
Total		Count	374	885	1259
		Expected Count	*374,0*	*885,0*	*1259,0*

E. Waiting time and cycle times

The waiting time is the time the cyclists has to wait for the light to turn green. The waiting times are calculated by subtracting the arrival time from the moment the light turns green. The people who arrive at green have a waiting time of zero seconds. Table 0-7 shows the mean and standard deviation (σ) are stated for both the waiting times that include the cyclist that arrive at green and without the cyclists arriving at green. Figures 0-2 to 0-6 show the distribution of the waiting times for the five different intersections..

The cycle times are calculated as the difference between the moment the light turns green for the cyclists. A problem with this calculation is the situations where there were not any cyclists for a few cycles, this would lead to a very high cycle time. In order to clean the data to calculate an mean and standard deviation, all point that where above the mean + 2x standard deviation are left out of the calculation. For intersection 3 and 5 there were not enough cyclist to calculate on the documented values. Both intersection have a shared light between the cars and bicycles and therefore the cycle time could also be measured when there are cars using the intersection. These cycle times are therefore measured directly from the film. The moment the light turns green is noted for 10 cycles and the mean and standard deviation of this 10 values are listed in Table 0-7 in red. The distribution of the cycle time on the other three intersections can be found in figures 0-7 to 0-9.

Intersection number	Waiting time, **with** arriving during green		Waiting time, **without** arriving during green		Cycle time	
	mean	σ	mean	σ	Mean	Σ
1	30.9	26.2	38.1	23.9	92.7	29.3
2	13.4	11.0	15.0	10.8	87	38
3	15.7	15.8	19.7	15.3	57.8	18.8
4	9.5	13.7	19.6	13.9	68	20
5	47.3	36.5	56.5	32.6	132.2	18.6

Table 0-7 waiting and cycle times in seconds. The "mean" columns state the average waiting or cycle time per intersection. The " σ" columns list the standard deviation of these averages. The two red values are calculated not directly from the excel sheet, but are measured by calculating the average over 10 values measured directly from the video observations.

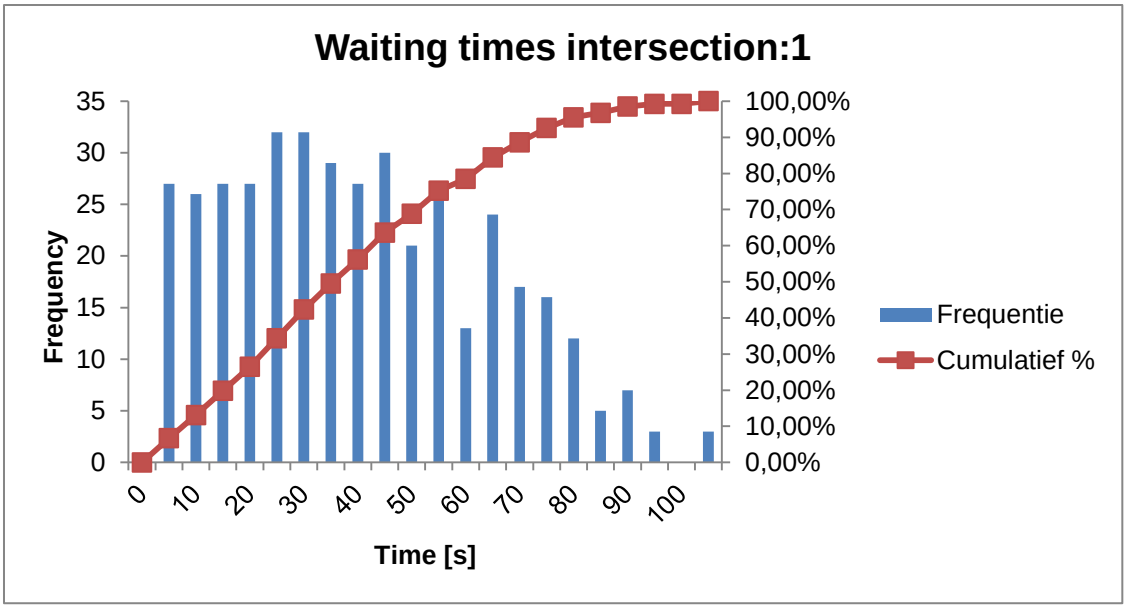

Figure 0-3 Waiting times distribution intersection 1

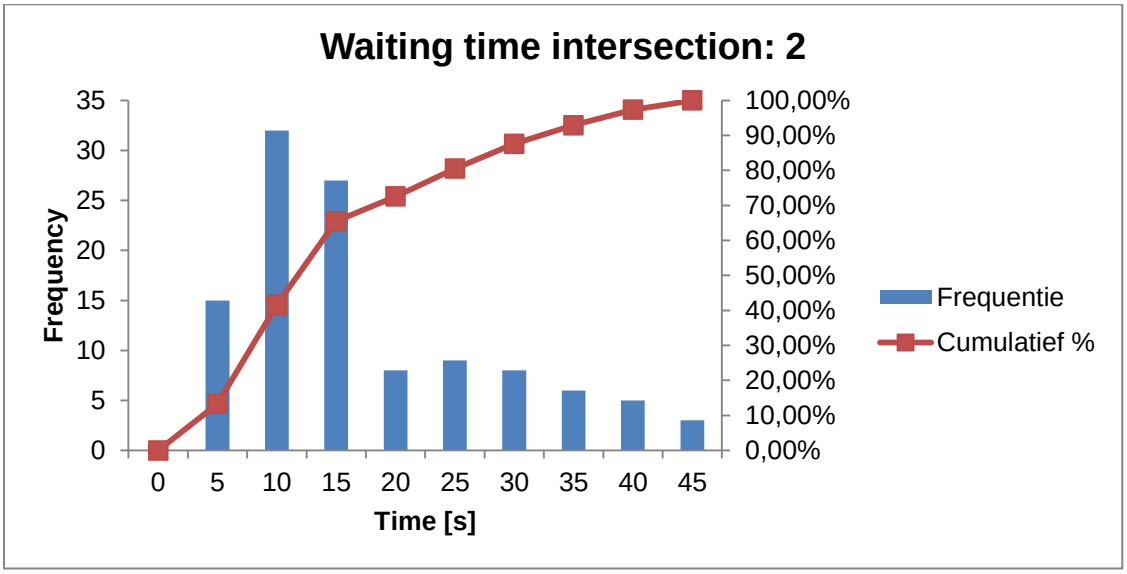

Figure 0-4 Waiting times distribution intersection 2

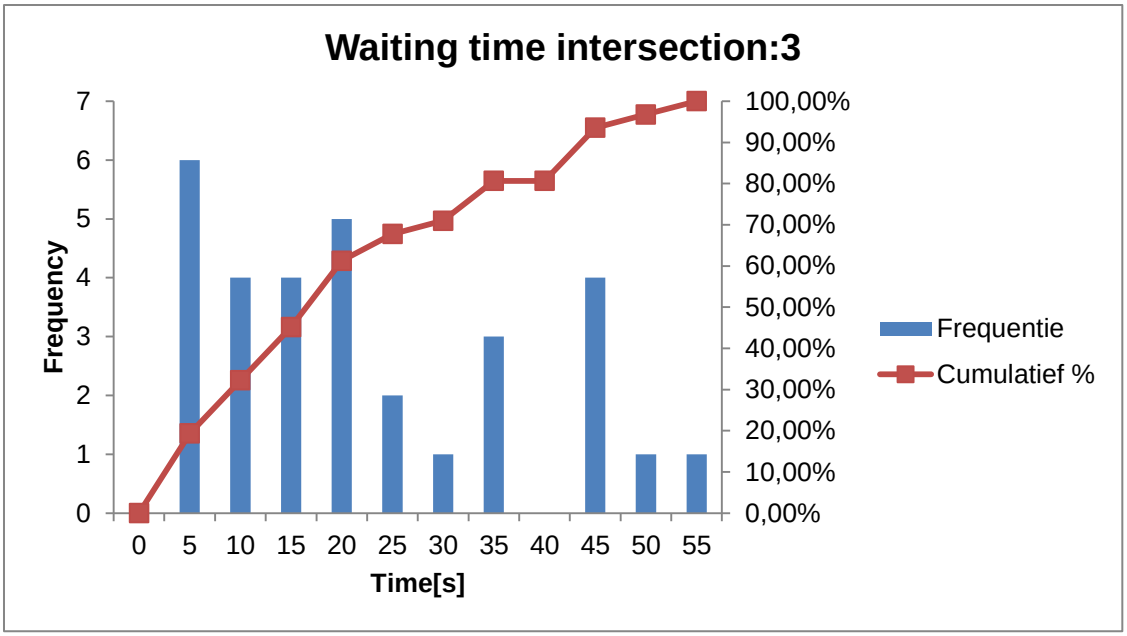

Figure 0-5 Waiting times distribution intersection 3

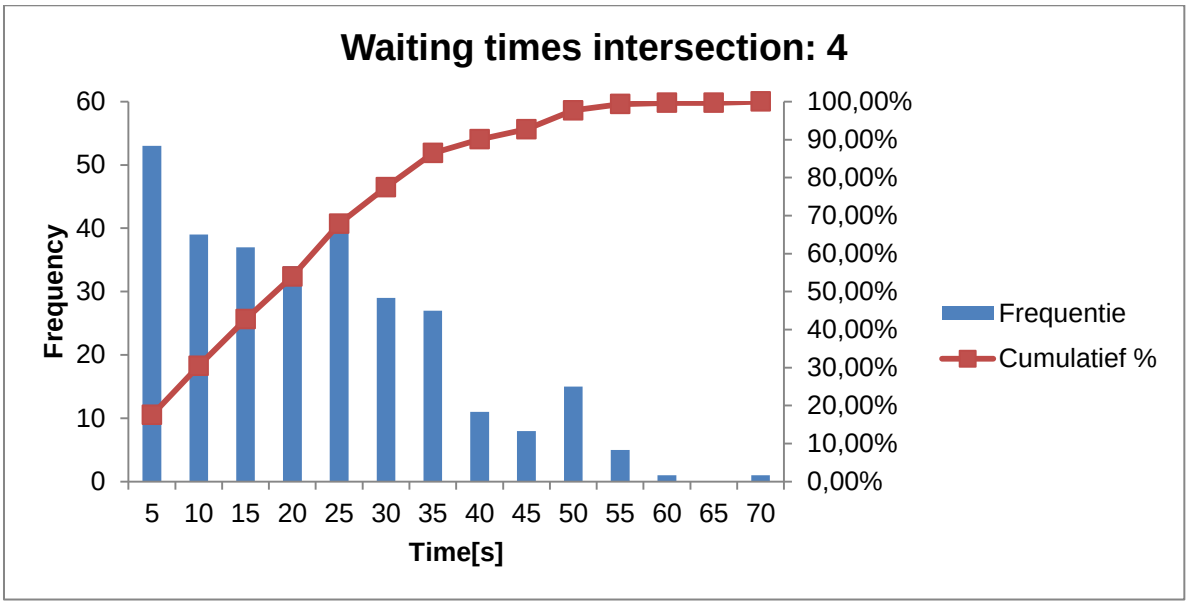

Figure 0-6 Waiting times distribution intersection 4

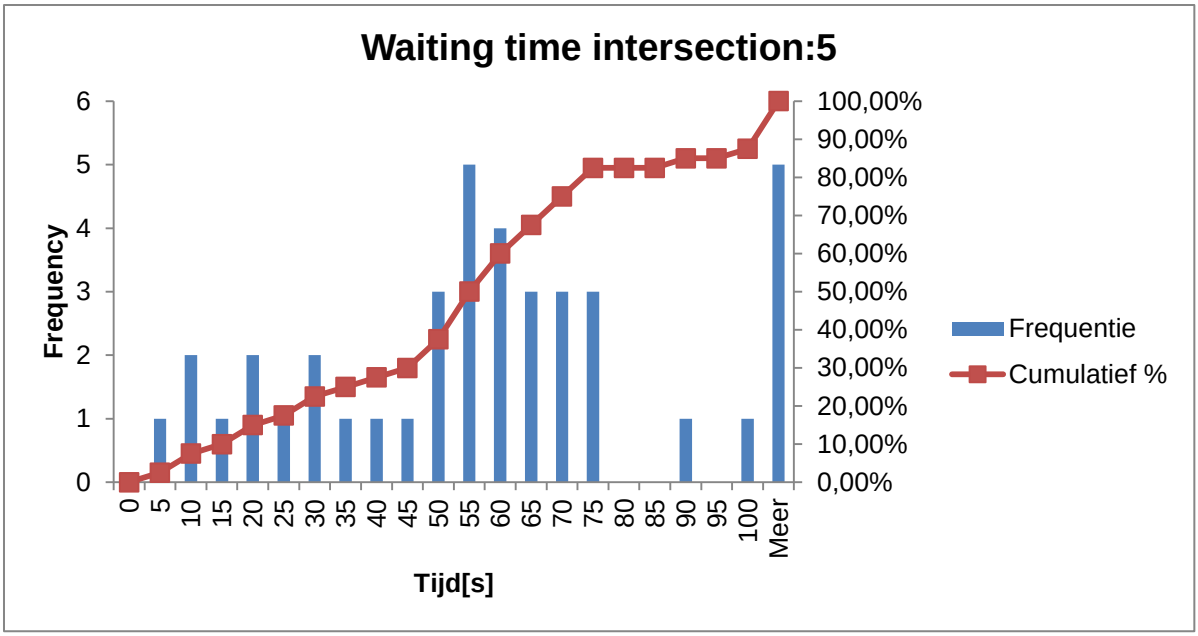

Figure 0-7 Waiting times distribution intersection 5

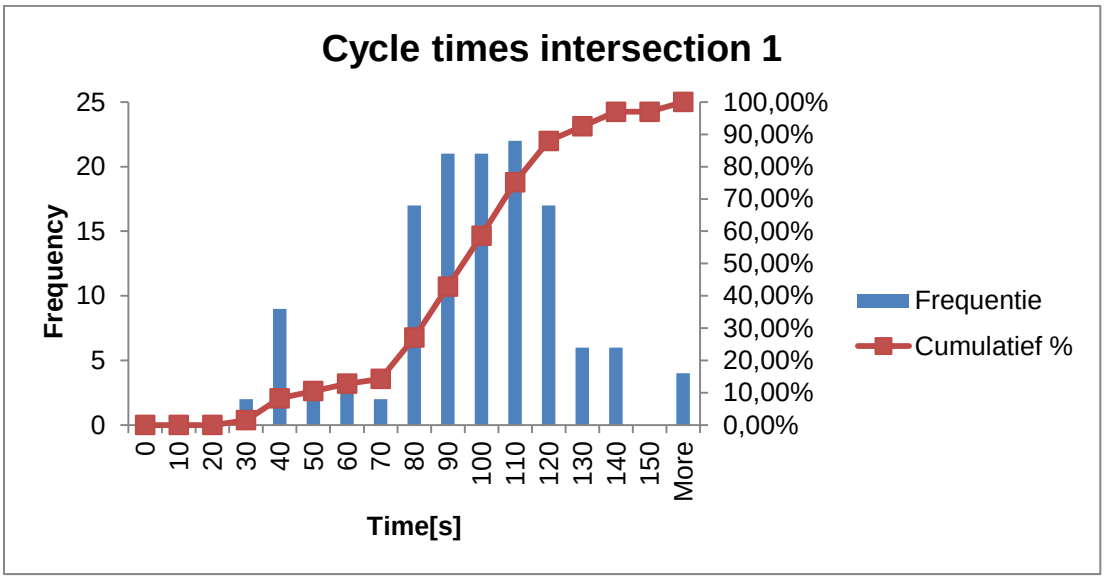

Figure 0-8 cycle time distribution intersection 1

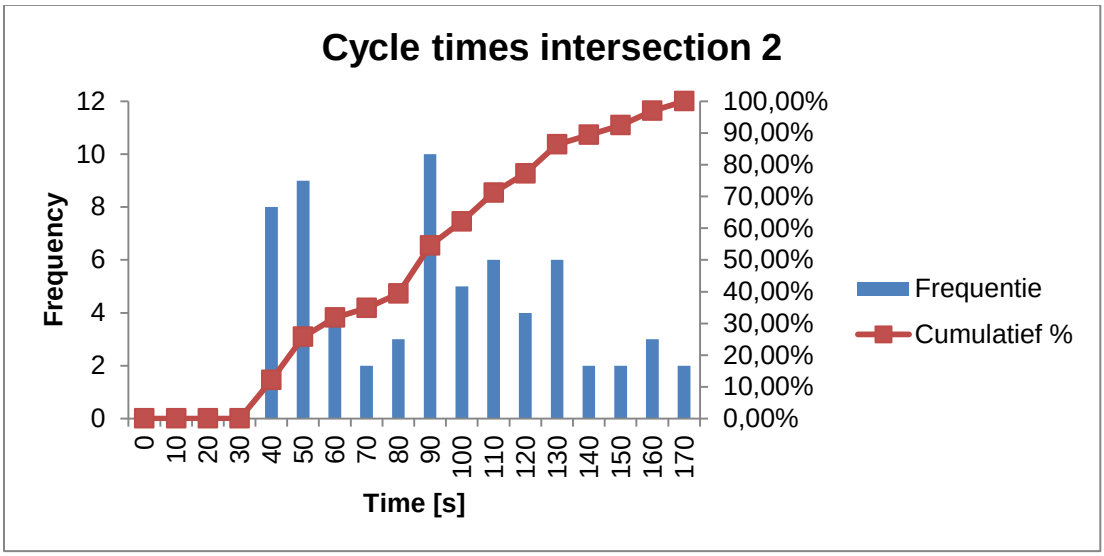

Figure 0-9 Cycle time distribution intersection 2

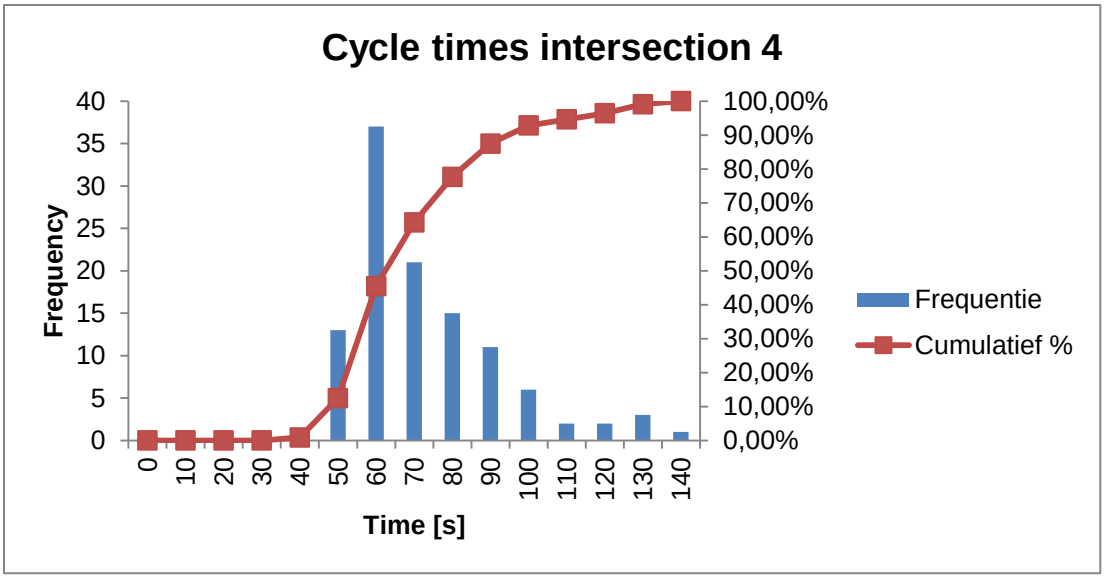

Figure 0-10 Cycle time distribution intersection 4

F. Raw data

In this appendix the raw data files of the intersections can be found. Of all the cyclists arriving at the crossing the time of arrival ('aankomst': during red (R) or during green (G)), gender ('Geslacht': Male(M) or Female(V)), type of vehicle ('Soort':Bicycle (F) or Moped (B)) and the age group is listed ('Leeftijd':young(j), adult(v) or elderly (o)). The other columns contain the information about the moment of crossing. 'Oversteken tijd' denotes the time of crossing when the cyclists violates the red light. 'Oversteken' contains the moment of crossing: Green (G), MidleRed (RR), End Red (ER), Begin Red (BR). The column 'Groen' contains the time the light turned green and 'Wachttijd' contains the waiting time for the cyclist. The last line of the tables contain the end time of the video observation. Some of the intersections are observerd for a shorter time, because of very low cyclists rates, but all observations are between 3 and 4 hours. The analysis does not use the averages per hour or the total divided over the time period, thus the difference in length of observation should not have an effect on the results.

Intersection 1:

Tijd	Aankomst	Geslacht	Soort	Leeftijd	Oversteken tijd	Oversteken	Groen	Wachttijd (tot groen)
7:00:20	R	V	B	v		G	7:00:59	0:00:39
7:00:34	R	V	B	v		G	7:00:59	0:00:25
7:00:45	R	M	F	v		G	7:00:59	0:00:14
7:01:45	R	V	F	v		G	7:02:21	0:00:36
7:03:27	R	M	B	v		G	7:03:40	0:00:13
7:03:56	R	V	F	v		G	7:04:56	0:01:01
7:05:23	R	M	F	v		G	7:06:35	0:01:12
7:06:02	R	M	F	v		G	7:06:35	0:00:33
7:06:19	R	M	F	v	0:07:27	RR		
7:06:24	R	V	F	j		G	7:06:35	0:00:11
7:06:44	G	M	F	j				
7:06:46	G	M	F	j				
7:07:06	R	M	F	v		G	7:08:16	0:01:10
7:07:26	R	M	F	v		G	7:08:16	0:00:51
7:07:34	R	M	F	v		G	7:08:16	0:00:43
7:07:40	R	V	F	v		G	7:08:16	0:00:36
7:07:40	R	V	F	v		G	7:08:16	0:00:36
7:08:30	G	M	F	j				
7:09:58	R	V	F	j		G	7:10:05	0:00:06
7:10:31	R	V	F	v		G	7:11:39	0:01:08
7:10:42	R	M	F	j		G	7:11:39	0:00:57
7:11:10	R	V	F	v		G	7:11:39	0:00:29
7:11:47	G	M	F	v				
7:11:48	G	M	F	v				
7:12:20	R	M	F	v		G	7:13:14	0:00:54
7:12:53	R	M	F	v		G	7:13:14	0:00:21
7:14:05	R	V	F	v		G	7:14:41	0:00:37
7:15:28	R	V	F	v		G	7:16:34	0:01:05
7:16:01	R	M	B	j		G	7:16:34	0:00:32
7:16:15	R	M	F	v		G	7:16:34	0:00:19
7:16:20	R	M	F	o		G	7:16:34	0:00:14
7:16:29	R	V	F	j		G	7:16:34	0:00:05
7:16:40	G	V	F	v				
7:16:56	R	M	F	v		G	7:17:49	0:00:52
7:17:39	R	V	F	v		G	7:17:49	0:00:10
7:18:13	R	V	F	v		G	7:19:31	0:01:19
7:18:39	R	M	F	v		G	7:19:31	0:00:53
7:19:10	R	V	F	v		G	7:19:31	0:00:22
7:19:10	R	M	F	o		G	7:19:31	0:00:22
7:20:01	R	V	F	v		G	7:21:08	0:01:07
7:20:41	R	M	F	v		G	7:21:08	0:00:26
7:23:15	R	M	F	v		G	7:24:40	0:01:25
7:23:52	R	M	F	v		G	7:24:40	0:00:49
7:23:52	R	M	F	v		G	7:24:40	0:00:49
7:24:00	R	V	F	v		G	7:24:40	0:00:40
7:25:15	R	M	F	v		G	7:26:34	0:01:19
7:25:38	R	M	F	v		G	7:26:34	0:00:56
7:25:50	R	M	B	v		G	7:26:34	0:00:43
7:26:22	R	V	F	v		G	7:26:34	0:00:12
7:28:33	R	V	F	v		G	7:28:42	0:00:09
7:28:46	G	M	F	v				
7:29:28	R	M	F	v	7:29:36	RR	7:30:10	
7:31:07	R	M	B	v		G	7:31:59	0:00:52
7:31:17	R	V	F	v		G	7:31:59	0:00:43

7:31:44	R	V	F	v		G	7:31:59	0:00:15
7:33:09	R	V	F	v		G	7:33:39	0:00:30
7:33:52	R	V	F	o		G	7:34:15	0:00:24
7:33:52	R	V	F	o		G	7:34:15	0:00:24
7:33:56	R	V	F	o		G	7:34:15	0:00:19
7:34:22	G	V	F	v				
7:34:22	G	M	F	v				
7:34:29	R	M	F	j		G	7:35:28	0:00:59
7:34:34	R	M	F	v		G	7:35:28	0:00:55
7:36:22	R	M	F	v		G	7:37:03	0:00:41
7:36:22	R	M	F	v		G	7:37:03	0:00:41
7:36:44	R	M	F	v		G	7:37:03	0:00:19
7:37:51	R	V	F	v		G	7:38:38	0:00:46
7:38:42	G	V	F	v				
7:39:08	R	V	F	v		G	7:39:14	0:00:06
7:39:14	G	V	F	j				
7:40:04	R	M	F	v		G	7:40:30	0:00:26
7:40:10	R	V	F	j		G	7:40:30	0:00:20
7:40:16	R	M	F	v		G	7:40:30	0:00:14
7:40:45	R	M	F	v		G	7:42:13	0:01:29
7:41:01	R	M	F	v		G	7:42:13	0:01:12
7:41:12	R	V	F	v		G	7:42:13	0:01:02
7:42:01	R	V	F	v		G	7:42:13	0:00:12
7:42:13	G	M	F	v				
7:42:34	G	M	F	v				
7:42:44	G	M	F	v				
7:43:20	R	V	B	v		G	7:44:20	0:00:59
7:45:24	R	V	F	v		G	7:46:14	0:00:50
7:45:30	R	M	F	j		G	7:46:14	0:00:44
7:46:50	R	V	F	v		G	7:48:21	0:01:31
7:47:08	R	V	F	v		G	7:48:21	0:01:13
7:47:08	R	M	F	v		G	7:48:21	0:01:13
7:47:53	R	M	F	v		G	7:48:21	0:00:28
7:47:56	R	M	F	v		G	7:48:21	0:00:26
7:47:57	R	M	F	v		G	7:48:21	0:00:24
7:48:26	G	M	F	v				
7:48:29	G	V	F	v				
7:48:32	G	M	B	v				
7:48:32	G	M	F	v				
7:48:53	R	M	F	v		G	7:50:05	0:01:12
7:49:01	R	V	F	v		G	7:50:05	0:01:04
7:49:26	R	M	F	v		G	7:50:05	0:00:39
7:50:02	R	M	F	v		G	7:50:05	0:00:04
7:50:02	R	M	F	v		G	7:50:05	0:00:04
7:50:10	G	M	F	v				
7:50:15	G	M	F	v				
7:50:15	G	M	F	v				
7:50:51	R	M	F	v		G	7:51:52	0:01:01
7:51:14	R	M	F	v		G	7:51:52	0:00:38
7:51:18	R	M	F	j		G	7:51:52	0:00:34
7:51:21	R	M	F	v		G	7:51:52	0:00:31
7:51:21	R	V	F	v		G	7:51:52	0:00:31
7:51:27	R	M	B	v		G	7:51:52	0:00:26
7:51:31	R	M	F	v		G	7:51:52	0:00:21
7:51:41	R	M	F	v		G	7:51:52	0:00:11
7:52:00	G	M	F	j				
7:52:03	G	M	F	v				
7:53:07	R	V	F	v		G	7:54:05	0:00:58
7:53:15	R	M	F	v		G	7:54:05	0:00:50
7:53:38	R	V	F	v		G	7:54:05	0:00:27
7:53:51	R	V	F	v		G	7:54:05	0:00:14
7:53:57	R	V	F	v		G	7:54:05	0:00:07
7:54:33	R	M	B	j		G	7:54:43	0:00:10
7:54:49	G	M	B	v				
7:54:52	G	V	F	j				
7:55:29	R	M	F	j		G	7:56:01	0:00:33
7:55:31	R	V	F	v		G	7:56:01	0:00:31
7:55:37	R	M	F	v		G	7:56:01	0:00:25
7:55:37	R	M	F	v		G	7:56:01	0:00:25
7:55:53	R	V	F	v		G	7:56:01	0:00:08
7:56:06	G	V	F	v				
7:56:21	R	M	F	j		RR		
7:56:25	R	M	B	j		G	7:56:54	0:00:29
7:56:47	R	V	F	j		G	7:58:06	0:01:18
7:56:47	R	V	F	j		G	7:58:06	0:01:18
7:56:47	R	M	F	j		G	7:58:06	0:01:18
7:56:56	R	V	F	j		G	7:58:06	0:01:09
7:57:04	R	V	F	v		G	7:58:06	0:01:02
7:57:09	R	V	F	j		G	7:58:06	0:00:57
7:57:30	R	M	F	v		G	7:58:06	0:00:35
7:57:41	R	M	F	j		G	7:58:06	0:00:25
7:57:44	R	V	F	v		G	7:58:06	0:00:22

7:58:02	R	M	F	j		G	7:58:06	0:00:03
7:58:12	G	V	B	v				
7:58:13	G	M	F	j				
7:58:51	R	M	F	v		G	7:59:56	0:01:05
7:59:04	R	V	F	j		G	7:59:56	0:00:52
7:59:06	R	V	F	v		G	7:59:56	0:00:50
7:59:46	R	M	F	j		G	7:59:56	0:00:10
8:00:00	G	V	F	j				
8:00:49	R	M	F	v		G	8:01:37	0:00:49
8:00:54	R	M	F	v		G	8:01:37	0:00:43
8:01:05	R	V	F	j		G	8:01:37	0:00:33
8:01:11	R	V	F	j		G	8:01:37	0:00:26
8:02:12	R	V	B	j		G	8:03:08	0:00:56
8:03:12	G	M	F	v				
8:03:39	R	V	F	v		G	8:03:45	0:00:06
8:03:46	G	M	F	j				
8:03:52	G	M	F	v				
8:04:03	R	M	F	v		G	8:04:51	0:00:48
8:04:23	R	M	F	v		G	8:04:51	0:00:27
8:04:39	R	V	F	j		G	8:04:51	0:00:12
8:05:12	R	M	F	v		G	8:06:41	0:01:29
8:05:32	R	M	F	v		G	8:06:41	0:01:09
8:06:18	R	M	F	v		G	8:06:41	0:00:22
8:06:18	R	V	F	v		G	8:06:41	0:00:22
8:06:25	R	V	F	v		G	8:06:41	0:00:16
8:06:30	R	V	F	v		G	8:06:41	0:00:10
8:07:17	R	M	F	v		G	8:08:21	0:01:04
8:07:28	R	M	F	j		G	8:08:21	0:00:53
8:07:41	R	V	F	v		G	8:08:21	0:00:40
8:07:47	R	M	F	o		G	8:08:21	0:00:34
8:07:51	R	M	F	v		G	8:08:21	0:00:30
8:07:57	R	M	F	v		G	8:08:21	0:00:24
8:07:59	R	M	F	j		G	8:08:21	0:00:22
8:08:04	R	M	F	v		G	8:08:21	0:00:18
8:08:12	R	V	F	j		G	8:08:21	0:00:10
8:08:12	R	V	F	j		G	8:08:21	0:00:10
8:08:13	R	V	F	j		G	8:08:21	0:00:08
8:08:33	G	V	F	j				
8:09:21	R	V	F	v		G	8:10:05	0:00:45
8:09:25	R	V	F	j		G	8:10:05	0:00:41
8:09:25	R	V	F	j		G	8:10:05	0:00:41
8:10:52	R	M	F	v		G	8:11:57	0:01:05
8:10:56	R	M	F	v		G	8:11:57	0:01:01
8:11:17	R	M	F	v		G	8:11:57	0:00:40
8:11:24	R	M	F	v		G	8:11:57	0:00:33
8:11:28	R	M	F	j		G	8:11:57	0:00:29
8:11:33	R	V	F	v		G	8:11:57	0:00:24
8:11:55	R	M	F	v	8:11:56	ER		
8:11:56	R	V	B	v		G	8:11:57	0:00:01
8:11:56	R	V	F	v		G	8:11:57	0:00:01
8:12:02	G	M	F	v				
8:12:09	G	M	F	j				
8:12:11	R	M	F	v	8:12:11	BR		
8:12:31	R	V	F	v		G	8:12:42	0:00:11
8:12:40	R	V	F	j		G	8:12:42	0:00:01
8:12:42	G	M	F	v				
8:13:02	R	M	F	v		G	8:14:09	0:01:07
8:13:07	R	V	F	v		G	8:14:09	0:01:02
8:13:25	R	V	F	j		G	8:14:09	0:00:44
8:13:33	R	M	F	j		G	8:14:09	0:00:36
8:13:46	R	M	F	v		G	8:14:09	0:00:23
8:13:52	R	M	F	v		G	8:14:09	0:00:17
8:14:15	G	M	F	v				
8:14:21	R	M	B	v	8:14:21	BR		
8:14:28	R	V	F	v	8:14:28	RR		
8:14:44	R	M	F	v	8:14:44	RR		
8:15:23	R	V	F	v		G	8:15:46	0:00:23
8:15:23	R	V	F	j		G	8:15:46	0:00:23
8:15:39	R	M	F	v		G	8:15:46	0:00:07
8:16:14	R	V	F	v		G	8:16:41	0:00:27
8:16:26	R	M	F	v		G	8:16:41	0:00:15
8:16:26	R	V	F	j		G	8:16:41	0:00:15
8:16:32	R	V	F	v		G	8:16:41	0:00:10
8:16:37	R	V	F	j		G	8:16:41	0:00:04
8:17:00	R	V	F	v		G	8:18:11	0:01:11
8:17:46	R	M	F	v		G	8:18:11	0:00:25
8:17:56	R	V	F	j		G	8:18:11	0:00:15
8:18:13	G	M	B	v				
8:18:25	R	V	F	v		G	8:18:44	0:00:20
8:18:25	R	M	F	j		G	8:18:44	0:00:20
8:18:26	R	M	F	v		G	8:18:44	0:00:18
8:18:32	R	M	F	v		G	8:18:44	0:00:13

8:18:50	R	V	F	v		G	8:20:03	0:01:14
8:19:18	R	M	F	v		G	8:20:03	0:00:45
8:19:23	R	M	F	v		G	8:20:03	0:00:40
8:19:49	R	V	F	v		G	8:20:03	0:00:15
8:19:51	R	V	F	v		G	8:20:03	0:00:13
8:19:58	R	V	F	v		G	8:20:03	0:00:06
8:20:01	R	M	B	v		G	8:20:03	0:00:02
8:20:01	R	M	F	v		G	8:20:03	0:00:02
8:20:29	R	V	F	v		G	8:21:54	0:01:25
8:21:07	R	M	F	v		G	8:21:54	0:00:47
8:21:07	R	V	F	j		G	8:21:54	0:00:47
8:21:18	R	M	F	v		G	8:21:54	0:00:36
8:21:18	R	V	F	v		G	8:21:54	0:00:36
8:21:38	R	M	F	v		G	8:21:54	0:00:16
8:21:53	R	V	F	v		G	8:21:54	0:00:01
8:22:02	G	V	F	v				
8:22:03	G	M	F	v				
8:22:04	G	M	F	v				
8:22:56	R	M	F	v		G	8:24:05	0:01:10
8:23:00	R	V	F	v		G	8:24:05	0:01:06
8:23:21	R	V	F	j		G	8:24:05	0:00:45
8:23:21	R	V	F	v		G	8:24:05	0:00:45
8:23:34	R	M	F	j		G	8:24:05	0:00:31
8:23:34	R	M	F	v		G	8:24:05	0:00:31
8:23:37	R	M	F	v		G	8:24:05	0:00:29
8:24:27	R	V	F	j		G	8:24:50	0:00:24
8:24:47	R	V	F	v		G	8:24:50	0:00:03
8:25:30	R	M	F	v		G	8:26:20	0:00:50
8:26:03	R	V	F	v		G	8:26:20	0:00:17
8:26:20	G	M	F	v				
8:26:25	G	V	F	v				
8:26:26	G	V	F	v				
8:26:29	G	V	F	j				
8:26:30	G	M	F	v				
8:27:11	R	M	B	v		G	8:27:49	0:00:39
8:27:23	R	M	B	j		G	8:27:49	0:00:26
8:28:02	R	M	F	v		G	8:29:19	0:01:17
8:28:07	R	V	F	v		G	8:29:19	0:01:12
8:28:12	R	M	F	v		G	8:29:19	0:01:07
8:28:18	R	M	F	v		G	8:29:19	0:01:01
8:28:29	R	M	F	v		G	8:29:19	0:00:50
8:28:55	R	V	F	v		G	8:29:19	0:00:24
8:28:55	R	M	B	j		G	8:29:19	0:00:24
8:29:00	R	M	F	v		G	8:29:19	0:00:19
8:29:16	R	V	F	v		G	8:29:19	0:00:03
8:29:27	G	V	F	v				
8:29:49	R	M	F	v		G	8:31:02	0:01:13
8:30:15	R	M	F	j		G	8:31:02	0:00:47
8:30:20	R	V	F	v		G	8:31:02	0:00:42
8:30:20	R	V	F	j		G	8:31:02	0:00:42
8:30:34	R	V	F	v		G	8:31:02	0:00:28
8:30:37	R	M	F	v		G	8:31:02	0:00:25
8:30:40	R	V	F	v		G	8:31:02	0:00:22
8:30:44	R	V	F	v		G	8:31:02	0:00:18
8:30:52	R	M	F	v		G	8:31:02	0:00:10
8:31:12	G	V	F	v				
8:31:18	R	V	F	v		G	8:33:13	0:01:55
8:31:30	R	M	F	j		G	8:33:13	0:01:43
8:31:46	R	M	B	v		G	8:33:13	0:01:28
8:31:52	R	V	F	v		G	8:33:13	0:01:22
8:31:52	R	M	F	j		G	8:33:13	0:01:22
8:31:56	R	V	F	o		G	8:33:13	0:01:17
8:32:28	R	M	F	v		G	8:33:13	0:00:45
8:34:00	R	M	F	v		G	8:35:00	0:01:00
8:34:07	R	V	F	j		G	8:35:00	0:00:53
8:34:23	R	V	F	j		G	8:35:00	0:00:37
8:34:28	R	M	F	v		G	8:35:00	0:00:32
8:35:22	R	M	F	v		G	8:36:45	0:01:23
8:35:34	R	M	F	v		G	8:36:45	0:01:11
8:35:36	R	M	F	v		G	8:36:45	0:01:09
8:35:53	R	V	F	v		G	8:36:45	0:00:53
8:36:42	R	V	F	v		G	8:36:45	0:00:04
8:36:54	G	M	F	v				
8:36:56	G	V	F	j				
8:36:56	G	V	F	j				
8:37:00	G	V	F	j				
8:37:03	R	V	F	v	8:37:03	BR		
8:37:12	R	V	F	v		G	8:37:23	0:00:11
8:37:18	R	M	F	j		G	8:37:23	0:00:05
8:37:32	G	M	F	j				
8:38:07	R	M	F	v		G	8:39:16	0:01:09
8:38:11	R	V	F	v		G	8:39:16	0:01:05

8:38:46	R	M	F	v		G	8:39:16	0:00:30
8:38:54	R	V	F	j		G	8:39:16	0:00:22
8:39:00	R	V	B	j		G	8:39:16	0:00:16
8:39:05	R	V	B	v		G	8:39:16	0:00:11
8:39:28	R	V	F	v	8:39:28	BR		
8:39:59	R	V	F	v		G	8:40:05	0:00:06
8:40:08	G	V	F	v				
8:40:36	R	M	B	v		G	8:41:33	0:00:57
8:41:23	R	V	F	v		G	8:41:33	0:00:10
8:41:32	R	M	F	v		G	8:41:33	0:00:01
8:42:30	R	V	F	v		G	8:43:22	0:00:53
8:42:31	R	V	F	v		G	8:43:22	0:00:51
8:42:39	R	M	F	o		G	8:43:22	0:00:44
8:42:45	R	M	F	v		G	8:43:22	0:00:37
8:42:59	R	V	F	v		G	8:43:22	0:00:24
8:44:23	R	M	F	j		G	8:45:14	0:00:51
8:44:43	R	V	F	v		G	8:45:14	0:00:31
8:44:48	R	M	F	v		G	8:45:14	0:00:26
8:44:52	R	M	F	v		G	8:45:14	0:00:22
8:45:46	R	V	F	v		G	8:45:48	0:00:02
8:45:52	G	V	F	v				
8:46:03	R	M	F	v		G	8:47:12	0:01:09
8:46:12	R	M	F	v		G	8:47:12	0:01:00
8:46:23	R	V	F	v		G	8:47:12	0:00:49
8:46:38	R	M	F	v		G	8:47:12	0:00:34
8:47:18	G	M	F	v				
8:47:19	G	V	F	v				
8:47:20	G	M	F	v				
8:47:21	G	M	F	v				
8:47:21	G	M	F	v				
8:47:32	G	M	F	v				
8:48:20	R	V	F	v		G	8:49:31	0:01:11
8:48:54	R	M	F	v		G	8:49:31	0:00:37
8:48:56	R	M	F	v		G	8:49:31	0:00:35
8:49:01	R	M	F	v		G	8:49:31	0:00:30
8:49:13	R	M	F	v		G	8:49:31	0:00:18
8:49:13	R	V	F	v		G	8:49:31	0:00:18
8:49:20	R	M	B	v		G	8:49:31	0:00:11
8:49:43	R	M	F	v	8:49:43	BR		
8:49:55	R	M	F	v		G	8:49:57	0:00:02
8:50:32	R	M	F	j		G	8:51:08	0:00:36
8:50:35	R	V	F	j		G	8:51:08	0:00:33
8:51:01	R	V	F	v		G	8:51:08	0:00:07
8:51:20	G	M	B	v				
8:51:39	R	M	F	v		G	8:53:12	0:01:33
8:51:40	R	M	F	v		G	8:53:12	0:01:32
8:51:46	R	V	F	v		G	8:53:12	0:01:26
8:51:56	R	V	F	j		G	8:53:12	0:01:16
8:52:10	R	V	F	o		G	8:53:12	0:01:02
8:52:56	R	M	F	v		G	8:53:12	0:00:16
8:53:02	R	M	F	v		G	8:53:12	0:00:10
8:53:21	G	M	F	v				
8:53:54	R	V	F	v	8:53:54	RR		
8:54:29	R	M	F	v		G	8:54:36	0:00:06
8:54:50	R	V	F	v		G	8:56:32	0:01:42
8:55:14	R	M	F	v		G	8:56:32	0:01:19
8:55:19	R	M	B	j		G	8:56:32	0:01:13
8:55:23	R	V	F	v		G	8:56:32	0:01:09
8:55:35	R	V	F	v		G	8:56:32	0:00:57
8:55:49	R	M	B	j		G	8:56:32	0:00:43
8:56:00	R	M	F	v		G	8:56:32	0:00:33
8:56:42	G	V	F	j				
8:56:49	R	M	F	j	8:56:49	RR		
8:57:13	R	V	F	v		G	8:58:26	0:01:13
8:57:13	R	M	F	v	8:57:13	RR		
8:57:33	R	V	F	v		G	8:58:26	0:00:53
8:57:41	R	V	F	v		G	8:58:26	0:00:45
8:57:50	R	V	F	v		G	8:58:26	0:00:36
8:58:57	R	M	F	v		G	8:59:01	0:00:04
8:59:07	G	V	F	v				
8:59:39	R	V	F	v		G	9:00:32	0:00:54
8:59:58	R	V	F	v		G	9:00:32	0:00:34
9:00:23	R	M	F	j		G	9:00:32	0:00:09
9:00:56	R	M	F	v		G	9:00:58	0:00:03
9:01:01	G	M	F	o				
9:01:03	G	M	F	v				
9:01:10	G	V	F	j				
9:01:38	R	M	F	v		G	9:02:10	0:00:33
9:01:50	R	V	F	j		G	9:02:10	0:00:20
9:02:58	R	V	F	v		G	9:04:07	0:01:09
9:03:06	R	M	F	v		G	9:04:07	0:01:01
9:03:16	R	M	F	v		G	9:04:07	0:00:51

9:03:16	R	M	F	v		G	9:04:07	0:00:51
9:04:12	G	M	F	v				
9:05:02	R	M	F	v		G	9:05:03	0:00:02
9:05:10	G	V	F	j				
9:05:11	G	V	F	v				
9:05:33	R	M	F	o		G	9:06:04	0:00:31
9:06:28	G	V	F	v				
9:06:30	G	M	F	v				
9:06:34	G	M	F	o				
9:07:07	R	V	F	j		G	9:08:09	0:01:02
9:07:55	R	V	F	v		G	9:08:09	0:00:14
9:08:01	R	M	F	v		G	9:08:09	0:00:07
9:08:15	G	M	F	v				
9:09:07	R	M	F	v		G	9:10:15	0:01:08
9:09:53	R	M	F	o		G	9:10:15	0:00:22
9:10:20	G	M	B	v				
9:10:26	G	V	F	j				
9:11:02	R	V	F	v		G	9:11:55	0:00:53
9:11:28	R	M	F	o		G	9:11:55	0:00:27
9:11:34	R	V	F	v		G	9:11:55	0:00:21
9:12:51	R	V	F	v		G	9:13:54	0:01:03
9:13:36	R	V	F	v		G	9:13:54	0:00:18
9:14:21	R	M	F	v		G	9:14:22	0:00:01
9:14:50	R	V	F	o		G	9:15:36	0:00:47
9:15:10	R	V	F	v		G	9:15:36	0:00:27
9:15:25	R	M	F	v		G	9:15:36	0:00:11
9:15:27	R	V	F	v		G	9:15:36	0:00:09
9:15:35	R	V	F	v		G	9:15:36	0:00:02
9:15:42	G	M	F	o				
9:16:12	R	V	F	j		G	9:16:51	0:00:39
9:17:26	R	V	F	v		G	9:18:17	0:00:51
9:18:17	G	V	B	v				
9:18:44	R	M	F	o		G	9:20:03	0:01:19
9:19:36	R	V	F	v		G	9:20:03	0:00:27
9:22:13	R	M	B	v		G	9:22:21	0:00:08
9:22:27	G	M	F	v				
9:22:49	R	M	F	v		G	9:23:46	0:00:56
9:23:10	R	M	B	v		G	9:23:46	0:00:36
9:24:24	R	M	F	v		G	9:25:24	0:01:00
9:24:42	R	V	F	o		G	9:25:24	0:00:42
9:24:56	R	V	B	v		G	9:25:24	0:00:28
9:25:16	R	V	F	v		G	9:25:24	0:00:08
9:25:27	G	V	F	v				
9:25:40	G	V	B	v				
9:26:17	R	M	F	o		G	9:27:13	0:00:56
9:26:22	R	M	F	v		G	9:27:13	0:00:50
9:26:33	R	V	F	v		G	9:27:13	0:00:39
9:26:46	R	M	F	v		G	9:27:13	0:00:27
9:27:43	R	M	F	j		G	9:28:49	0:01:06
9:29:10	R	V	F	v		G	9:30:39	0:01:28
9:29:20	R	M	F	v		G	9:30:39	0:01:18
9:34:01	R	V	F	v		G	9:34:09	0:00:08
9:34:16	G	V	F	v				
9:34:43	R	M	F	o		G	9:35:45	0:01:02
9:34:55	R	V	F	v		G	9:35:45	0:00:51
9:36:54	R	M	F	v		G	9:37:36	0:00:42
9:37:05	R	V	F	v		G	9:37:36	0:00:32
9:37:57	R	M	B	v		G	9:39:22	0:01:24
9:38:36	R	M	F	v	9:38:45	RR		
9:38:53	R	M	F	v		G	9:39:22	0:00:28
9:38:58	R	V	F	v		G	9:39:22	0:00:23
9:39:59	R	V	F	v		G	9:41:15	0:01:16
9:40:05	R	M	F	v		G	9:41:15	0:01:10
9:40:36	R	M	F	o		G	9:41:15	0:00:39
9:40:42	R	M	F	v		G	9:41:15	0:00:33
9:42:18	R	M	F	v		G	9:42:42	0:00:23
9:42:18	R	M	F	v		G	9:42:42	0:00:23
9:43:58	R	M	F	v		G	9:44:32	0:00:35
9:45:08	R	M	F	v	9:46:17	ER	9:46:22	
9:45:23	R	V	F	v	9:46:17	ER	9:46:22	
9:47:25	R	M	F	v		G	9:47:43	0:00:17
9:47:43	G	M	F	j				
9:47:53	R	M	F	v	9:47:53	BR		
9:48:26	R	V	F	o		G	9:49:29	0:01:03
9:49:25	R	M	F	j		G	9:49:29	0:00:04
9:49:29	G	V	F	v				
9:50:06	R	M	F	v		G	9:50:45	0:00:40
9:52:07	R	V	F	v		G	9:53:01	0:00:55
9:52:09	R	V	F	v		G	9:53:01	0:00:53
9:52:21	R	M	F	v		G	9:53:01	0:00:41
9:52:47	R	V	F	v		G	9:53:01	0:00:15
9:54:09	R	V	F	o		G	9:54:38	0:00:29

9:55:45	R	V	F	v		G	9:55:56	0:00:12
9:56:26	R	V	F	o		G	9:57:15	0:00:50
9:56:50	R	M	F	v		G	9:57:15	0:00:26
9:57:42	R	V	F	j		G	9:58:35	0:00:52
9:58:53	R	M	F	v		G	9:59:10	0:00:17
10:01:13	R	M	B	j	10:01:19	RR		
10:01:30	R	V	F	v		G	10:01:59	0:00:28
10:03:51	R	V	F	j		G	10:04:53	0:01:02
10:04:14	R	M	F	v		G	10:04:53	0:00:39
10:06:22	R	V	F	j		G	10:06:27	0:00:05
10:06:29	G	M	B	v				
10:07:07	R	V	F	v		G	10:07:49	0:00:42
10:08:13	R	M	F	v		G	10:09:24	0:01:11
10:08:55	R	V	F	v		G	10:09:24	0:00:29
10:10:03	R	M	B	v		G	10:10:41	0:00:38
10:10:14	R	M	F	v		G	10:10:41	0:00:27
10:10:49	G	M	F	v				
10:10:58	R	V	F	j		G	10:12:01	0:01:03
10:11:00	R	M	F	v		G	10:12:01	0:01:01
10:11:00	R	V	F	v		G	10:12:01	0:01:01
10:13:09	R	V	F	v		G	10:13:56	0:00:48
10:13:14	R	V	F	v		G	10:13:56	0:00:42
10:15:31	R	M	F	v		G	10:15:34	0:00:04
10:15:37	G	M	F	v				
10:17:50	R	M	B	v		G	10:18:24	0:00:34
10:19:12	R	M	B	v		G	10:20:01	0:00:49
10:20:05	G	M	F	v				
10:21:41	G	V	F	j				
10:22:50	R	M	B	j	10:22:50	RR		
10:24:28	R	M	F	o		G	10:24:36	0:00:08
10:25:55	R	M	F	v		G	10:26:03	0:00:09
10:26:22	G	M	F	v				
10:26:56	R	M	F	o		G	10:27:40	0:00:44
10:27:02	R	V	F	j		G	10:27:40	0:00:38
10:27:16	R	M	F	o		G	10:27:40	0:00:24
10:28:59	R	M	F	v		G	10:29:06	0:00:07
10:29:30	R	V	F	o		G	10:30:58	0:01:27
10:30:09	R	M	F	o		G	10:30:58	0:00:49
10:31:41	R	M	F	o		G	10:32:22	0:00:40
10:32:40	R	M	F	v		G	10:33:55	0:01:15
10:32:52	R	V	F	v		G	10:33:55	0:01:03
10:33:23	R	M	F	v		G	10:33:55	0:00:31
10:33:52	R	M	F	v		G	10:33:55	0:00:03
10:34:45	R	V	F	v		G	10:35:28	0:00:43
10:34:45	R	V	B	v		G	10:35:28	0:00:43
10:35:50	G	V	F	v				
10:35:54	R	M	b	v	10:35:54	BR		
10:36:10	R	M	F	v		G	10:36:49	0:00:39
10:36:38	R	V	F	o		G	10:36:49	0:00:11
10:36:58	G	M	F	v				
10:40:52	R	V	F	v		G	10:41:41	0:00:49
10:40:55	R	M	F	v		G	10:41:41	0:00:46
10:44:30	R	M	F	v		G	10:44:54	0:00:24
10:44:55	G	V	F	o				
10:47:32	R	V	F	v		G	10:47:47	0:00:15
10:50:08	R	M	F	o				
10:50:11	R	M	F	v				
10:50:24	R	M	F	v				
Einde video-opname op 10:55								

Intersection 2:

Tijd	Aankomst	Geslacht	Soort	Leeftijd	Oversteken tijd	Oversteken	Groen	Wachttijd (tot groen)
7:06:13	R	M	F	j	7:06:20	ER	7:06:23	0:00:10
7:08:45	R	M	F	v	7:08:45	RR		
7:13:33	R	M	F	v	7:13:33	RR		
7:22:59	R	V	F	v	7:23:13	ER	7:23:15	0:00:16
7:25:22	R	M	F	v		G	7:25:38	0:00:16
7:32:45	R	V	F	v		G	7:32:53	0:00:08
7:32:48	R	M	F	v	7:32:49	RR	7:32:53	0:00:06
7:34:52	R	V	F	j		G	7:35:01	0:00:09
7:34:54	R	M	F	v		G	7:35:01	0:00:07
7:36:16	R	V	F	j		G	7:36:28	0:00:12
7:36:56	R	V	F	v		G	7:37:07	0:00:12
7:37:38	R	M	F	j		G	7:37:55	0:00:17
7:40:51	R	V	F	v	7:40:52	RR		
7:41:14	R	V	F	v		G	7:41:23	0:00:09
7:41:15	R	M	F	j		G	7:41:23	0:00:08
7:43:05	R	V	F	v		G	7:43:29	0:00:24
7:44:38	R	V	F	v		G	7:44:53	0:00:15
7:46:15	R	V	F	v		G	7:46:18	0:00:03
7:46:44	R	V	F	v		G	7:46:58	0:00:14
7:48:45	R	V	F	j		G	7:49:18	0:00:32
7:49:01	R	V	F	j		G	7:49:18	0:00:17
7:51:39	R	M	F	v		G	7:52:02	0:00:23
7:54:20	R	V	F	v	7:54:50	RR		
7:55:22	R	M	F	j	7:55:24	RR	7:55:34	0:00:12
8:00:33	R	V	F	v		G	8:01:00	0:00:27
8:01:49	R	M	F	j		G	8:01:57	0:00:08
8:02:45	R	V	F	j	8:02:46	RR		
8:03:59	R	M	F	v		G	8:04:07	0:00:08
8:04:49	R	V	F	v	8:04:53	ER	8:04:55	0:00:06
8:08:02	R	M	F	v		G	8:08:25	0:00:24
8:08:58	R	V	F	j		G	8:09:09	0:00:11
8:09:03	R	M	F	j		G	8:09:09	0:00:06
8:09:03	R	V	F	j		G	8:09:09	0:00:06
8:09:06	R	V	F	j		G	8:09:09	0:00:03
8:09:09	G	V	F	j				0:00:00
8:09:09	G	V	F	j				0:00:00
8:10:40	R	V	F	v	8:10:44	RR	8:10:50	0:00:10
8:10:40	R	V	F	v	8:10:44	RR	8:10:50	0:00:10
8:12:02	R	M	F	j		G	8:12:18	0:00:16
8:12:10	R	V	F	v		G	8:12:18	0:00:08
8:13:49	G	M	F	o				0:00:00
8:19:16	R	V	F	v		G	8:19:38	0:00:22
8:19:29	R	M	B	j		G	8:19:38	0:00:10
8:19:40	G	V	F	v				0:00:00
8:20:47	R	V	F	v		G	8:21:00	0:00:13
8:22:40	R	V	F	v		G	8:22:41	0:00:01
8:25:47	R	V	F	v		G	8:26:05	0:00:18
8:26:32	R	M	F	j		G	8:26:44	0:00:12
8:26:32	R	V	F	v		G	8:26:44	0:00:12
8:26:37	R	V	F	j		G	8:26:44	0:00:07
8:28:22	R	M	F	o	8:28:22	ER	8:28:24	0:00:02
8:29:33	R	V	F	v		G	8:29:57	0:00:24
8:30:42	R	V	F	o		G	8:30:43	0:00:01
8:31:20	R	M	F	j		G	8:31:27	0:00:07
8:32:31	R	V	F	v	8:32:31	RR		
8:32:37	R	V	F	v	8:32:37	RR		
8:33:03	R	V	F	v		G	8:33:36	0:00:33
8:33:38	G	V	F	v				0:00:00
8:35:16	R	V	F	v		G	8:35:50	0:00:34
8:35:50	G	M	F	v				0:00:00
8:36:23	R	V	F	j		G	8:36:29	0:00:06
8:37:54	R	V	F	v		G	8:37:56	0:00:01
8:38:12	R	M	F	v		G	8:38:51	0:00:39
8:38:50	R	V	F	v		G	8:38:51	0:00:01
8:40:18	R	M	F	v		G	8:40:31	0:00:12
8:40:24	R	V	F	v		G	8:40:31	0:00:06
8:40:27	R	M	F	o		G	8:40:31	0:00:04
8:40:42	R	V	F	v		G	8:41:25	0:00:43
8:41:12	R	V	F	v		G	8:41:25	0:00:12
8:44:20	R	M	F	v		G	8:44:27	0:00:06
8:44:49	R	M	F	v		G	8:45:15	0:00:27
8:46:43	R	M	F	v		G	8:46:57	0:00:14
8:46:48	R	M	F	v		G	8:46:57	0:00:08
8:47:01	G	V	F	v				0:00:00
8:47:06	G	V	F	j				0:00:00
8:47:50	R	V	F	v	8:47:50	RR		
8:48:04	R	V	F	j		G	8:48:45	0:00:41
8:48:34	R	V	F	v		G	8:48:45	0:00:10
8:49:26	R	V	F	v		G	8:50:00	0:00:34

8:49:33	R	V	F	v		G	8:50:00	0:00:27
8:49:49	R	V	F	v		G	8:50:00	0:00:11
8:51:05	R	V	F	v		G	8:51:14	0:00:09
8:51:35	R	M	F	v	8:52:01	ER	8:52:02	0:00:27
8:53:16	R	V	F	v		G	8:53:31	0:00:14
8:53:20	R	V	F	j		G	8:53:31	0:00:11
8:53:24	R	V	F	v		G	8:53:31	0:00:07
8:53:40	G	M	F	j				0:00:00
8:55:20	R	V	F	j		G	8:55:25	0:00:05
8:55:21	R	V	F	j		G	8:55:25	0:00:04
8:56:39	R	V	F	v		G	8:57:19	0:00:40
8:57:09	R	M	F	j		G	8:57:19	0:00:10
8:58:59	R	V	F	v		G	8:59:02	0:00:03
8:59:52	R	V	F	v	8:59:52	ER	8:59:57	0:00:05
9:03:27	R	M	F	j		G	9:03:56	0:00:29
9:03:40	R	V	F	v		G	9:03:56	0:00:16
9:03:44	R	V	F	j		G	9:03:56	0:00:12
9:03:56	G	V	F	v				0:00:00
9:05:34	R	M	F	v		G	9:05:56	0:00:22
9:05:50	R	M	F	v		G	9:05:56	0:00:06
9:07:56	R	V	F	v		G	9:08:08	0:00:12
9:09:04	R	v	f	v	9:09:18	RR	9:09:23	0:00:18
9:09:58	R	M	F	v		G	9:10:01	0:00:03
9:11:55	R	V	F	o		G	9:12:07	0:00:12
9:12:36	R	V	F	v		G	9:12:50	0:00:15
9:16:37	R	M	F	v		G	9:17:05	0:00:28
9:17:52	R	M	F	v	9:17:52	RR		
9:18:31	R	M	F	v		G	9:18:43	0:00:12
9:19:33	R	M	F	v	9:19:33	ER		
9:23:21	R	V	F	o		G	9:23:28	0:00:08
9:25:05	R	V	F	v		G	9:25:17	0:00:13
9:26:05	R	V	F	j		G	9:26:47	0:00:42
9:28:40	R	M	F	j		G	9:28:45	0:00:05
9:31:49	R	V	F	v		G	9:31:54	0:00:05
9:35:05	R	M	F	j	9:35:20	RR		
9:35:28	R	M	B	j		G	9:35:59	0:00:32
9:35:58	R	V	F	j		G	9:35:59	0:00:02
9:36:20	R	V	F	v		G	9:36:39	0:00:19
9:38:25	R	V	F	o		G	9:38:49	0:00:24
9:41:12	R	M	F	v		G	9:41:26	0:00:14
9:41:42	R	V	F	v		G	9:42:05	0:00:23
9:45:12	R	V	F	v		G	9:45:25	0:00:13
9:46:05	R	V	F	v	9:46:25	ER		
9:46:41	R	V	F	v		G	9:46:47	0:00:06
9:48:22	R	M	F	j	9:48:27	RR		
9:49:10	R	V	F	v		G	9:49:22	0:00:12
9:55:01	R	V	F	j	9:55:01	RR		
9:56:22	R	M	F	v		G	9:56:30	0:00:08
9:57:33	R	M	F	v		G	9:58:01	0:00:28
10:01:38	R	V	F	v		G	10:02:16	0:00:38
10:02:07	R	V	F	j		G	10:02:16	0:00:09
10:03:08	R	M	F	v		G	10:03:17	0:00:09
10:03:17	G	M	F	v				0:00:00
10:03:50	R	V	F	j		G	10:03:54	0:00:04
10:04:34	R	M	F	v		G	10:04:42	0:00:08
10:09:52	R	M	F	v		G	10:10:05	0:00:13
10:10:03	R	V	F	v		G	10:10:05	0:00:02
10:13:31	R	V	F	j		G	10:14:10	0:00:39
10:15:06	R	V	F	v		G	10:15:19	0:00:13
10:17:35	R	V	F	v	10:17:35	RR		
10:17:45	R	M	F	v		G	10:17:55	0:00:10
10:18:01	G	M	B	j				0:00:00
10:22:18	R	M	F	j	10:22:18	RR		
10:22:48	R	V	F	o		G	10:23:01	0:00:13
10:27:59	R	V	F	o	10:27:59	RR		
10:30:56	R	V	F	o		G	10:31:27	0:00:31
10:32:16	R	V	F	v		G	10:32:55	0:00:39
10:38:20	R	V	F	o		G	10:38:41	0:00:21
10:40:55	R	M	F	v		G	10:41:25	0:00:30
10:41:25	G	V	F	j				0:00:00
10:41:42	R	M	F	o		G	10:41:58	
Einde video-opname op 10:45								

Intersection 3:

For this intersection the column ‘Richting’ lists the direction the cyclists turn: Straight (S), Left (L) or Right (R). At this intersection the measurements only lasted 3 hours because of the large time gap between the cyclists at the end of the third hour and a change in the weather conditions.

Tijd	Aankomst	Geslacht	Soort	Leeftijd	Richting	Oversteken tijd		Oversteken	Groen	Wachttijd (tot groen)
7:24:03	R	M	F	v	S			G	7:24:13	00:09,4
7:32:22	R	M	F	v	S			G	7:32:32	00:10,4
7:36:35	R	M	F	v	S			G	7:37:06	00:30,2
7:46:36	G	M	F	v	S					
7:50:00	G	M	F	v	S					
7:50:16	R	V	F	v	S	7:51:06	R	R		
7:51:56	R	V	F	j	S			G	7:52:05	00:09,1
7:59:28	R	V	B	j	L			G	8:00:20	00:51,4
8:03:21	G	V	F	j	S					
8:07:25	R	M	F	j	S			G	8:07:34	00:08,9
8:12:56	R	M	F	v	S			G	8:13:10	00:13,4
8:13:14	G	M	F	j	S					
8:16:41	R	V	F	v	S			G	8:16:57	00:16,4
8:18:41	R	V	F	v	S			G	8:19:15	00:34,1
8:19:46	R	V	F	v	S			G	8:20:21	00:34,5
8:22:45	R	M	F	j	S	8:22:45	R	R		
8:22:45	R	V	F	j	S	8:22:45	R	R		
8:22:45	R	M	F	j	S	8:22:45	R	R		
8:23:14	G	V	F	j	S					
8:31:54	R	V	F	v	S			G	8:32:35	00:40,3
8:32:05	R	V	F	v	S			G	8:32:35	00:29,8
8:32:22	R	V	F	v	S			G	8:32:35	00:12,6
8:32:30	R	V	F	v	S			G	8:32:35	00:04,6
8:36:29	G	V	F	v	S					
8:40:38	R	M	F	v	S			G	8:40:50	00:12,8
8:49:06	R	M	F	j	S			G	8:49:21	00:15,3
8:49:06	R	M	F	j	S			G	8:49:21	00:15,3
8:51:40	R	V	F	v	S			G	8:52:23	00:42,8
8:52:06	R	V	F	v	S			G	8:52:23	00:16,8
8:53:04	R	M	F	o	S			G	8:53:21	00:16,7
8:53:20	R	M	F	v	L			G	8:53:21	00:01,0
9:00:25	R	M	F	o	S			G	9:00:32	00:07,1
9:00:25	R	V	F	o	S			G	9:00:32	00:07,1
9:02:35	R	M	F	v	S			G	9:02:38	00:02,8
9:04:21	R	M	F	v	S	9:04:21	R	R		
9:06:24	G	M	F	v	S					
9:08:31	R	V	F	v	S			G	9:09:20	00:49,3
9:08:31	R	V	F	v	S	9:08:31	R	R		
9:09:51	R	M	F	v	S	9:09:51	R	R		
9:12:22	R	M	F	j	S			G	9:12:24	00:01,9
9:12:22	R	M	F	j	S			G	9:12:24	00:01,9
9:12:22	R	M	F	j	S			G	9:12:24	00:01,9
9:17:06	R	M	F	v	S			G	9:17:46	00:40,0
9:19:48	R	V	F	v	S			G	9:20:13	00:24,4
9:24:41	R	V	F	j	S			G	9:25:04	00:23,3
9:25:04	G	M	F	o	S					
9:36:32	R	V	F	j	S			G	9:37:15	00:43,1
9:43:17	R	M	F	v	S	9:43:17	B	R		
Einde video opname 10:04										

Intersection 4:

The data of intersection 4 has two extra columns. The column “voetgangerslicht” indicates if the pedestrian light was green during the red light running of the cyclists. The colum “oversteek” indicates if the cyclists ran a red light at only the first part (1), only the second part (after the median refuge)(2) or both crossings (3).

Tijd	aankomst	Geslacht	Soort	Leeftijd	Oversteken tijd		oversteken	voetgangerslicht	oversteek	Groen	wachttijd (tot
7:04:14	R	M	F	j	7:04:25		R		3		
7:05:09	G	V	F	v							
7:05:27	R	M	F	o	7:05:27	E	R		3		
7:05:53	R	M	G	v	7:05:53		R	x	3		
7:08:43	R	M	F	v	7:08:43		R	x	3		
7:09:43	R	V	F	v	7:09:43		R		3		
7:10:23	R	M	B	j			G			7:10:34	0:00:10
7:10:59	R	M	F	v			G			7:11:30	0:00:31
7:12:20	R	V	F	v			G			7:13:03	0:00:43
7:13:15	G	M	F	v							
7:15:22	R	M	F	j			G			7:15:44	0:00:23
7:15:51	G	V	F	v							
7:15:52	G	M	F	o							
7:15:54	G	V	F	v							
7:17:15	R	M	F	v	7:17:15		R	x	3		
7:18:56	R	V	F	v	7:18:56		R	x	3		
7:19:44	R	M	F	v	7:19:44		R	x	3		
7:19:56	R	M	B	v	7:19:56	E	R		1		
7:20:23	R	M	F	v			G			7:20:41	0:00:18
7:20:42	G	V	B	v							
7:20:43	G	N	B	v							
7:20:49	G	M	F	o							
7:22:27	R	M	F	v	7:22:27		R		3		
7:23:46	G	V	F	v							
7:23:53	G	V	F	v							
7:24:04	R	V	F	v	7:24:17		R		3		
7:24:14	R	V	F	j	7:24:17		R		3		
7:25:03	R	V	F	v	7:25:03		R		1	7:25:17	0:00:14
7:25:40	R	V	F	v	7:25:40		R		3		
7:26:51	R	V	F	v			G			7:27:01	0:00:11
7:27:00	R	M	F	v			G			7:27:01	0:00:02
7:27:26	R	V	f	j	7:27:30		R				
7:27:45	G	V	F	v							
7:28:20	R	M	F	v			G			7:28:29	0:00:09
7:29:21	G	V	F	v					1		
7:30:00	RG	M	F	j	7:30:00		R				
7:30:13	G	M	F	v							
7:30:17	R	V	F	v	7:30:17		R	x	3		
7:30:22	R	M	B	v	7:30:22		R	x	3		
7:30:33	RG	V	F	v	7:30:33		R	x	1		
7:30:41	RG	M	F	v	7:30:46		R		1		
7:30:42	RG	M	F	v	7:30:45		R		1		
7:31:04	G	V	F	v							
7:31:44	R	M	F	j			G			7:31:48	0:00:04
7:31:53	G	M	F	v							
7:32:02	R	v	f	v	7:32:02		R	x	3		
7:32:50	R	M	F	v	7:32:50		R	x	3		
7:32:52	R	V	B	j	7:32:52		R	x	3		
7:33:14	R	M	F	j			G			7:33:21	0:00:07
7:33:26	G	M	F	v							
7:34:12	G	M	F	v							
7:34:13	G	V	F	v							
7:34:19	R	M	F	v	7:34:19	B	R	x	3		
7:34:24	R	M	F	v			G			7:34:45	0:00:20
7:35:14	R	M	F	v			G			7:35:25	0:00:11
7:35:18	R	V	F	j			G			7:35:25	0:00:07
7:35:18	R	V	F	j			G			7:35:25	0:00:07
7:35:28	G	M	F	v							
7:35:41	R	M	F	j	7:35:41		R	x	3		
7:35:49	R	V	F	j	7:35:49		R		3		
7:35:56	R	M	F	v	7:35:56		R		3		
7:36:21	G	M	F	v							
7:36:33	R	V	F	o			G			7:36:56	0:00:23
7:36:35	R	V	F	j	7:36:35		R		3		
7:36:54	R	V	F	v			G			7:36:56	0:00:01
7:37:00	G	M	F	o							
7:37:29	R	V	F	j			G			7:37:33	0:00:04
7:38:34	R	M	F	j			G			7:38:39	0:00:06
7:38:39	G	V	F	v							
7:38:42	G	V	F	v							
7:38:58	R	M	F	j	7:38:58	B	R	x	3		

7:40:12	G	M	f	j							
7:40:17	R	M	f	j	7:40:17	B	R	x	3		
7:40:28	R	M	F	j			G			7:40:58	0:00:30
7:40:50	R	M	B	j	7:40:50		R		3		
7:40:53	R	M	F	v	7:40:53		R		3		
7:40:56	RG	V	F	o	7:40:56		R		1		
7:40:56	RG	V	F	j	7:40:56		R		1		
7:41:00	G	M	F	j							
7:41:41	R	M	F	v			G			7:41:51	0:00:10
7:41:44	R	M	F	j			G			7:41:51	0:00:07
7:41:45	R	M	F	j			G			7:41:51	0:00:06
7:42:28	R	M	F	j			G			7:42:48	0:00:20
7:43:00	G	M	F	v							
7:43:04	R	M	F	j	7:43:04		R	x	3		
7:43:18	R	V	F	v	7:43:20		R		3		
7:43:23	R	M	F	j			G			7:43:34	0:00:11
7:43:36	G	V	F	v							
7:43:42	G	V	F	j							
7:43:42	G	V	F	j							
7:43:43	G	M	B	v							
7:43:43	G	M	B	j							
7:43:48	G	V	F	j							
7:43:54	R	V	F	j	7:43:54		R		3		
7:44:16	R	M	F	j			G			7:44:20	0:00:04
7:44:19	R	M	F	j			G			7:44:20	0:00:01
7:44:24	G	M	F	j							
7:45:06	R	M	F	j	7:45:13		R		3		
7:45:06	R	V	F	j	7:45:12		R		3		
7:45:10	R	M	F	v	7:45:46	E	R	x			
7:45:12	R	V	F	v	7:45:44		R	x			
7:45:35	R	V	F	v			G			7:45:47	0:00:12
7:45:55	G	M	F	j							
7:46:00	G	V	F	v							
7:46:25	R	V	F	v			G			7:46:39	0:00:14
7:46:25	R	m	F	j			G			7:46:39	0:00:14
7:46:25	R	v	F	j			G			7:46:39	0:00:14
7:46:31	R	v	F	j			G			7:46:39	0:00:09
7:46:41	G	m	F	v							
7:46:44	G	v	F	v							
7:46:45	G	M	F	v							
7:46:49	G	M	F	j							
7:46:54	R	V	F	j	7:46:54	B	R	x	3		
7:46:58	R	V	F	j	7:46:58	B	R	x	3		
7:47:16	R	V	F	j			G			7:47:47	0:00:31
7:47:16	R	M	F	v	7:47:18	R	R		3		
7:47:26	R	V	F	j	7:47:26		R		3		
7:47:38	R	V	F	j			G			7:47:47	0:00:09
7:47:40	R	M	F	v			G			7:47:47	0:00:07
7:47:48	G	M	F	v							
7:47:50	G	M	F	j							
7:47:53	G	V	F	v							
7:47:59	G	M	F	j							
7:48:08	R	M	F	j			G			7:48:41	0:00:33
7:48:08	R	M	F	j	7:48:08		R	x	1		
7:48:13	R	V	F	j	7:48:13		R		1		
7:48:13	R	V	F	j	7:48:13		R		1		
7:48:21	R	M	F	v			G			7:48:41	0:00:20
7:48:32	R	M	F	v			G			7:48:41	0:00:10
7:48:32	R	V	F	v			G			7:48:41	0:00:10
7:48:38	R	M	B	v	7:48:38		R		3		
7:48:47	G	M	F	j							
7:49:07	G	M	F	j							
7:49:22	R	V	F	j			G			7:50:00	0:00:38
7:49:39	R	M	B	j			G			7:50:00	0:00:21
7:49:44	R	M	B	v			G			7:50:00	0:00:16
7:50:09	G	V	f	v							
7:50:23	R	M	F	j	7:50:23		R		3		
7:50:46	R	V	F	o			G			7:50:55	0:00:08
7:51:01	G	M	F	v							
7:51:08	G	M	F	j							
7:51:15	R	V	F	v			G			7:51:41	0:00:26
7:51:24	R	M	F	j	7:51:26		R				
7:51:31	R	M	F	j	7:51:31		R				
7:51:50	G	M	F	j							
7:51:50	G	M	F	j							
7:51:50	G	M	F	j							
7:51:56	R	M	F	j	7:51:56	B	R	x	3		
7:52:19	R	M	F	j			G			7:52:37	0:00:18
7:52:19	R	M	F	j			G			7:52:37	0:00:18
7:52:19	R	M	F	j			G			7:52:37	0:00:18
7:52:20	R	V	F	j	7:52:20		R		3		
7:52:29	R	V	B	j			G			7:52:37	0:00:08

7:52:37	G	M	F	j							
7:52:39	G	M	F	v							
7:52:40	G	V	F	v							
7:52:42	G	M	F	v							
7:52:42	G	V	F	o							
7:52:44	G	V	F	j							
7:52:45	G	V	F	j							
7:52:59	R	M	F	j			G			7:53:36	0:00:37
7:53:16	R	V	F	v			G			7:53:36	0:00:19
7:53:33	R	V	F	v	7:53:33		R	x	3		
7:53:33	R	V	F	j	7:53:33		R	x	3		
7:53:33	R	V	F	j	7:53:33		R	x	3		
7:53:36	G	V	B	v							
7:53:40	G	V	F	j							
7:53:40	G	V	F	j							
7:53:42	G	V	F	j							
7:53:42	G	V	F	j							
7:53:43	G	V	F	v							
7:53:43	G	M	F	j							
7:53:45	G	V	F	j							
7:53:53	R	M	F	j	7:53:53	B	R	x	3		
7:53:59	R	V	F	j	7:53:59		R		1		
7:53:59	R	V	F	j	7:53:59		R		1		
7:54:03	R	M	F	v	7:54:03		R		3		
7:54:09	R	V	F	j			G			7:54:48	0:00:39
7:54:11	R	M	F	v			G			7:54:48	0:00:37
7:54:19	R	M	F	j			G			7:54:48	0:00:29
7:54:36	R	M	F	j			G			7:54:48	0:00:13
7:54:37	R	v	F	j			G			7:54:48	0:00:11
7:54:56	G	M	F	j							
7:55:07	R	M	F	j	7:55:07		R	x	1		
7:55:18	R	V	F	j	7:55:18		R		3		
7:55:18	R	V	F	j	7:55:18		R		3		
7:55:20	R	M	F	v	7:55:20		R		3		
7:55:32	R	M	F	j			G			7:55:35	0:00:03
7:55:33	R	M	f	j			G			7:55:35	0:00:02
7:55:35	G	M	F	j							
7:55:44	G	V	F	j							
7:55:46	G	M	F	j							
7:55:59	R	M	F	j	7:55:59		R		1		
7:55:59	R	M	F	j	7:55:59		R		1		
7:56:07	R	M	F	j			G			7:56:34	0:00:27
7:56:14	R	M	F	j			G			7:56:34	0:00:20
7:56:14	R	M	F	j			G			7:56:34	0:00:20
7:56:21	R	v	F	v			G			7:56:34	0:00:14
7:56:24	R	m	F	j			G			7:56:34	0:00:10
7:56:33	R	m	F	j			G			7:56:34	0:00:01
7:56:33	R	m	F	j			G			7:56:34	0:00:01
7:56:33	R	V	F	j			G			7:56:34	0:00:01
7:56:48	G	V	F	j							
7:56:48	G	V	F	j							
7:56:50	G	V	F	j							
7:57:17	R	V	F	j			G			7:57:41	0:00:24
7:57:28	R	V	F	j			G			7:57:41	0:00:13
7:57:28	R	V	F	j			G			7:57:41	0:00:13
7:57:38	R	V	F	j			G			7:57:41	0:00:04
7:57:38	R	V	F	j			G			7:57:41	0:00:04
7:57:46	G	V	f	J							
7:57:48	G	V	f	J							
7:57:48	G	V	f	J							
7:57:54	G	M	B	v							
7:57:55	R	M	F	v	7:57:55		R	x	3		
7:58:18	R	M	B	v			G			7:58:33	0:00:15
7:58:27	R	M	F	v			G			7:58:33	0:00:06
7:58:27	R	V	F	v			G			7:58:33	0:00:06
7:58:39	G	M	F	v							
7:58:42	G	V	F	v							
7:58:42	G	M	F	v							
7:58:48	R	M	F	v	7:58:48		R				
7:58:57	R	V	F	j			G			7:59:17	0:00:20
7:58:59	R	M	F	v			G			7:59:17	0:00:18
7:59:00	R	V	F	j			G			7:59:17	0:00:17
7:59:06	R	V	F	v			G			7:59:17	0:00:11
7:59:21	G	v	F	j							
7:59:22	G	M	F	j							
7:59:23	G	M	F	j							
7:59:23	G	M	F	j							
7:59:25	G	M	F	j							
7:59:27	G	M	F	v							
7:59:30	G	M	F	j							
7:59:30	G	M	F	j							
7:59:31	G	V	F	j							

7:59:32	G	M	F	j							
7:59:33	G	V	F	j							
7:59:50	R	V	F	v			G			8:00:07	0:00:17
8:00:04	RG	M	F	v	8:00:04		R	x	1		
8:00:09	G	V	F	v							
8:00:14	G	M	F	v							
8:00:19	G	M	F	j							
8:00:19	G	M	F	j							
8:00:21	G	V	F	j							
8:00:27	R	M	F	j	8:00:27		R		3		
8:00:34	R	V	F	v			G			8:00:59	0:00:25
8:00:37	R	V	F	j	8:00:41		R		1		
8:00:44	R	M	F	j	8:00:44		R		1		
8:00:46	R	M	F	j	8:00:46		R		1		
8:00:50	R	V	F	j	8:00:57		R	x			
8:00:54	R	V	F	j	8:00:58		R	x			
8:01:01	G	M	F	j							
8:01:04	G	M	F	v							
8:01:04	G	M	F	v							
8:01:12	G	V	F	j							
8:01:12	G	V	F	j							
8:01:14	G	V	F	v							
8:01:16	R	M	F	j	8:01:16	B	R	x	3		
8:01:16	R	M	F	j	8:01:16	B	R	x	3		
8:01:17	R	V	F	j	8:01:17	B	R	x	3		
8:01:37	R	M	B	v			G			8:01:58	0:00:21
8:01:39	R	V	F	v			G			8:01:58	0:00:18
8:01:39	R	V	F	v			G			8:01:58	0:00:18
8:01:49	R	V	F	v			G			8:01:58	0:00:09
8:01:51	R	V	F	v			G			8:01:58	0:00:07
8:01:55	R	V	F	v			G			8:01:58	0:00:03
8:02:07	G	M	F	v							
8:02:11	G	M	F	v							
8:02:15	R	M	F	j	8:02:15		R	x	3		
8:02:15	R	M	F	j	8:02:15		R	x	3		
8:02:18	R	V	F	j			R	x	3		
8:02:26	R	V	F	v	8:02:41		R		1		
8:02:36	R	V	F	v	8:02:39		R		1		
8:02:43	R	V	B	v			G			8:03:03	0:00:20
8:02:52	R	V	F	o			G			8:03:03	0:00:11
8:02:55	R	M	F	v			G			8:03:03	0:00:08
8:02:58	R	V	F	j			G			8:03:03	0:00:05
8:02:58	R	M	F	j			G			8:03:03	0:00:05
8:03:08	G	M	F	v							
8:03:08	G	M	F	v							
8:03:15	G	M	F	o							
8:03:18	G	M	F	j							
8:03:18	G	M	F	j							
8:03:19	R	M	F	j	8:03:19		R	x	3		
8:03:24	R	M	F	v	8:03:24		R	x	3		
8:03:37	R	M	F	j	8:03:56		R	x		8:03:57	0:00:20
8:03:44	R	V	F	j	8:03:54		R	x		8:03:57	0:00:13
8:03:49	R	M	F	j	8:03:54		R	x		8:03:57	0:00:08
8:03:57	G	V	F	v							
8:04:07	G	V	B	v							
8:04:14	R	M	F	j	8:04:14		R	x	3		
8:04:19	R	M	F	j	8:04:19		R		3		
8:04:27	R	V	F	j	8:04:42		R	x	3		
8:04:42	R	V	F	j			G			8:04:48	0:00:06
8:04:42	R	V	F	v	8:04:42		R	x	3		
8:04:45	R	M	F	j	8:04:45		R	x	1		
8:04:48	G	V	F	j							
8:04:48	G	V	F	j							
8:04:51	G	M	B	v							
8:04:53	G	M	F	v							
8:04:54	G	V	F	v							
8:04:56	G	M	F	j							
8:05:00	G	M	F	j							
8:05:00	G	M	F	j							
8:05:01	G	V	F	v							
8:05:01	G	V	F	j							
8:05:02	G	M	F	j							
8:05:11	R	M	F	j	8:05:11		R		3		
8:05:15	R	V	F	v	8:55:33		R		1		
8:05:17	R	M	F	v			G			8:05:41	0:00:24
8:05:21	R	V	B	j			G			8:05:41	0:00:20
8:05:24	R	v	F	j			G			8:05:41	0:00:17
8:05:35	R	m	f	j	8:05:35		R		1		
8:05:46	G	v	f	v							
8:05:49	G	V	f	j							
8:05:49	G	V	f	j							
8:05:57	R	M	F	j	8:05:57		R	x	3		

8:05:58	R	M	F	j			G			8:06:32	0:00:33
8:05:59	R	M	F	v	8:05:59		R	x	3		
8:06:05	R	M	F	j			G			8:06:32	0:00:26
8:06:21	R	M	F	j			G			8:06:32	0:00:11
8:06:28	R	M	F	j	8:06:28		R	x	1		
8:06:32	G	M	F	v							
8:06:34	G	M	F	v							
8:06:39	G	M	F	o							
8:06:40	G	M	F	v							
8:06:56	R	M	F	j	8:06:56		R		1		
8:07:05	R	V	F	v			G			8:07:19	0:00:13
8:07:33	R	V	F	j	8:07:33		R	x	3		
8:07:33	R	V	F	j	8:07:33		R	x	3		
8:07:55	R	V	F	v			G			8:08:11	0:00:15
8:08:03	R	M	F	o	8:08:03		R	x	3		
8:08:30	R	V	F	v	8:08:30		R		1		
8:08:38	R	M	F	j			G			8:09:09	0:00:31
8:08:47	R	V	F	j	8:08:51		R		1		
8:09:02	R	V	F	j			G			8:09:09	0:00:07
8:09:11	G	M	F	j							
8:09:18	G	V	F	v							
8:09:24	R	M	F	v	8:09:24		R	x			
8:09:25	R	V	F	v	8:09:25		R	x			
8:09:55	R	V	F	v			G			8:10:18	0:00:22
8:09:55	R	v	f	j			G			8:10:18	0:00:22
8:10:11	R	v	f	v	8:10:11		R	x			
8:10:13	R	m	f	j	8:10:13		R	x			
8:10:15	R	v	f	v			G			8:10:18	0:00:03
8:10:17	R	v	f	j	8:10:17		R	x			
8:10:20	G	m	f	j							
8:10:23	G	v	f	v							
8:10:32	G	v	f	v							
8:10:37	R	m	f	v	8:10:37		R	x			
8:10:42	R	V	F	v			G			8:11:14	0:00:32
8:10:42	R	V	F	j			G			8:11:14	0:00:32
8:10:56	R	M	F	v			G			8:11:14	0:00:18
8:11:12	R	V	F	v			G			8:11:14	0:00:02
8:11:24	G	V	F	j							
8:11:26	G	M	F	v							
8:11:57	R	V	b	v			G			8:12:07	0:00:09
8:12:16	G	M	F	j							
8:12:16	G	V	F	j							
8:12:17	G	M	F	j							
8:12:28	R	V	F	o			G			8:13:00	0:00:32
8:12:40	R	v	f	o			G			8:13:00	0:00:20
8:13:00	G	V	F	v							
8:13:07	G	V	F	j							
8:13:25	R	v	b	j	8:13:42		R				
8:13:29	R	v	f	j			G			8:13:53	0:00:25
8:13:29	R	m	f	j			G			8:13:53	0:00:25
8:14:14	G	m	f	j							
8:14:42	R	V	f	v			G			8:15:11	0:00:29
8:14:57	R	m	f	v			G			8:15:11	0:00:15
8:15:17	G	v	f	j							
8:15:24	G	m	f	j							
8:15:27	R	V	f	v	8:15:27		R	x	3		
8:15:28	R	v	b	v	8:15:28		R	x	3		
8:16:02	R	v	f	v			G			8:16:23	0:00:21
8:16:05	R	m	f	j	8:16:11		R	x	1		
8:16:14	R	v	f	v	8:16:14		R	x	1		
8:16:24	G	v	f	j							
8:16:35	G	v	f	v							
8:16:35	G	v	f	j							
8:16:36	G	v	f	v							
8:17:29	G	m	f	j							
8:17:47	R	m	f	j			G			8:18:31	0:00:44
8:17:54	R	v	f	v			G			8:18:31	0:00:37
8:17:59	R	v	f	v			G			8:18:31	0:00:32
8:18:35	G	v	f	v							
8:18:42	G	m	f	j							
8:19:00	R	v	f	v			G			8:19:24	0:00:24
8:19:06	R	v	b	v			G			8:19:24	0:00:18
8:19:30	G	v	f	v							
8:19:38	G	v	f	j							
8:20:27	R	m	f	j	8:20:27		R				
8:20:32	R	v	f	v			G			8:20:49	0:00:16
8:20:32	R	v	f	j			G			8:20:49	0:00:16
8:20:44	R	m	f	v			G			8:20:49	0:00:04
8:20:44	R	m	b	v			G			8:20:49	0:00:04
8:20:55	G	m	f	j							
8:21:28	R	m	f	j	8:21:28		R				
8:21:44	R	m	f	v			G			8:22:17	0:00:33

8:22:23	G	m	f	v							
8:22:42	R	v	f	v			G			8:23:34	0:00:52
8:22:42	R	v	f	j			G			8:23:34	0:00:52
8:22:42	R	v	f	v			G			8:23:34	0:00:52
8:22:59	R	m	f	v			G			8:23:34	0:00:35
8:23:34	G	m	f	j							
8:23:37	G	v	f	j							
8:23:58	R	m	f	v			G			8:25:04	0:01:06
8:24:06	R	v	f	v			G			8:25:04	0:00:58
8:24:12	R	m	f	v	8:24:16		R		3		
8:24:19	R	m	f	v	8:24:19		R				
8:24:56	R	v	f	v	8:24:56		R	x			
8:25:09	G	m	f	v							
8:25:09	G	v	f	j							
8:25:11	G	v	f	o							
8:25:11	G	v	f	v							
8:25:11	G	m	f	v							
8:25:13	G	m	f	v							
8:25:46	R	m	f	v	8:26:00		R	x			
8:26:09	R	m	f	v			G			8:26:15	0:00:07
8:26:14	R	m	f	j	8:26:14		R	x			
8:26:32	G	v	f	v							
8:26:55	R	m	f	v	8:27:18		R	x	3		
8:27:11	R	v	f	o			G			8:27:24	0:00:13
8:27:34	G	v	b	j							
8:27:38	R	m	f	v	8:27:38		R	x	3		
8:28:41	G	v	f	v							
8:28:45	G	m	f	v							
8:28:45	G	v	f	v							
8:29:37	R	m	f	o	8:29:46		R	x	3		
8:29:41	R	v	f	v			G			8:30:11	0:00:30
8:29:41	R	m	f	v			G			8:30:11	0:00:30
8:29:43	R	m	f	v	8:29:43		R	x	3		
8:29:46	R	v	f	v			G			8:30:11	0:00:25
8:30:19	G	v	b	v							
8:30:21	G	m	f	v							
8:30:32	R	v	f	j			G			8:31:18	0:00:47
8:30:32	R	v	f	j			G			8:31:18	0:00:47
8:30:32	R	v	f	j			G			8:31:18	0:00:47
8:30:32	R	v	f	j			G			8:31:18	0:00:47
8:30:55	R	v	f	v	8:30:55		R		3		
8:31:00	R	v	f	v	8:31:00		R		1		
8:31:11	R	m	f	j			G			8:31:18	0:00:07
8:31:17	R	m	f	v			G			8:31:18	0:00:01
8:31:23	G	m	f	j							
8:31:23	G	m	f	j							
8:31:40	R	m	f	j	8:31:40		R	x	3		
8:31:40	R	v	f	j	8:31:40		R	x	3		
8:31:40	R	v	f	j	8:31:40		R	x	3		
8:31:48	R	m	f	v	8:31:48		R		3		
8:31:49	R	v	f	v	8:31:49		R		1		
8:31:58	R	m	b	j			G			8:32:34	0:00:36
8:32:07	R	v	f	j			G			8:32:34	0:00:28
8:32:13	R	m	f	j	8:32:19		R				
8:32:32	R	m	f	j			G			8:32:34	0:00:02
8:32:34	R	v	b	v			G			8:32:34	
8:32:40	G	v	f	v							
8:32:46	G	m	f	v							
8:33:00	R	v	f	v	8:33:00		R		1		
8:33:04	R	v	f	j			G			8:33:58	0:00:54
8:33:23	R	m	b	o			G			8:33:58	0:00:35
8:33:24	R	v	b	o			G			8:33:58	0:00:34
8:33:29	R	v	f	j			G			8:33:58	0:00:29
8:33:33	R	m	f	v			G			8:33:58	0:00:25
8:34:04	G	m	f	v							
8:34:26	R	v	b	v			G			8:34:59	0:00:33
8:34:56	R	m	f	j			G			8:34:59	0:00:03
8:34:56	R	m	f	j			G			8:34:59	0:00:03
8:34:56	R	m	f	j			G			8:34:59	0:00:03
8:34:56	R	m	f	j	8:34:56		R	x	1		
8:35:03	G	m	f	v							
8:35:06	G	v	f	j							
8:35:56	R	v	f	j			G			8:36:09	0:00:13
8:36:04	R	m	b	v	8:36:04		R	x	3		
8:36:29	R	m	f	j	8:36:29		R		3		
8:37:00	G	v	f	j							
8:37:15	R	m	SM	o			G			8:37:45	0:00:30
8:37:19	R	v	f	v			G			8:37:45	0:00:26
8:37:49	G	m	f	v							
8:37:49	G	v	f	v							
8:37:51	G	v	f	j							
8:37:53	G	m	f	j							

8:37:58	G	v	f	j							
8:37:58	G	m	f	j							
8:38:30	R	v	f	j			G			8:39:12	0:00:42
8:38:34	R	v	f	j			G			8:39:12	0:00:39
8:39:00	R	m	f	v			G			8:39:12	0:00:13
8:39:05	R	m	b	v			G			8:39:12	0:00:07
8:39:27	G	v	f	j							
8:39:27	G	v	f	j							
8:39:46	R	m	f	v	8:40:12		R	x	1		
8:40:09	R	m	f	j	8:40:09		R	x	1		
8:40:30	G	m	f	v							
8:41:24	R	v	f	v	8:41:24		R	x	3		
8:41:27	R	m	f	j	8:41:27		R	x	3		
8:41:50	R	m	f	v			G			8:42:13	0:00:23
8:42:05	R	v	b	v			G			8:42:13	0:00:08
8:42:10	R	v	f	j			G			8:42:13	0:00:03
8:42:14	G	m	f	v							
8:42:20	G	m	f	o							
8:42:50	R	v	b	v			G			8:43:10	0:00:20
8:43:08	R	m	f	j			G			8:43:10	0:00:02
8:43:18	G	m	f	v							
8:43:19	G	m	b	v							
8:43:45	R	m	f	j			G			8:44:11	0:00:27
8:43:45	R	v	f	o			G			8:44:11	0:00:27
8:43:45	R	v	f	o			G			8:44:11	0:00:27
8:43:45	R	v	f	j			G			8:44:11	0:00:27
8:43:56	R	v	f	v	8:43:56		R		1		
8:44:17	G	m	f	v							
8:44:18	G	v	f	o							
8:44:19	G	v	f	j							
8:44:59	R	v	f	j			G			8:45:17	0:00:19
8:45:06	R	v	f	v			G			8:45:17	0:00:11
8:45:17	R	v	f	j			G			8:45:17	
8:45:17	R	v	f	j			G			8:45:17	
8:45:27	G	m	f	J							
8:46:11	R	m	b	v			G			8:46:38	0:00:27
8:46:17	R	m	f	j			G			8:46:38	0:00:22
8:46:26	R	m	f	j			G			8:46:38	0:00:13
8:46:26	R	m	f	j			G			8:46:38	0:00:13
8:46:26	G	v	f	v							
8:46:26	G	v	f	v							
8:46:36	R	m	f	j			G			8:46:38	0:00:02
8:46:44	G	v	f	j							
8:46:53	G	m	f	j							
8:46:55	R	v	f	v	8:46:55		R	x	3		
8:47:10	R	m	f	j			G			8:47:51	0:00:41
8:47:41	R	m	f	j	8:47:41		R	x			
8:47:45	R	m	f	j	8:47:45		R	x			
8:47:48	R	m	f	j						8:47:51	0:00:03
8:47:54	G	m	f	j							
8:47:58	G	v	f	o							
8:48:00	G	v	f	j							
8:48:00	G	v	f	j							
8:48:06	G	v	f	j							
8:48:08	G	v	f	v							
8:48:23	R	m	f	v			G			8:49:08	0:00:44
8:48:38	R	m	f	v	8:49:04		R	x			
8:48:59	R	v	f	v	8:48:59		R				
8:49:22	R	v	f	v	8:49:22	B	R	x	3		
8:49:35	R	v	b	v			G			8:50:04	0:00:29
8:49:36	R	m	f	v			G			8:50:04	0:00:28
8:49:42	R	v	f	j			G			8:50:04	0:00:22
8:49:42	R	m	f	j			G			8:50:04	0:00:22
8:50:06	G	m	f	j							
8:50:10	G	v	f	j							
8:50:11	G	v	f	j							
8:50:22	R	m	f	j							
8:50:22	R	m	f	j							
8:50:56	R	v	f	j	8:50:56		R	x	1		
8:50:56	R	v	f	j	8:50:56		R	x	1		
8:50:56	R	v	f	j	8:50:56		R	x	1		
8:50:56	R	m	f	j	8:50:56		R	x	3		
8:51:06	G	m	f	j							
8:51:13	G	m	f	j							
8:51:38	R	m	f	j	8:51:57		R		1		
8:51:44	R	v	f	j	8:51:44		R		1		
8:51:44	R	v	f	j	8:51:44		R		1		
8:51:51	R	m	f	v	8:51:53		R		1		
8:51:51	R	m	f	j	8:51:55		R		1		
8:51:51	R	m	f	j	8:51:55		R		1		
8:52:00	R	v	f	j	8:52:00		R		1		
8:52:02	R	m	f	j	8:52:02		R	x	1		

8:52:02	R	m	f	j	8:52:02		R	x	1		
8:52:11	R	m	f	j							
8:52:17	G	v	f	v							
8:52:21	G	m	f	j							
8:52:32	G	m	b	j							
8:52:33	G	v	f	j							
8:52:39	R	v	f	v	8:52:39		R	x			
8:52:39	R	m	f	v	8:52:39		R	x			
8:52:55	R	v	f	v	8:53:31		R	x			
8:52:57	R	v	f	j	8:53:26		R	x			
8:53:28	R	v	f	v	8:53:28		R				
8:53:33	G	m	f	j							
8:53:33	G	v	f	j							
8:53:36	G	m	f	j							
8:53:37	G	v	f	v							
8:53:38	G	v	f	j							
8:53:42	G	m	f	j							
8:53:49	R	v	f	j	8:53:49	B	R	x	3		
8:54:09	R	m	f	j	8:54:09	R	R		3		
8:54:09	R	m	f	j	8:54:09	R	R		3		
8:54:12	R	m	f	j			G			8:54:36	0:00:24
8:54:31	R	v	f	j						8:54:36	0:00:04
8:54:31	R	v	f	j						8:54:36	0:00:05
8:54:31	R	v	f	j	8:54:35		R	x	1		
8:54:31	R	v	f	j	8:54:35		R	x	1		
8:54:31	R	v	f	j	8:54:36		R	x	1		
8:54:41	G	v	f	j							
8:54:44	G	v	f	j							
8:54:46	G	v	f	v							
8:55:16	R	m	b	j			G			8:55:40	0:00:24
8:55:16	R	m	f	v			G			8:55:40	0:00:24
8:55:26	R	v	b	v			G			8:55:40	0:00:14
8:55:40	G	m	f	v							
8:55:47	G	v	f	j							
8:56:03	R	v	f	v			G			8:56:28	0:00:25
8:56:05	R	v	f	j			G			8:56:28	0:00:23
8:56:15	R	m	f	v	8:56:15		R				
8:56:15	R	v	f	v	8:56:15		R				
8:56:19	R	m	b	j			G			8:56:28	0:00:09
8:56:31	G	v	f	j							
8:56:31	G	m	b	j							
8:56:56	R	v	f	v			G			8:57:12	0:00:16
8:57:06	R	m	f	v	8:57:06		R	x	3		
8:57:06	R	m	f	v	8:57:06		R	x	3		
8:57:26	G	m	f	j							
8:57:30	R	v	f	v	8:57:30		R		1		
8:57:46	R	v	f	j	8:58:00		R	x	1		
8:58:02	R	m	f	v	8:58:02		R	x	1		
8:58:09	R	v	b	v	8:58:09		R	x	1		
8:58:15	G	v	f	v							
8:58:17	G	v	f	j							
8:58:19	G	m	f	j							
8:58:45	R	m	f	v	8:58:52		R		3		
8:59:06	R	v	f	v	8:59:06		R		3		
8:59:10	R	v	f	j	8:59:10		R	x	1		
8:59:10	R	v	f	j	8:59:10		R	x	1		
8:59:20	G	m	f	j							
8:59:28	G	v	f	j							
8:59:36	R	m	f	j	8:59:36		R	x	3		
8:59:42	R	m	f	j			G			9:00:27	0:00:45
8:59:42	R	m	f	j			G			9:00:27	0:00:45
9:00:24	R	v	f	j			G			9:00:27	0:00:04
9:00:27	R	m	f	j			G			9:00:27	0:00:01
9:00:44	G	v	b	v							
9:01:19	R	v	b	v			G			9:01:46	0:00:27
9:01:45	R	m	f	j			G			9:01:46	0:00:01
9:01:45	R	m	b	j			G			9:01:46	0:00:01
9:02:00	G	m	f	j							
9:02:08	R	m	b	j	9:02:08		R	x	3		
9:02:26	R	v	f	v			G			9:02:45	0:00:19
9:02:52	G	m	f	j							
9:03:09	R	m	f	o			G			9:03:37	0:00:28
9:03:09	R	v	f	o			G			9:03:37	0:00:28
9:03:26	R	v	f	v			G			9:03:37	0:00:11
9:03:40	G	v	f	v							
9:03:55	R	m	f	v	9:03:55		R	x	3		
9:04:25	R	m	f	o	9:04:25		R		3		
9:04:27	R	v	f	v	9:04:27		R		3		
9:04:29	R	m	f	v	9:04:35		R		1		
9:04:43	G	v	f	v							
9:05:00	R	m	f	v	9:05:35		R		1		
9:05:26	R	m	f	v			G			9:05:39	0:00:13

9:05:49	G	m	f	v							
9:06:31	R	m	f	v	9:06:31		R		3		
9:06:40	R	v	f	j	9:06:40		R		3		
9:07:02	R	v	f	v			G			9:07:06	0:00:05
9:08:02	R	m	f	v			G			9:08:05	0:00:03
9:08:05	G	m	f	v							
9:08:09	G	m	f	o							
9:08:33	R	v	f	j	9:08:41		R		3		
9:08:52	R	m	f	v			G			9:09:25	0:00:33
9:09:06	R	v	f	v			g			9:09:25	0:00:19
9:09:22	R	m	F	j			G			9:09:25	0:00:03
9:09:36	G	v	f	v							
9:10:14	R	m	b	j							
9:10:23	R	m	f	j			G			9:10:35	0:00:12
9:12:17	G	m	f	j							
9:12:54	R	v	b	v	9:12:54		R		1		
9:12:57	R	v	f	v			G			9:13:20	0:00:23
9:14:24	G	m	f	v							
9:14:47	R	m	f	v			G			9:15:12	0:00:24
9:15:19	G	m	f	o							
9:15:28	R	m	b	v	9:15:28		R	x	3		
9:15:39	R	m	f	v			G			9:16:21	0:00:41
9:16:13	R	m	b	j	9:16:13		R	x	3		
9:16:22	G	v	f	v							
9:17:21	G	v	f	j							
9:17:29	R	v	b	v			G			9:17:56	0:00:28
9:17:43	R	m	f	v			G			9:17:56	0:00:13
9:18:25	R	v	f	o			G			9:18:55	0:00:30
9:18:44	R	v	f	o	9:18:44		R				
9:19:09	G	v	b	v							
9:19:09	G	v	f	o							
9:19:14	G	v	f	v							
9:19:35	R	m	f	v			G			9:19:46	0:00:11
9:19:38	R	m	f	v	9:19:38		R		3		
9:19:46	R	m	f	v	9:19:46		R		1		
9:20:40	R	v	f	o			G			9:20:45	0:00:05
9:20:45	G	m	f	v							
9:21:31	R	v	f	j			G			9:21:47	0:00:16
9:23:19	R	m	f	j	9:23:55		R	x	1		
9:25:21	G	v	b	v							
9:25:59	R	m	f	j			G			9:26:12	0:00:14
9:26:14	G	m	f	o							
9:26:17	G	v	b	v							
9:27:10	R	v	f	j			G			9:27:16	0:00:06
9:27:20	G	v	f	v							
9:27:49	R	v	f	v			R			9:28:16	0:00:27
9:28:40	R	m	f	o	9:28:40		R		1		
9:29:51	R	v	f	j	9:29:51		R		1		
9:30:35	R	v	f	v			G			9:31:08	0:00:34
9:30:37	R	m	f	v	9:30:37		R	x	1		
9:30:59	R	m	f	v			G			9:31:08	0:00:09
9:31:14	G	v	f	o							
9:31:25	R	m	f	v	9:31:25		R	x	3		
9:32:01	R	m	f	v			G			9:32:07	0:00:06
9:32:09	G	m	f	o							
9:32:30	R	v	f	j			G			9:32:54	0:00:24
9:32:41	R	v	f	j			G			9:32:54	0:00:13
9:32:57	G	m	f	v							
9:32:59	G	v	f	j							
9:33:05	G	v	b	j							
9:33:26	R	m	f	o	9:33:30		R		3		
9:33:53	G	v	f	j							
9:33:53	G	v	f	j							
9:34:21	R	m	f	v			G			9:34:52	0:00:31
9:34:42	r	m	f	v	9:34:49		R		1		
9:34:45	R	m	f	v	9:34:49		R		1		
9:35:56	R	m	f	v	9:35:56		R		3		
9:36:07	R	m	f	j			G			9:36:11	0:00:03
9:36:07	R	m	f	j			G			9:36:11	0:00:03
9:36:07	R	v	f	j			G			9:36:11	0:00:03
9:36:26	G	v	f	v							
9:36:30	R	v	f	v	9:36:30		R				
9:36:38	R	v	f	v			G			9:37:08	0:00:30
9:36:38	R	v	f	j	9:37:01		R	x	1		
9:37:03	R	v	f	o	9:37:03		R	x	1		
9:37:36	R	m	f	o	9:38:23		R		1		
9:37:53	R	v	f	v			G			9:38:25	0:00:32
9:38:44	G	v	f	v							
9:39:40	R	m	f	v	9:39:40		R	x	3		
9:39:42	R	m	f	v	9:39:42		R	x	3		
9:40:31	G	v	f	j							
9:41:08	R	v	f	v			G			9:41:10	0:00:02

9:41:32	R	v	f	j			G			9:41:56	0:00:24
9:42:15	R	m	f	v	9:42:15		R	x	3		
9:42:15	R	v	f	v	9:42:15		R	x	3		
9:42:17	R	m	f	j			G			9:43:05	0:00:48
9:42:36	R	m	f	v	9:42:38		R		3		
9:42:36	R	m	f	v	9:42:57		R	x	1		
9:43:07	G	v	f	o							
9:43:14	G	v	f	j							
9:43:51	R	m	f	v	9:43:51		R		3		
9:45:04	R	v	f	v	9:45:38		R		1		
9:45:18	R	m	f	v	9:45:20		R	x	3		
9:45:33	R	m	f	v	9:45:33		R		3		
9:46:00	G	v	f	v							
9:46:03	G	v	f	v							
9:46:05	G	m	f	j							
9:46:08	G	m	f	v							
9:47:06	G	m	f	v							
9:47:11	G	v	f	j							
9:48:15	R	m	f	o	9:48:15		R	x	1		
9:48:29	G	m	f	v							
9:48:52	R	m	f	j			G			49:19,7	0:00:27
9:48:55	R	m	f	v			G			49:19,7	0:00:25
9:48:55	R	m	f	v			G			49:19,7	0:00:25
49:19,7	G	v	f	v							
9:49:26	G	m	f	j							
9:49:40	R	m	f	v	9:49:40		R	x			
9:50:11	R	v	f	v			G			9:50:52	0:00:41
9:50:14	R	m	f	j			G			9:50:52	0:00:38
9:50:28	R	v	f	v			G			9:50:52	0:00:24
9:50:34	R	v	f	o			G			9:50:52	0:00:18
9:50:34	R	v	f	j			G			9:50:52	0:00:18
9:50:49	R	m	f	v			G			9:50:52	0:00:03
9:50:56	G	m	f	v							
9:50:56	G	m	f	j							
9:50:58	G	m	f	j							
9:50:58	G	v	f	j							
9:50:59	G	m	f	v							
9:51:28	R	m	f	j			G			9:52:06	0:00:38
9:51:57	R	m	b	v			G			9:52:06	0:00:09
9:52:12	G	v	b	v							
9:52:13	G	m	f	j							
9:52:15	G	v	f	v							
9:52:16	G	v	f	v							
9:52:25	G	v	f	o							
9:53:12	R	m	f	j	9:53:12		R		1		
9:53:12	R	m	f	j	9:53:12		R		1		
9:53:31	G	m	f	v							
9:53:31	G	v	f	j							
9:53:38	G	m	f	o							
9:53:50	R	m	f	j	9:53:54		R		1		
9:53:54	R	v	f	v	9:53:54		R		3		
9:53:57	R	v	f	v	9:53:57		R		3		
9:54:21	G	m	f	v							
9:54:28	R	v	f	v	9:54:28		R	x	3		
9:54:43	R	v	f	j	9:54:55		R		1		
9:55:00	R	v	f	j			G			9:55:02	0:00:02
9:55:12	G	v	f	v							
9:55:13	G	m	f	v							
9:55:22	R	m	f	j	9:55:22		R	x	3		
9:55:45	R	v	f	v	9:55:45		R		3		
9:56:00	R	v	f	v	9:56:00		R	x	3		
9:56:44	R	v	f	j			G			9:57:34	0:00:50
9:56:48	R	v	f	j			G			9:57:34	0:00:45
9:56:52	R	m	f	v			G			9:57:34	0:00:42
9:57:09	R	v	f	v			G			9:57:34	0:00:25
9:57:09	R	m	f	o			G			9:57:34	0:00:25
9:57:11	R	v	b	j			G			9:57:34	0:00:23
9:57:21	R	m	f	j			G			9:57:34	0:00:12
9:57:39	G*	v	f	j							
9:57:39	G*	v	f	j							
9:57:41	G*	v	f	j							
9:57:41	G*	v	f	v							
9:57:43	G	v	f	v							
9:57:44	G	v	f	v							
9:58:00	R	v	f	v			G			9:58:46	0:00:46
9:58:00	R	v	f	j			G			9:58:46	0:00:46
9:58:12	R	m	f	j			G			9:58:46	0:00:34
9:58:26	R	m	b	j			G			9:58:46	0:00:20
9:59:04	R	m	f	j	9:59:04		R	x	3		
9:59:20	R	v	f	j			G			9:59:35	0:00:15
9:59:38	G	v	f	j							
9:59:44	G	v	f	v							

9:59:45	G	v	f	j							
10:00:03	R	m	f	o			G			10:00:18	0:00:15
10:00:35	G	v	f	v							
10:01:08	G	m	f	j							
10:01:23	R	v	b	v	10:01:23		R		3		
10:01:58	R	m	f	j			G			10:02:00	0:00:02
10:01:58	R	m	f	j			G			10:02:00	0:00:02
10:02:04	G	m	f	j							
10:02:04	G	m	f	j							
10:02:06	G	v	f	o							
10:02:48	R	v	f	j	10:02:48		R		1		
10:03:17	R	m	f	o	10:03:45		R				
10:03:27	R	m	f	j			G			10:04:01	0:00:34
10:03:52	R	m	f	v			G			10:04:01	0:00:09
10:04:34	R	v	f	v			G			10:05:05	0:00:32
10:04:41	R	v	f	j			G			10:05:05	0:00:24
10:04:49	R	v	f	o			G			10:05:05	0:00:16
10:05:05	G	v	f	j							
10:05:40	R	m	f	v	10:05:50		R		1		
10:06:15	G	v	b	j							
10:06:54	R	v	f	j	10:06:54		R		1		
10:07:06	G	v	f	v							
10:07:10	G	m	b	j							
10:07:44	R	m	f	v	10:07:55		R		1		
10:08:53	R	m	f	o			G			10:08:55	0:00:02
10:11:17	G	v	f	o							
10:11:26	R	m	f	v	10:11:26		R	x	3		
10:11:27	R	v	f	v	10:11:27		R	x	1		
10:12:56	R	m	f	v			G			10:13:36	0:00:39
10:13:03	R	m	b	v			G			10:13:36	0:00:33
10:13:12	R	v	b	v			G			10:13:36	0:00:24
10:13:38	G	m	f	o							
10:13:45	G	m	f	v							
10:13:45	G	v	f	v							
10:14:09	R	m	f	o			G			10:14:35	0:00:26
10:14:25	R	m	f	v			G			10:14:35	0:00:09
10:14:44	G	v	f	v							
10:15:34	R	v	f	j			G			10:15:36	0:00:01
10:15:42	G	m	f	j							
10:16:04	R	m	f	o			G			10:16:43	0:00:40
10:16:17	R	m	f	j	10:16:17		R		3		
10:16:47	G	v	f	j							
10:16:47	G	v	f	j							
10:17:36	G	m	b	j							
10:18:51	R	v	f	o	10:18:51		R	x	3		
10:19:28	R	v	f	v			G			10:19:50	0:00:22
10:19:30	R	v	f	v			G			10:19:50	0:00:20
10:20:08	R	v	f	v			G			10:20:58	0:00:50
10:20:08	R	v	f	j			G			10:20:58	0:00:50
10:23:04	R	m	f	v			G			10:23:34	0:00:30
10:25:52	R	m	f	j			G			10:26:37	0:00:46
10:26:21	R	m	f	v	10:26:21		R		3		
10:26:39	G	v	f	j							
10:26:57	R	v	f	v	10:26:57		R	x	3		
10:27:56	R	m	f	v	10:27:56		R	x	1		
10:31:23	R	m	f	v			G			10:31:28	0:00:05
10:32:18	G	v	f	v							
10:33:09	R	m	f	j	10:33:09		R		1		
10:33:49	R	m	b	j			G			10:34:41	0:00:52
10:35:42	G	m	f	o							
10:36:16	R	m	f	v	10:36:16		R		3		
10:38:30	R	m	f	o	10:38:30		R		3		
10:38:33	R	m	f	v	10:38:33		R		3		
10:39:24	R	m	f	v			G			10:39:39	0:00:15
10:40:00	R	v	f	v			G			10:40:15	0:00:15
10:40:00	R	m	f	o			G			10:40:15	0:00:15
10:40:06	R	m	f	v			G			10:40:15	0:00:09
10:40:11	R	v	f	v			G			10:40:15	0:00:04
10:40:59	R	m	f	o			G			10:41:09	0:00:10
10:41:01	R	v	f	o			G			10:41:09	0:00:07
10:41:09	G	m	f	o							
10:41:17	G	v	f	o							
10:41:59	R	v	f	v			G			10:42:09	0:00:09
10:42:09	G	m	f	j							
10:42:15	G	m	f	o							
10:42:18	G	v	f	o							
10:42:22	G	v	f	v							
10:42:23	G	v	f	v							
10:43:52	R	m	f	o	10:43:52	R	R		3		
10:44:03	G	m	f	j							
10:44:13	G	m	b	j							
10:44:27	R	m	b	j			G			10:45:12	0:00:45

10:44:43	R	m	f	o			G			10:45:12	0:00:29
10:45:16	G	m	f	v							
10:45:17	G	v	f	v							
10:47:45	G	v	f	o							
10:47:47	G	m	f	j							

Intersection 5:

For this intersection the column 'Richting' lists the direction the cyclists turn: Straight (S), Left (L) or Right (R).

Tijd	Aankomst	Geslacht	Soort	Leeftijd	Richting	Oversteken tijd		Oversteken	Groen	Wachttijd (tot groen)
7:02:49	R	M	F	v	L			G	7:03:17	00:27,8
7:04:08	R	V	F	v	L	7:04:37	R	R		
7:18:00	R	V	F	v	S			G	7:18:56	00:55,7
7:30:06	R	M	B	v	S			G	7:31:10	01:04,6
7:38:55	R	M	F	v	L			G	7:39:12	00:17,0
7:38:57	R	M	F	v	S	7:39:10	E	R		
7:43:13	R	M	F	v	S			G	7:44:02	00:49,0
7:45:19	R	V	F	v	L			G	7:46:16	00:56,2
7:45:20	R	V	B	v	L	7:45:20	R	R		
7:47:10	R	M	F	v	L			G	7:48:16	01:05,9
7:50:14	R	M	F	v	L	7:50:34	R	R		
7:51:24	R	M	F	v	S	7:51:24	R	R		
7:56:49	R	V	F	v	S	7:56:49	R	R	7:57:53	01:03,6
8:08:29	R	M	F	v	L			G	8:10:31	02:01,7
8:09:38	R	M	F	o	L			G	8:10:31	00:53,0
8:12:51	R	M	F	v	S			G	8:13:13	00:22,0
8:12:54	R	M	F	v	L			G	8:13:13	00:19,6
8:17:23	R	M	F	v	S	8:17:23	R	R		
8:19:21	G	M	F	v	S					
8:21:40	G	V	F	v	S					
8:21:46	G	V	F	v	L					
8:22:42	R	V	F	v	L	8:23:24	R	R	8:24:19	01:37,4
8:24:14	R	V	F	v	S			G	8:24:19	00:05,0
8:24:23	G	M	B	v	S					
8:29:20	R	M	F	v	S			G	8:30:24	01:04,3
8:30:16	R	M	F	v	S			G	8:30:24	00:07,8
8:31:51	R	M	F	v	S			G	8:33:05	01:13,7
8:31:53	R	M	B	v	S			G	8:33:05	01:11,7
8:32:37	R	M	F	v	S			G	8:33:05	00:28,3
8:33:55	R	V	F	v	S	8:33:55	R	R		
8:35:14	R	V	F	v	S			G	8:36:08	00:54,9
8:35:21	R	V	F	v	L			G	8:36:08	00:47,4
8:37:54	R	V	F	v	L			G	8:39:20	01:25,9
8:38:37	R	M	F	v	L			G	8:39:20	00:42,3
8:41:25	R	V	F	v	S			G	8:41:56	00:31,0
8:42:30	R	M	B	v	L			G	8:44:31	02:01,0
8:45:18	R	M	F	v	S	8:45:18	R	R		
8:46:33	R	M	F	v	S			G	8:45:56	
8:48:05	R	M	F	v	L	8:48:05	R	R		
8:48:15	R	V	F	v	L	8:48:15	R	R		
8:48:45	R	M	F	v	L	8:48:45	R	R		
8:51:25	R	m	B	j	L			G	8:52:14	00:48,5
8:59:17	R	M	F	v	S	8:59:17	R	R		
9:00:34	R	V	f	v	L			G	9:01:00	00:25,9
9:01:42	R	V	f	j	L	9:01:42	R	R		
9:05:38	R	V	f	v	S			G	9:06:34	00:55,6
9:07:43	R	M	f	v	S	9:07:43	R	R		
9:15:32	R	V	b	v				G	9:17:56	02:23,6
9:19:48	R	m	f	o	S			G	9:20:42	00:53,6
9:21:57	R	m	f	v	S	9:22:00	R	R		
9:22:11	R	v	f	v	S			G	9:23:23	01:12,2
9:22:32	R	m	f	v	S	9:22:37	R	R		
9:26:21	R	m	f	v	L			G	9:26:35	00:14,1
9:28:57	G	M	f	v	L					
9:30:43	R	M	f	v	S			G	9:31:36	00:53,2
9:34:38	R	M	F	v	S	9:34:38	R	R		
9:37:38	R	V	F	v	L			G	9:38:34	00:55,7
9:44:04	R	V	F	v	L			G	9:45:13	01:08,9
9:46:36	R	M	B	v	S			G	9:47:29	00:52,9
9:49:46	G	M	F	v	S					
9:49:48	G	M	F	v	S					
9:51:02	R	V	F	v	L			G	9:52:08	01:06,3
9:51:30	R	V	F	o	S	9:52:06	R	R		
9:52:30	R	V	F	o	S	9:52:30	R	R		
9:54:34	G	V	F	v	S					
9:55:10	R	M	F	v	S			G	9:57:04	01:54,0
9:59:05	R	M	F	v	S			G	9:59:14	00:08,9
10:05:48	R	M	F	v	L			G	10:06:24	00:35,5
10:06:51	R	V	F	o	S	10:06:51	R	R		
10:11:56	R	V	F	v	L	10:12:33	R	R		
10:14:01	R	M	F	v	S			G	10:15:42	01:41,7
DVD eindigt op 10:24 tussen 10:14 en 10:24 geen fietsers										