TRAFFIC ACCIDENT ANALYSIS ON SEMARANG TOLL WAY

THESIS

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Thank you

ABSTARCT

Road traffic accident is a major but neglected public health challenge. road traffic accidents and related injuries tend to be under-recognized as major health problems in developing countries. a number of problems when it comes to toll way and analyzing various arithmetical data obtained from accident prone areas and to use this for making an analysis of trends and then to develop counter measure programs in order to improve road security.

Semarang toll way thus giving an indication that traffic accidents is important to be analyzed in order to determine the appropriate remedial order to reduce the number of accidents and fatality rate. In view to the above a thorough planning and scheduling has been organized on the methodology such as reading, adopting literature review, combination of analyzing of case study and adopting literature review, combination of analyzing of case study and adopting of actual data on site.

The process of data collection has involved to obtaining observe from authority office PT. Jasa Marga. Then the data are present and analyze conjuction with the aim and objectives of this study. In conclusion, some source of traffic accident analysis area by Km could be be minimize at semarang toll way in every section (A, B and C). From the analytical results obtained for section A from 2003 to 2012 kilometer area that needs to be very aware of is mile 5+000 – 6+000 accident occurred in mile 6+000 – 7+000, area 0+000 – 1+000, because the point - the point is beyond the point of the upper control limit, which means very bad and indicates there is a problem at that point. For section B from 2003 to 2012 kilometer area that needs to be very noticed because it exceeds the upper control limit which means it is very bad and can not tolerate the area 9+000 – 10+000 accidents and area 10+000 – 11+000 accidents in the year And the next is section C on the toll way semarang in 2003 to 2012 in the area that needs to be highly noticed in the analysis because it exceeds the upper control limit line which means it is very bad and not biased in tolerance is mile 10+000 – 11+000 accidents occurred in Area 11+000 – 12+000 occurred in the year and area 13+000 – 14+000.

Keywords : Accident Rate, Toll Way

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CHAPTER I
INTRODUCTION

1.1 Background

Road traffic accident is a major but neglected public health challenge. The World report on road traffic accident prevention has indicated that worldwide, an estimated 1.2 million people die in road traffic accident each year and as many as 50 million are being injured Current and projected trends in motorization indicated that the problem of RTAs will get worse, leading to a global public health crisis. It has been indicated that, accordingly, by 2020 traffic accident is expected to be the third major killer after HIV/AIDS and TB (Peden, 2004).

Due to its perception as a 'disease of development', road traffic accidents and related injuries tend to be under-recognized as major health problems in developing countries. According to who report, 90% of the world's fatalities on the roads occur in low-income and middle-income countries, which have only 48% of the world's registered vehicles (Who, 2009).

The safety of teen drivers has too often been neglected in books and publications on adolescent health, even though motor-vehicle crashes are the greatest single public health threat to teens in many countries, including the U.S. According to the Web-based Injury Statistics Query and Reporting System, 1 in 2004 crashes accounted for 41% of all deaths among teens aged 13–19 years in the U.S. In contrast, other unintentional injuries accounted for 15%, homicide accounted for 15%, and suicide for 14% of all teen deaths. Awareness of the health threat posed by crashes needs to be raised among public health practitioners working with teenagers so that new interventions can be developed and existing programs can be enhanced to reduce teens' involvement in motor-vehicle crashes. This article summarizes data on the motor-vehicle risk of teen drivers, historical trends in teen driver crashes, the effect of policies on teen driver crashes, characteristics of teen driver crashes, and combinations of crash characteristics (Peden, 2004).

Road Safety is a global problem but the number of deaths is decreasing in many industrialized countries whereas they are still increasing in developing countries. In Indonesia in 1992 road accidents caused more than 4, 50.01 deaths and more than 31,000 injuries. The economic consequences are costs to the community which include loss of output, property damage, medical cost, administrative costs and human suffering, and the

total sum is very high indeed. It has been shown that, on average, road accidents tend to cost a country in the region of 1% of its Gross National Product (GNP). The cost in grief and misery to those affected directly is obviously unacceptable though difficult to quantify. But one must be realistic and accept that wherever there are people and motorized transport there will inevitably be road accidents. However, by supporting the Government's target to reduce the number of road deaths through planned programmers of education, engineering and enforcement, perhaps these accidents and the toll of deaths could be reduced considerably such that Indonesia would become a lot safer for road users of all ages.

The severity of road traffic crashes is also likely to be much greater in Africa than anywhere else, because many vulnerable road users are involved, poor transport conditions such as lack of seat belts, overcrowding, and hazardous vehicle environments. The poor reporting system has also masked the magnitude of the problem in Africa. The lack of pre-hospital and hospital emergency care after accidents makes the outcome of car accidents in Africa the worst. According to federal police commission report the death rate due to car accident is significantly increasing among pedestrians and passengers from time to time in Ethiopia total of 25,110 accidents and 3,415 fatalities were recorded in Addis Ababa during 2000-2009. The majority of fatalities were pedestrian, 2970 (87%) followed by passengers 297 (9%) and drivers 148 (4%) (Yilma *2000-2009)* A report from traffic Police office of Mekelle town (the study area) indicated that in 2008, there were a total 313 RTAs and in 2009 the total number RTAs increased to 353. On the other hand, the report showed that 96% of the causes were related to human risk behavior whereas 4% was due to vehicle problem (Mekelle, 2009). Evidences noted that human behavior is the most common factor accounting for more than 85% of all traffic acciden (Peden, 2004).

Among the risky human behaviors is driving over the recommended speed. Studies has indicated that an increase of 1 km/h in mean traffic speed results in a 3% increase in the incidence of accident crashes and a 4-5% increase in fatal crashes. Another risky behavior identified for road traffic accident is taking alcohol and driving (Gururaj, 2004). Not using seat belt while driving is additional risky behavior identified .Mobile phoning while driving is becoming one of the riskier behaviors as well.

Knowledge, belief, attitude on risky driving behaviors and driving experience were also important aspects of risky behaviors identified with evidences. Since evidences are directing us the most important factor for road traffic accident is human behavior, we have investigated the most important human factors of risky driving behavior for road traffic

accident in Mekele city, northern part of Ethiopia. Traffic congestion is a major problem in urban areas. It has a significant adverse economic impact through deterioration of mobility, safety and air quality. A recent study (Federal Highway Administration, 2001) estimated that 32% of the daily travel in major US urban areas in 1997 occurred under congested traffic conditions. The annual cost of lost time and excess fuel consumption during congestion was estimated at $72 billion, over $900 per driver. These numbers represent a 300% increase from 1982. estimated that 1,800 new freeway lane-miles and 2,500 new urban street lane-miles would have been required in the US in order to keep congestion from increasing from 1998 to 1999. The budgets required for such infrastructure investments far exceed available resources. Moreover, in many urban areas, land scarcity and environmental constraints would limit construction of new roads or expansion of existing ones even if funds were available Motor vehicle crashes are the leading cause of death for 15- to 20-year-olds, causing roughly one-third of all deaths for this age group. Teenagers are overrepresented in traffic crashes both as drivers and as passengers. On the basis of miles driven, teenagers are involved in three times as many fatal crashes as all other drivers. The high crash-involvement rate for this age group is caused primarily by their lack of maturity and driving experience coupled with their overconfidence and risk-taking behaviors. High-risk behaviors include failure to wear safety belts, speeding, and driving while impaired (by alcohol or other drugs, and drowsy or distracted driving). This age group is particularly susceptible to distractions caused by other passengers in the vehicle, electronic devices, and music.

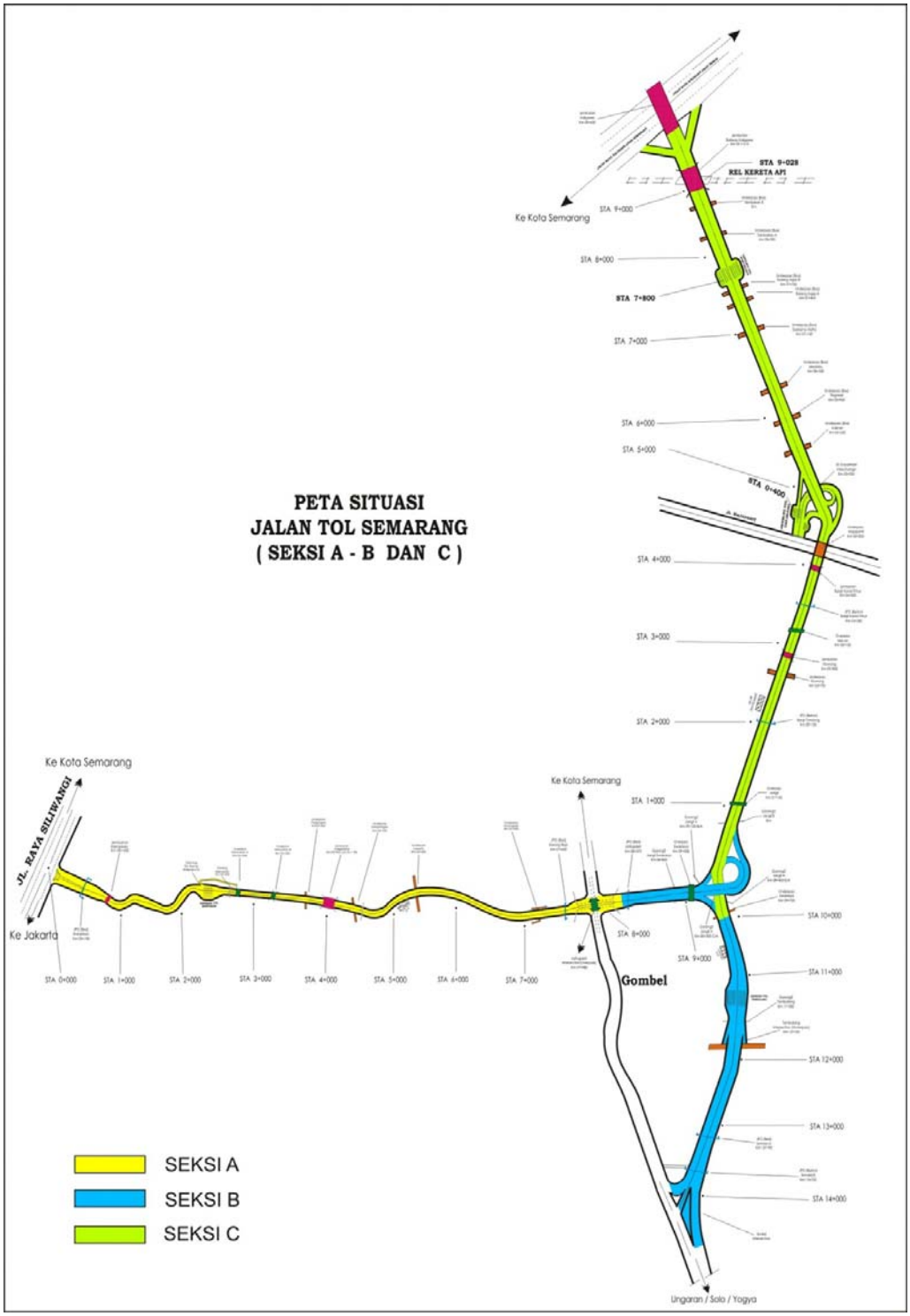
a) A larger percentage of fatal crashes involving teenage drivers are single-vehicle crashes compared to those involving other drivers. In this type of fatal crash, the vehicle usually leaves the road and overturns or hits a roadside object such as a tree or pole.
b) In general, fewer teens wear their safety belts compared to other drivers.
c) A larger proportion of teen fatal crashes involve speeding, or going too fast for road conditions, compared to other drivers.
d) More teen fatal crashes occur when passengers, usually other teenagers, are in the car than do crashes involving other drivers. Two out of three teens who die as passengers are in vehicles driven by other teenagers (Federal Highway Administration, 2001).

Semarang Toll Road, which is part of the Trans Java toll road network, connects the Western, Eastern and Southern parts of the city of Semarang. These serve as essential paths for the transportation to the destinations of East Java, Yogyakarta and Solo. Semarang Toll Road is operated gradually starting from 1983. Toll road with the length of 24.75 km has 2x2 lanes and passes the areas of Srondol, Kaligawe and Manyaran. The toll road that has completed its widening in 2010 will be connected to the new Section I of Semarang-Solo Toll Road, which is operated by Trans Marga Jateng (one of Jasa Marga's Subsidiaries).

Semarang toll way was constructed in year1983 which consisted of three sections A,B, and C. the operation and maintenance of this toll way is responsible of PT. Jasa Marga, a state owned company. The first section was in 1983, Section A Toll Road (Srondol - Jatingaleh) commenced operation by total length 8,300 km followed in 1987 Section B Toll Road (Jatingaleh-krapyak) commenced operation by total length 6,124 km and in 1998 Section C Toll Road (Jangli-Kaligawe) commenced operation by total length 10,176 km. (see figure 1.1).

Semarang toll road is part of the public road network which is made with a view to reducing traffic congestion in the city, operating cost, travel time and as a way of alternatives, however the incidence of accidents on the highway showed moderate amounts high enough, thus giving an indication that traffic accidents is important to be analyzed in order to determine the appropriate remedial order to reduce the number of accidents and fatality rate. To meet the above expectations, then conducted research with the following objectives:

a) Analyzing traffic accident that occurred in Semarang toll road with the experience and the operational time of more than 10 years.
b) Evaluate and determine the "black spot" that is associated with the geometric conditions and road traffic conditions
c) Establish strategies to improve the safety of highway traffic



Source : PT. Jasa Marga

Figure 2.1 Study Area of Semarang Toll Way

1.2 Problem Statement

In present, a number of problems when it comes to toll way and analyzing various arithmetical data obtained from accident prone areas and to use this for making an analysis of trends and then to develop counter measure programs in order to improve road security. The major subject when it comes to attempting to establish a general trend here is that there are a number of influences that can exist which comprise alterations in the characteristics of the population, changes in the legislation, enforcement levels, in toll way system improvements and also alterations in Semarang approach of drivers. There also exists a problem in relation to the allocation of monetary resources to develop effective programs that are intended to reduce the amount of toll way accidents in Semarang.

1.3 Objectives

The main objectives of this research are:

1. To investigate the accidents on toll way in Semarang and factors contribute to the problem.
2. To identify various kinds of treatment that is undertaken to improve toll way safety.
3. To evaluate the accident critical area as a case study in Semarang to contribute significantly to toll way safety.

CHAPTER II

LITERATURE REVIEW

2.1 Definition of Accident and Criteria.

Government Regulation No. 43 Year 1993 on Infrastructure and Then Cross, which is the translation of Act No. 14 of 1992 regarding traffic and road transport, was born due to the high number of accidents that occur on the road which states that a traffic accident is an event in the way that unexpected - and unintentional thought involving vehicles that are move with or without other road users, resulting in loss of life or loss of property. Crash victims named in this case could be the victim certainly died as a result of traffic accidents in the long within 30 (thirty) days after the accident. The victim suffered serious injuries to permanent disability resulting from an accident or the victim must be treated a period of more than 30 (thirty) days from the occurrence of the accident. Victim minor injuries where the victim did not have the two things mentioned above. In this regard, a variety of programs handling traffic accidents the road has been carried out by various agencies both government and private. PT Jasa Marga as manager of toll roads in Indonesia has another definition with the same type that is fatal, heavy, light and very light. Next on This research will be used by PT Jasa Marga is a road manager Toll in Indonesia.

2.2 Factor - Factor Causes Accident

To ensure smooth transportation activities and avoid accidents required a transportation pattern in accordance with the development of goods and services. Each component must be on the safe transportation patterns, comfortable, and efficient. Some of the obstacles that must be addressed in order to achieve transportation is desired mixing road use and land use around it (mixed used) thereby creating a traffic mix (mixed traffic). Factors used mixed and mixed traffic can lead to increased number of traffic accidents, and of course also an increase in congestion. Design geometric ineligible (on existing roads) potential lead to accidents, such as the bend is too sharp, layered conditions road pavement that does not meet the requirements (which are too slippery surfaces) contribute the cause of the accident. Violations of technical requirements operations and the violation of traffic regulations (signs, markings, signals) by very often the driver caused the accident. Placement and control settings traffic is less precise and impressed minimal such as traffic signs, road markings, traffic control lights disimpang road alignment, can lead to trouble in

a traffic accident. Guidelines for Planning and Operation of traffic in urban areas, Directorate of Traffic and Transportation Systems Directorate General of Civil City Army, stated that the factors causing accidents usually classified identically with the elements - elements of the transport system, is road users (drivers and Pedestrians feet), Vehicles, Roads and the Environment, or a combination of two or more elements. (Oder and Spicer, 1976) in (Fachrurrozy, 2001), states that traffic accidents can result from situations - situations involving a conflict with the driver with environment (perhaps a vehicle) driver with an important role to perform evasive action / dodge anything. So implement measures to avoid barriers, may or may not lead to what is called the collision (Accidents). Of the above factors, the cause of the accident can be grouped into 4 factors consist of:

a. The human factor
b. Factors vehicle
c. Factors road
d. Environmental factors

2.2.1 Human Factors

The human factor plays a very dominant, because many factors that affect behavior.

a. Driver (driver).

All road users have an important role in the prevention and reduction of accident. Although accidents tend to occur not only by a single cause, but road users is the most dominant influence. In some cases the absence of skills or experience to infer things - things that are important from a series of events lead to the wrong decisions or actions. Road Research Laboratory grouped into 4 categories:

1. Safe (S): the driver who had very few accidents, always giving mark on every movement. Frequency equal to the frequency at the ready to prepare.
2. Dissosiated Active (DA): active driver broke away, most often an accident, the movement - the movement of dangerous, little use of glass mirror. More often than at the ready prepare.
3. Dissosiated Passive (DP): kesiagaannya driver with a low level, driving the vehicle in the middle of the road and did not adjust the speed of the vehicle with the surroundings. More often than preparing at the ready.

4. Injudicious (I): distance calculation ugly, unusual movement of vehicles, overuse of the rearview mirror. In preparing the motion - unnecessary movement. According to research by psychologists turned out that human behavior is influenced by factors beyond himself, while also depending on the physical, gender, intelligence, character and age. According to (Y. Ohkuba, 1966) in (Hobbs FD, 1995) factors affecting the driver in a traffic accident is causing poor concentration 65.5%, 17.0% violation of the rules, skills less 6.1%, 3.1% alcohol, fatigue 1.7%, 1.5% personality, Sex psychiatric 0.4%, others - others 4.7%.

b. Pedestrians (Pedestrian)

In 1968 pedestrians occupy 31% of all victims die within traffic accidents in New York State, and 18% of the entire national, and 8% of the overall injuries - injuries, both in New York State and nationally. Parents more often involved. More than 83% of deaths associated with crossing at the meeting, which involved people aged 45 years or more, either in New York State or New York City. Pedestrians 14 years or younger recorded over 45% of the wounded, while on the road or playing a game - Playing on the road, and about 68% of them coming from the parking lot. To reduce or avoid the occurrence of traffic accidents, the we need a control for pedestrians (pedestrian controle), include the - As follows:

1. Special place for pedestrians (side walk)
2. Road crossings (cross walk).
3. Sign or signs - signs for pedestrians (pedestrian signal).
4. Barrier for pedestrians (pedestrian barriers)
5. The area is safe and necessary (safety zones and island).
6. Crosses are not a plot under way (pedestrian tunnels) and on the road (Overpass).
7. Radiation (highway lighting) Characteristics of the road above, can not be ignored in the planning geometric, so the design must be true - really pay attention to this, especially in when planning and detailing of the road furniture components of a segment road.

2.2.2 Factors vehicle.

Vehicle accident can be a factor if it can not controlled as it should be, namely as a result of technical conditions that are not feasible road or use is not in accordance with.

a. Brake tension, mechanical failure, flat tire is a condition of vehicle not roadworthy. Steering is not good, or as loose coupling, lights especially on night, slips and so on.
b. Over load or overload is a vehicle that uses not in accordance with the order of the charge.
c. Design vehicle weight can be a factor contributing to accident severity, button - the button on the dashboard of a vehicle could injure people driven fore a collision, the steering column can penetrate the driver's chest during collision. Similarly, the front of the vehicle design can injure pedestrians were hit by a vehicle. Repair vehicle design depends primarily the vehicle manufacturer's recommendation but regulatory or government can give effect to the designer.
d. Vehicle lighting systems that have a dual purpose for the driver to the condition of the road in front of him and be consistent with the velocity distinguish / converting the vehicle to observers from all directions without blinding, In recent years, many states have automobile physical changes vehicle design, including the addition of light vehicles, which increases quality of vision of the driver.

2.2.3 Factors road.

Relationships road width, curvature and visibility all give effect major accidents. Generally more sensitive when considering factors - these factors together - the same as having a psychological effect on drivers and influence the choice on velocity. For example, widening the road alignment that was narrow and well alignment not be able to reduce accidents if the speed remains the same after the repair of roads. However, speed is usually greater because of the sense of security, so that the rate increases the accidents. Superelevation improvement and repair the road surface is implemented isolation also has the same tendency to increase the rate of accident. Of safety considerations, condition assessment should be performed speed that may occur after any type of road repairs and checking the width lines, visibility and road surface are all satisfactory to raise the speed of thought. The selection of materials for lining the road to suit the needs of traffic and

accidental slippage is no less important than the election for the purpose of - Construction purposes. The place - a place that has a surface with the edge low coefficient of style a few times will easily have an accident slippage than location - other similar locations that have value - the value high. This is important when braking or bending often occurs, for example, the curved road roundabout and the intersection and the intersection when approaching bus stops, pedestrian and on the sloping road, it needs to be suitable road surface.

2.2.4 Environmental factors

Consideration of unfavorable weather and road conditions can affect traffic accidents, but the effect could not be determined. However the driver and pedestrians are the biggest factors in the accident traffic. Circumstances surrounding the road that must be considered is the pedestrian street, either sometimes humans or animals. Street lighting needs to be dealt with carefully, placing it well within the light and strength. Since the traffic engineer should strive to change driver behavior and pedestrians, with proper regulation and enforcement, to be reduction actions - their harmful actions. The designers responsible way to include as much as possible form - the form of safety in design in order to minimize the number of accidents, with respect to geometric deficiencies. Environmental factors can be effect of unfavorable weather, the road conditions, pedestrians roads, street lighting.

2.3 Factors - Factors In Road Geometry Design.

The main design objective is to generate the geometry that can be serve traffic with convenient, efficient and safe. The capacity of a road is a factor on the road - the road, safety is a factor dominant for the road, which has a high speed. Element - the main elements of the design geometry is: a. Horizontal alignment Horizontal alignment especially put emphasis on planning road axis which will see the road is a straight road, swerved to the left, or to the Right. Road axis consists of a series of straight lines, curved circular and curved transition from a straight line to forms to forms a circle. Geometric path planning focuses on the selection of the location and length of this section, in accordance with field conditions.

To determine rates highway section to accident report. To evaluate risk traffic accident at location in terms of length in miles (km), average daily traffic, the number of accident, and involvements at Semarang highway.

2.4 Determination of ranging the highway section accident report at Semarang highway.

Road location differ so much that intermingling them for purpose of accident study both impractical and undesirable, nevertheless, methods of selecting locations for study apply generally to all kinds of location. Roads may be classified for accident purpose in two ways :

a. As junction or sections (spots or stretches)
b. By character of service

Junction are considered separately, do not count junction accident in road sections. Junction accidents are so numerous that if they are counted in sections, they will predominate and obscure other kinds of accidents. Hence, junction and accidents at them can be ignore in selecting road section. There are two methods of deciding how much road will be included in a section for accident purpose:

a. Homogeneity of characteristics
b. Standard section lengths

A Standard lengths of road section is chosen with section of standard lengths the number of accidents does not need changed to accidents per mile of ranging purpose. The first step in doing this is to list or rank the locations according to some measure of the risk or accident experience. The next step is to decide how far down the list to go trying the location.

Number of accidents is the simplest methods. Locations are ranked according to the number of accidents experience at each location for the same period, usually a year. The one having the most accident is listed first, the one with next most second, and so on. Locations having three or fewer accidents are omitted because they have too little experience to be significant. The number of accidents in sections of road has little significant unless all sections are the same length. If sections are not the same length, accidents per mile instead of number of accidents must be used. Rate or risk of accidents is a more useful method of rangking location according to be accident experience. A road location may have numerous accident because it is much used rather than because it is

especially hazardous. Thus the location having the most accidents is not necessarily the most dangerous to use , conversely , lack of reported accidents for a specific period does not mean that there is no risk.

Risk or hazard maybe as an accident rate : the number of those experiencing accidents (involvements) at a location in a specified time divided by the number using the location in the same period, because accident are rare events, the simple rate is very small decimal fraction therefore , for ease in writing the rate is multiplied by a million and quoted as accident involvements per million users. Three kinds of rates are needed, one for junction and two for section of roads. The former (Rj) is the simple number of involvements per million users. But because of road section may vary in length and therefore give different exposure to accidents, rates for road sections must be in terms of accidents per mile or kilometer per year (Rm) or per million miles or kilometers travelled per year in the section (Rs). Equations for these three rates follow:

$$Rj = \frac{2A\ X\ 10^6}{\mathrm{T(V1 + V2 \ldots \ldots \ldots . . Vn)}}$$

$$Rm = \frac{365\ \mathrm{A}}{\mathrm{TL}}$$

$$Rs = \frac{\mathrm{A\ X}\ 10^6}{\mathrm{TVL}}$$

Where :

Rj = Junction rate involvements (or accidents) per million vehicles entering.

Rm = Section rate in accidents per mile or kilometer per year.

Rs = Section rate in involvements (or accidents) per million vehicles miles or kilometres travelled.

A = involvements (or accidents) recorded in T days.

T = period (days) for which accidents are countea, usually exactly 365, a full year.

V = average annual daily traffic on a section (vehicles per day).

V1 = Average annual daily traffic on one junction leg (n = number of junction legs)

L = length of section in miles or kilometers.

If a section is exactly a mile long (standard section for rural area), the section rate (Rs) is the same as the junction rate (Rj) both are involvements per million vehicles entering. The rate is untrustworthy if the number of accidents is small. In practice ay rate

based on three or fewer accidents is likely to be untrustworthy. It is the best extend the period until five or more accidents have been accumulated before calculating the rate (Baerwald, 1965)

2.5 Evaluated risk traffic.

Risk is not directly proportional to volume because rates are intended to elimate traffic volume as variable in evaluating hazard, perhaps the last factor on the list need explaining. To simplify, assume that the location is an ordinary, uncontrolled , four leg junction without pedestrians , cyclists or turning movements and that no driver pays any attention to vehicles on the cross street. Then the chance of a vehicle's entering one leg and colliding with another vehicle will be the proportion (percent) of the time that the vehicle's path is blocked by cross traffic. This time will increase almost in proportion to the volume of traffic on the cross road. If cross traffic –road volume doubles, chance of collision double. The same is true for vehicle on every leg of the junction depends on the volume traffic crossing.

Involvements compared to accidents the numerator of an accident rate that truly represented risk of using a location would be the number of involvements that is the number of motor vehicle, pedal cycles and pedestrians involvements in accidents at that location during the period considered. In practice for purpose of establishing priorities for study of accidents at location, accidents rates are simplified. In the numerator of the rate, number of accidents rather than the number of involvements is used. at ordinary junctions, because most accidents are two – car collisions, the number of accidents is about half of the number of involvements. But between junction, where there are many lone vehicle accidents, this is definitely not so. The volume traffic is derived from the average annual daily traffic (AADT). For junction the estimated number using the location in a day is half the sum of the AADT's of all the legs. To use total AADT for all junction legs would to be count each vehicle twice. From considerations of factors influencing risk or hazard, it is clear that risk or hazard may vary from season to season and even from moment to moment. Any rate representing suck risk is therefore, and average risk over a lengthy period.

The principal objection to using accidents rates to establish priorities for studies of accidents at road locations is that the rates can give a low priority to locations where accidents are frequent and thus where even a small percent reduction will result in a

substantial reduction in number accidents. Another difficulty is that recent reliable traffic counts are often not avaible as a basis for rates and special counts for the purpose are tedious and costly. Once location have been evaluated or ranked according to hazard, some system or method is needed to choose to ones to study. Three methods will be described:

a. Number of accident
b. Number – rate combination
c. Quality control

Number of accident is a natural cutoff, especially in small yurisdictions where the total number of locations to be studies is not large. If the number of accidents at a location in the period is small, it probably represents chance occurrences that are unreliable for rates and are unlikely to indicate accidents patterns. On this basis locations with fewer than three accidents per year can be omitted.

Number – rate combination is a useful method for state- wide and other large road networks where many locations have about the same number of accidents. It is especially useful for junction. A first cutoff is made on the basis of the number of involvements of the location this selected, a second cutoff is made on the basis of involvements rates. Thus of two locations having the same number of involvements, the one with the greatest risk (involvements rate) is given preference. With large numbers of locations, locations of different kinds should be treated separately. Thus, section of freeways will not be grouped with sections of minor roads; urban junction will not be grouped with rural junction.

Quality control is adapted from industry. It is mainly useful for sections of rural routes with fairly uniform traffic volumes, but it can also be used for junction or any group of similar locations. A critical calculated for each location based on the average for all locations in the group. If the actual accident rate is greater than the critical rate, the deviation is probably not due to chance but to an unfavorable characteristic of the location that warrants study. The location is then said to be “out of control”. The equation for the critical rate of a section is

$$Rc = Ra + K\sqrt{\frac{Ra}{M} + \frac{1}{2\,M}}$$

Where :

Rc = Critical accident rate for section.

Ra = Average accident rate for all sections in the group in accidents per million vehicles miles or kilometres.

M = Millions of vehichle miles or vehicle kilometer for the section.

K = Probability constant. A value of 1.5 is suggested. A smaller value will tend to give more sections out of control and therefore a larger list of sections for study, but it will increase the probability that the rate is high by chance.

The same equation can be used for junction. Then Ra is the average accident rate in million of vehicle entering for all junctions in the group, and M is the number of vehicle entering the particular junction. The quality – control method offers an opportunity to discover locations at which accidents are much fewer than might be expected on the basic of chance. By examining these location , it may be possible to discover road characteristic that are especially desirable. Section has an actual rate below the lower control limit and therefore would appear to have something about it that make it unusually safe. The formula for the lower critical rate is (Baerwald, 1965) :

$$Rc = Ra - K\sqrt{\frac{Ra}{M}} - \frac{1}{2M}$$

Where :

Rc = Critical accident rate for section.

Ra = Average accident rate for all sections in the group in accidents per million vehicles miles or kilometres.

M = Millions of vehichle miles or vehicle kilometer for the section.

K = Probability constant. A value of 1.5 is suggested. A smaller value will tend to give

CHAPTER III
METHODOLOGY

3.1 Overview of Study

The propose methods applied in order to achieve the aim and objectives of the study. The methodology of this study was divided into three stages. There were preliminary stage, analysis stage and evaluation stag

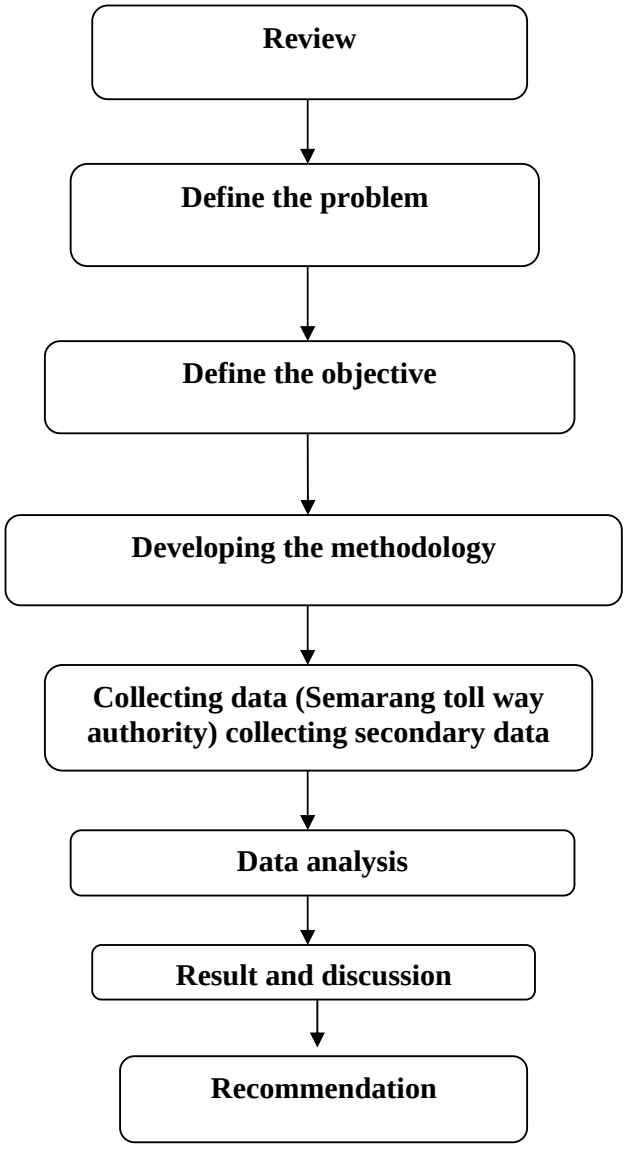


Figure 3.1 Overview of study

3.2 The Study Area

The main objective of this study is the scope of this research Semarang toll road is divided into 3 (three) sections namely section A, B and C along the 24.6 km is to know the cause of the accidents in (Semarang toll way) and to know the causes in Semarang The research hypothesizes that there are some controllable factors that Contribute to road accidents such as road condition and Therefore, delineation and subsequent improvement of these factors should improve the road safety in Semarang. With this aim, this chapter shall show the methodology used in this study for data collection, types of data, modeling for some of data have been Achieved. The initial focus was to compare the road safety condition was the main objective of this thesis is to build a model roomates represents the relationship between the time (2003 to 2012) and the number of fatal people. Afterwards, control measures for reducing the toll way accidents have been established

The location of the study is chosen toll way because it noticed that there are a lot of traffic accidents that lead to death registered in the area and this research will focus on the actual causes such fatal accidents and study the reduction of accidents in the study site toll way in Semarang. Therefore the whole study area is shown in figure 3-1 below as well as its divided to three sections section A, section B and section C.

Source : PT. Jasa Marga

Figure 3.2 Semarang toll way section A, B And C

3.3 Collection Of Data

For the purpose of conducting this study, As we mentioned earlier that the main goal of this research is to find out the main reasons of accidents that lead to death also, which lead to serious damage and material and moral damage so it will be collected all data necessary of the study site immediately with through and the secondary data of (Semarang toll way authority) from the period (2003 -2012), then to the data analysis phase and adoption in the fourth chapter.

Table 3.1 Methods Of HighwayAccording to Accident Report

line	Section number	1 2 3 4 5 6 7 8 9 10	Total	Average
	Basic data			
A	Length in miles km			
B	Average daily traffic			
C	Accident			

Source : Transportation And Traffic Engginering Handbook

Data collected for this study is secondary data obtained from the office Authority PT. Jasa Marga include Accident data ie data traffic accidents to be used as the base data for this study, obtained from the traffic accident reports available at the branch office of PT services Marga Semarang also from interviews with the head of a branch operation Semarang toll way. In order to obtain data that can describe the actual accident, the data collected is the data field accident report. The data consists of accidents for the past 10 years from 2003 to 2012. Form traffic accidents is equipped with information relating to the accident, and the accident site in general include the total accidents per year 2003 - 2012, the total number of injured third section (A, B and C) from the year 2003 to 2012, the total number of injured no accident the third section (A, B, and C) from the year 2003 to 2012, and specifically the number of accident per section A, B, and C a-km from the scene of the accident immediately so that appropriate to a research conducted. After that, there is also generally obtained total average daily traffic of the three sections (A, B, and C) from the year 2003 to 2012 and a comparison in each section so as to describe the

lowest and highest levels. And specifically also obtained average daily traffic per year per section A, B and C of the year 2003 - 2012

3.4 The Data Analysis

Data are analyzed manually by using the statistical data with excel formulas incorporate data sourced from the book transportation and traffic engineering handbook is to calculate traffic accident analysis with methods of ranking highway where the inside is looking for Ra is average accident rate per section (A, B and C) per year (2003-2012) and then the researcher guesses what the models is then he has computed the trend line and the Ra. Among all guesses, the researcher has decided the best model in roommates it is produces the highest Ra and tends to explain the plot data. That is why the scattered plot matters. Modeling of road accidents and time (2003-2012) and the result will be displayed through tables and graphs the data by searching for critical accident rate area (Rc) for each every section (A, B and C) per year (2003 -2012) with critical accident rate limit upper area control limit for the highest accident and rare critical area under the lower control limit for the accident would therefore Appear to have something about it that makes it unusually safe analyzes Be personally in the location of the study roommates include all the targets groups in this research. Then test and analyze the results that are displayed in Chapter four with the results of the plot area to contribute the highest accident and lowest average accident rate per year, 2003 to 2012 per section A, B and C.

CHAPTER IV
DATA COLLECTION AND ANALYSIS

4.1 Overview Of Traffic Accident On Semarang Toll Way.

Semarang toll way consists of three sections (A, B, and C) the length in miles 24.6 km. from the observation data on Semarang toll way by PT. Jasa Marga Semarang in 2003 to 2012 are generally known total average daily traffic, accidents, involvements, killed, injured and No - injury accident For further based on data Semarang toll way by PT. Jasa Marga of the year 2003 - 2012 it can be seen from the comparison of the three sections (A, B, And C) and a detailed breakdown per - section (A, B, and C) as will be described below, namely:

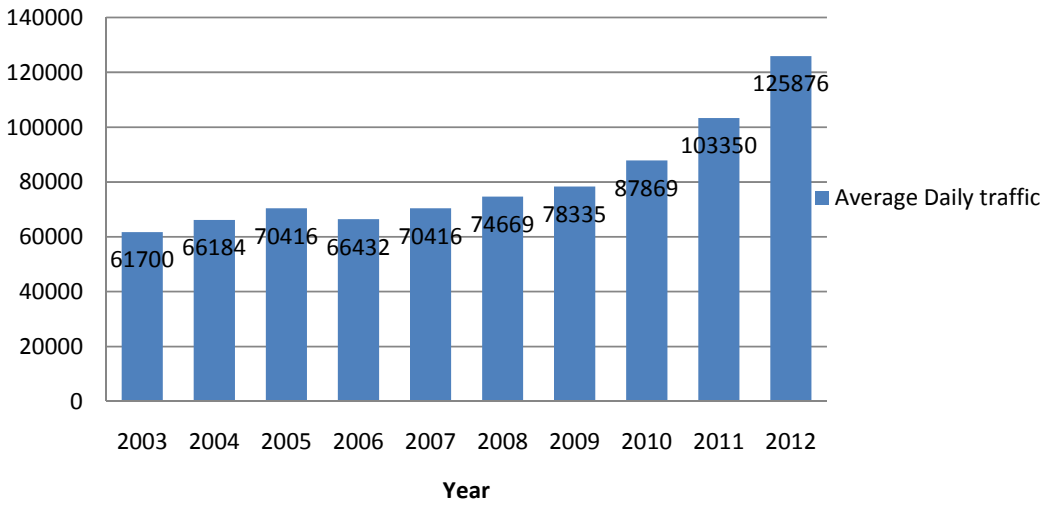
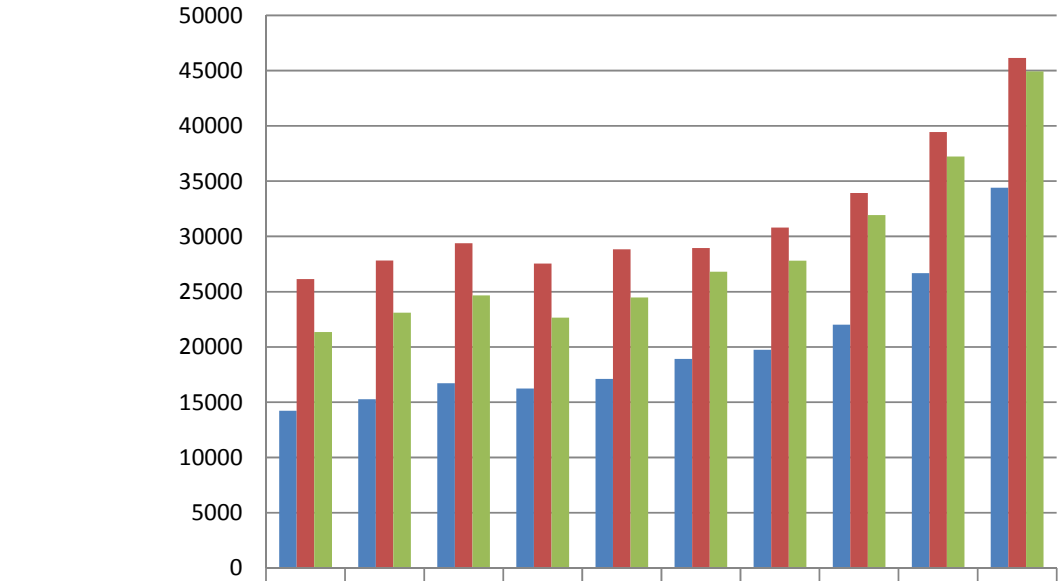


Figure 4.1 Total Average Daily Traffic in Section A,B,C (Semarang Toll way)

In figure 4.1 Total Average daily traffic from on thirth section (A, B, and C) from 2003 to 2005 has Increased but in 2006 there were slightly Decreased from the year 2005 is 70416 to 66432, and the following year has average daily traffic Increased to reach in 2012 to 125876 years. To see how much the contribution and the comparisons that exist on

the average daily traffic in sections (A, B, and C) each year, it can be seen in figure 4.2 below.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Average Daily traffic A	14225	15268	16717	16241	17109	18923	19734	22017	26682	34405
Average Daily traffic B	26134	27815	29377	27540	28832	28941	30799	33930	39439	46152
Average Daily traffic C	21342	23101	24667	22651	24476	26805	27802	31921	37229	44934

Figure 4.2 Average Daily traffic by Section

In figure 4.2 is the number of comparisons in each section A, B and C in Semarang toll way from the year 2003 until the year 2012. in figure 4.2 on the third section of the highest levels of average daily traffic is section B, while the lowest are in section A, while the average daily traffic is most dense in the third section, namely A, B and C are in the final year of research, namely 2012. Where A is the number of 34405 section, section B of 46152, and section C is 44934.

In general, the data has done by Jasa Marga company of the year 2003 - 2012 noted that the number of total accidents that exist in all three sections (A, B, and C) in the year 2003 to 2012 can be seen in figure 4.3 while for data comparison accidents per - section (A, B, and C) each year between 2003 - 2012 can be seen in figure 4.4 for section A, figure 4.5 for section B, and figure 4.6 for section C

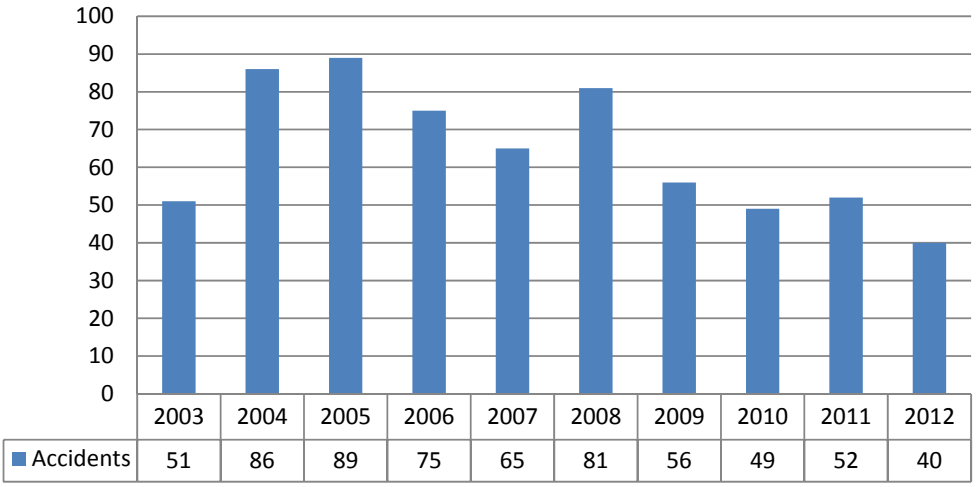


Figure 4.3 Accident in Section A,B,C (Semarang Toll Way)

In figure 4.3 it can be seen that the number of accident on the third section (A, B, and C) from 2003 to 2012 can be seen that the largest was in 2005 and as many as 89 for the lowest accident was in 2012 by 40 accident.

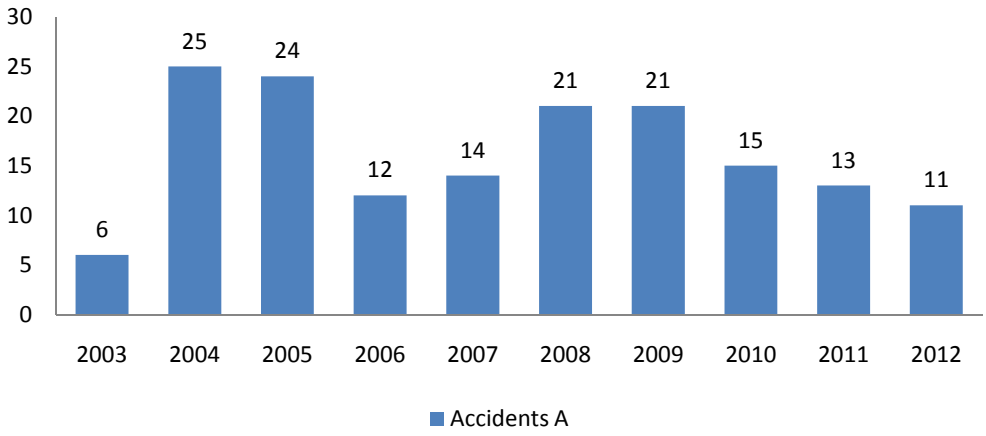


Figure 4.4 Accidents in Section A

In figure 4.4 the accidents listed in section A can be seen that from the year 2003 to 2012 the largest number of accident occurred in 2004 that were 25 accidents, while in section A is the smallest number of accident that in 2003 as many as 6.

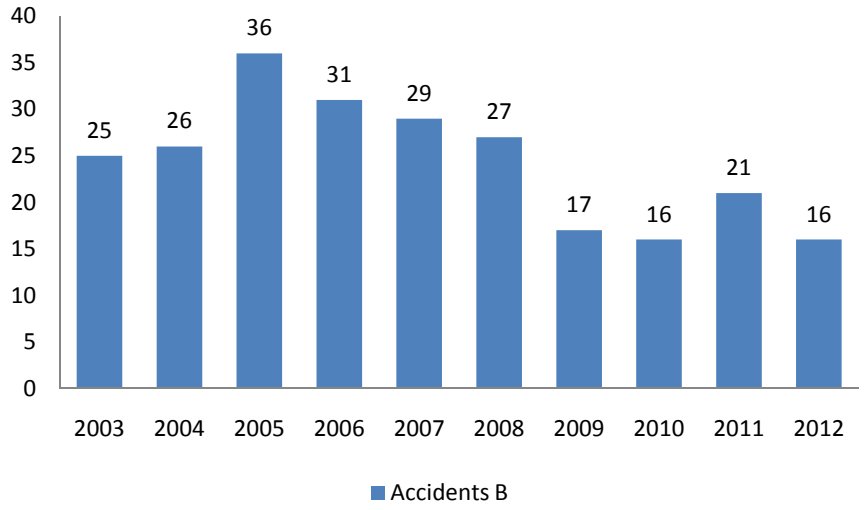


Figure 4.5 Accidents in section B

In figure 4.5 the accidents listed in section B can be seen that from the year 2003 to 2012 the number of the largest accident in 2005 that as many as 36 accidents, while in section B is the smallest number of accident that in 2010 and 2012 as many as 16.

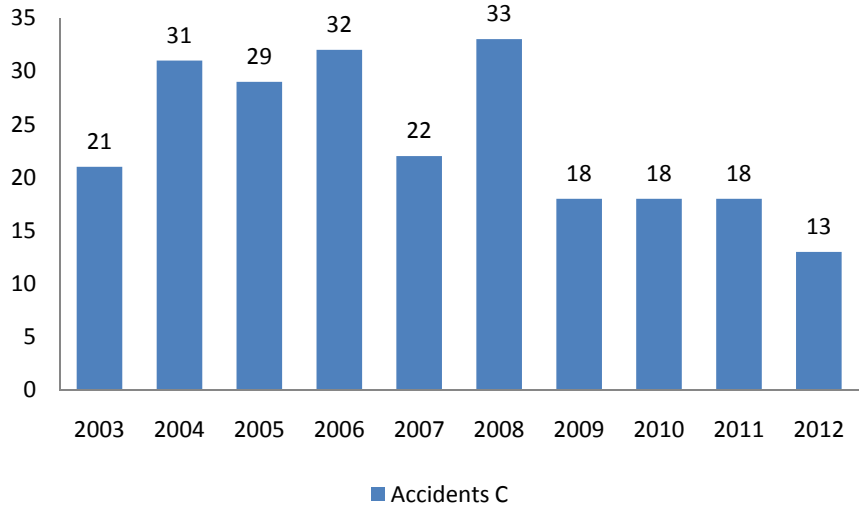


Figure 4.6 Accident in Section C

In figure 4.6 the accidents listed in section C can be seen that from the year 2003 to 2012 the largest number of accident occurred in 2008 that as many as 33 accidents, while in section B of the smallest number of accident was in 2012 that as many as 13.

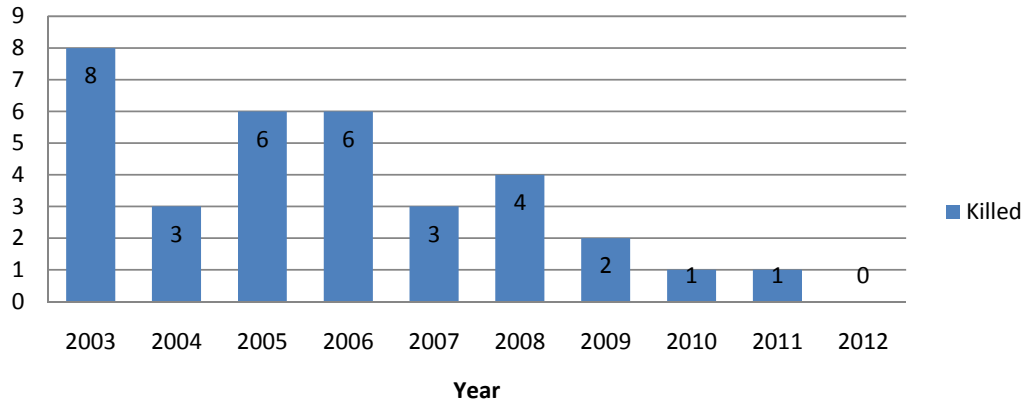


Figure 4.7 Total Killed in Section A,B,C (Semarang Toll Way)

In figure 4.7 can be seen the number of total killed in Semarang toll way on all three sections A, B, and C in which the greatest number of people killed occurred early in 2003 and the end of the year 2012 has decreased to no one killed or 0.

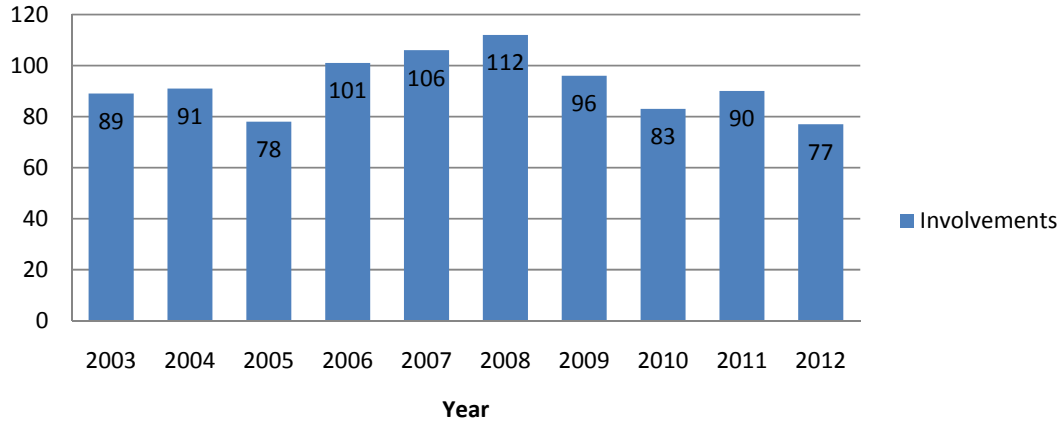


Figure 4.8 Involvements in Section A,B,C (Semarang Toll Way)

In figure 4.8 it is known that the number of involvements in section A, B, and C Semarang toll way experienced fluctuating amounts in 2003 through 2012, which tebesar was in 2008 with a total of 112, and the lowest was in 2012 that as many as 77 .

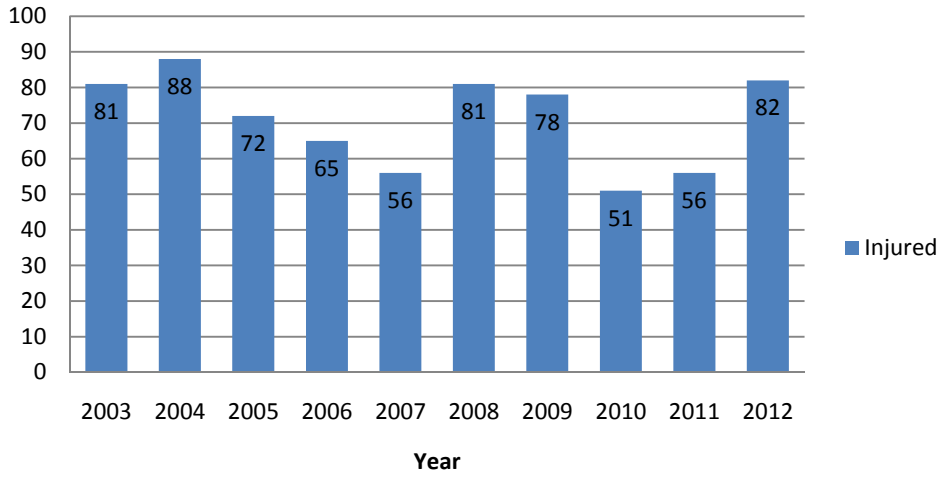


Figure 4.9 Injure in Section A,B,C (Semarang Toll Way)

In figure 4.9 in Semarang toll way the accident happened can be seen that the three injured in section A, B, and C in Semarang toll way ever in 2004 a total of 88 people in 2010, while the lowest were 51 people.

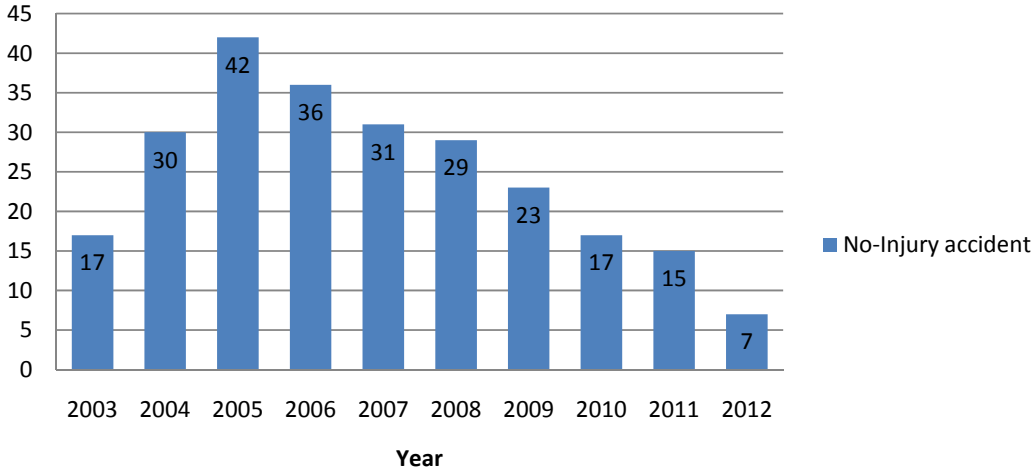


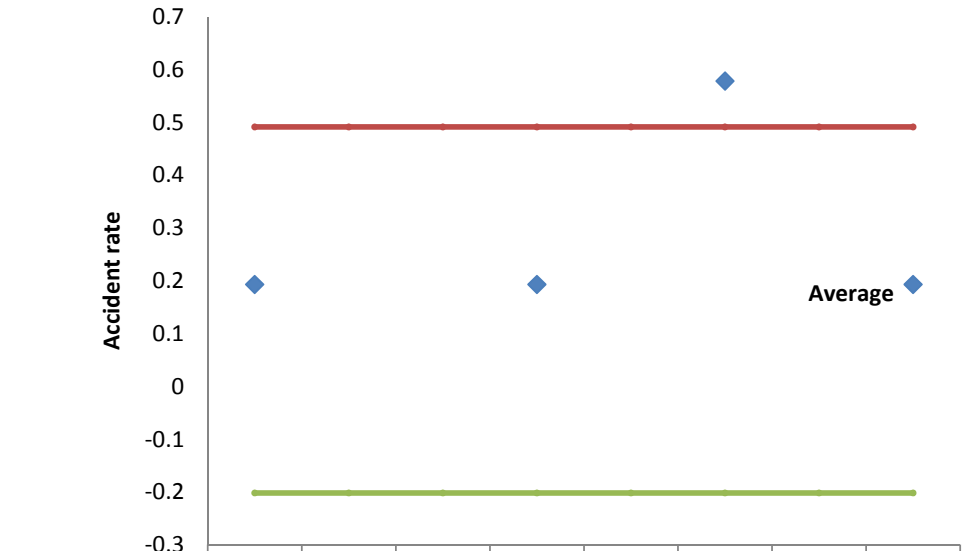
Figure 4.10 No - Injure in Section A,B,C (Semarang Toll Way)

In figure 4.10 it can be seen the number of people no accident - injured in Semarang toll way all three sections A, B, and C the highest in 2005 at 42 people and the lowest in the last year of research in 2012 that as many as 7 people.

4.2 Accidents Rate

Accident data is data that is obtained by PT. Jasa Marga of observations performed live and recorded directly on any accident that occurs in Semarang toll way while the accident rate is derived from the results of calculations using formulas that have been entered into Excel, where the data from the previous data, namely PT. Jasa Marga has unknown number of accident per Km and then divided by the Vehicle-miles (km) x 10^{-6} then get the accident rate of these results can seek critical rate, upper control limit and under control limit for more details can be found in the appendix. Here is the analysis of accident rate on each section per - Km from year 2003 - 2012 in which the results obtained are accident rate position.

4.2.1 Accident Rate Section A

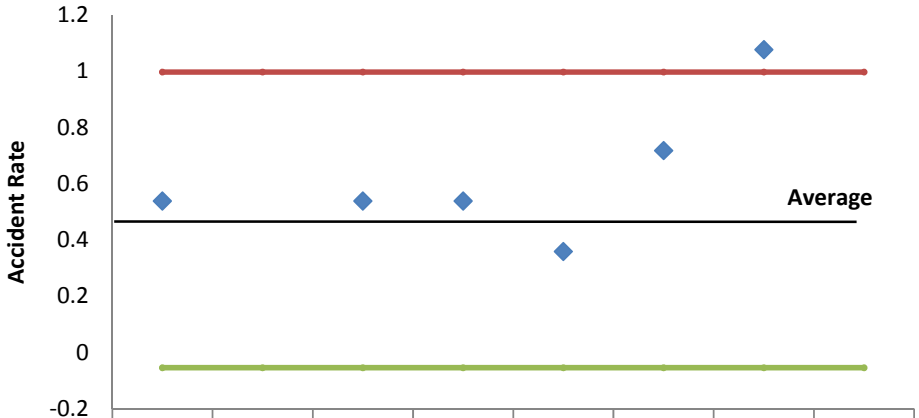


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.1925993			0.1925993		0.5777981		0.1925993
Upper control limit	0.4909431	0.4909431	0.4909431	0.4909431	0.4909431	0.4909431	0.4909431	0.4909431
Under control limit	-0.202044	-0.202044	-0.202044	-0.202044	-0.202044	-0.202044	-0.202044	-0.202044

Average Accident rate = 0.144449527

Figure 4.11 Accident Distribution Semarang Highway Section A Report Year 2003

From the analysis in section A in 2003 from figure 4.11 is define the lowest accident in 2003 in section A are at mile 1+00 – 2+00, 2 + 000 – 3 + 000, 4+000 – 5+000, and 6+000 – 7 + 000 where is the accident rate is zero, and the most accidents are at mile 5 + 000 -6 + 000 which were total accident is 3 where that the accident rate is 0,577 with the upper control limit of 0,490 and under the control limit of -2,202 where is the highest value that the accident rate is in mile 5+000 – 6+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

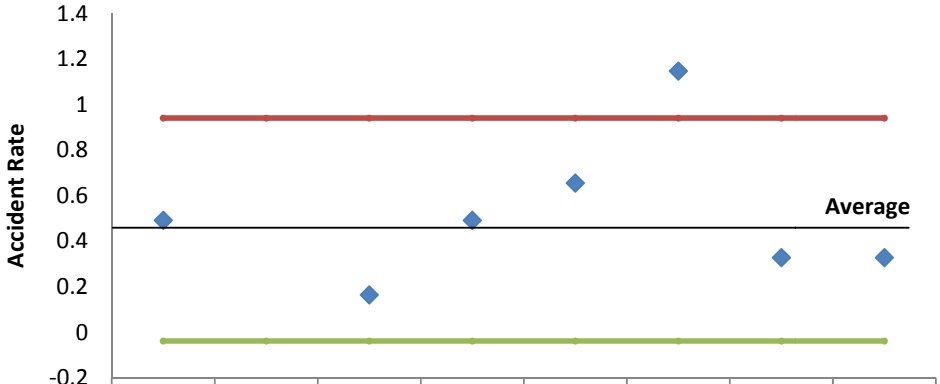


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.538327		0.538327	0.538327	0.358884	0.717769	1.076654	
Upper control limit	0.996852	0.996852	0.996852	0.996852	0.996852	0.996852	0.996852	0.996852
Under control limit	-0.05478	-0.05478	-0.05478	-0.05478	-0.05478	-0.05478	-0.05478	-0.05478

Average Accident rate = 0.471036208

Figure 4.12 Accident Distribution Semarang Highway Section A Report Year 2004

From the analysis in section A in 2004 from figure 4.12 is define the lowest accident in 2004 in section A are at mile 1+00 – 2+00, and 7+000 – 8 + 000 where is the accident rate is zero, and the most accidents are at mile 6 + 000 -7 + 000 which were total accident is 6 where that the accident rate is 1,076 with the upper control limit of 0,996 and under the control limit of -0,0547 where is the highest value that the accident rate is mile 6+000 - 7+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

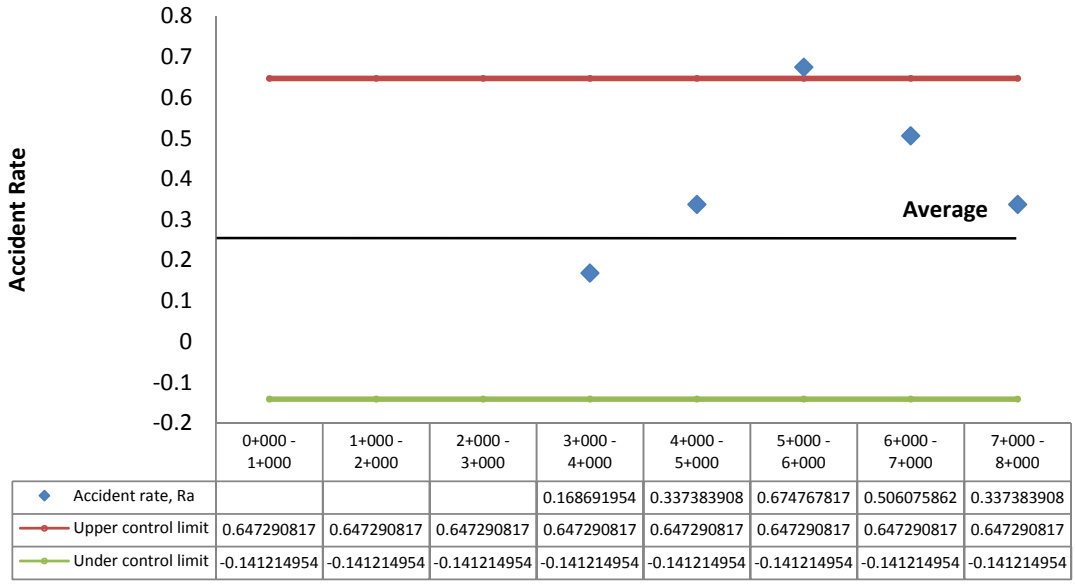


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.49166585		0.16388861	0.49166585	0.65555447	1.14722032	0.32777723	0.32777723
Upper control limit	0.94030579	0.94030579	0.94030579	0.94030579	0.94030579	0.94030579	0.94030579	0.94030579
Under control limit	-0.0389184	-0.0389184	-0.0389184	-0.0389184	-0.0389184	-0.0389184	-0.0389184	-0.0389184

Average Accident rate = 0.4506937

Figure 4.13 Accident Distribution Semarang Highway Section A Report Year 2005

From the analysis in section A in 2005 from figure 4.13 is define the lowest accident in 2005 in section A are at mile 1+00 – 2+00, where is the accident rate is zero, and the most accidents are at mile 5 + 000 -6 + 000 which were total accident is 7 where that the accident rate is 1,147 with the upper control limit of 0,940 and under the control limit of -0,038 where is the highest value that the accident rate is in mile 5+000 – 6+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

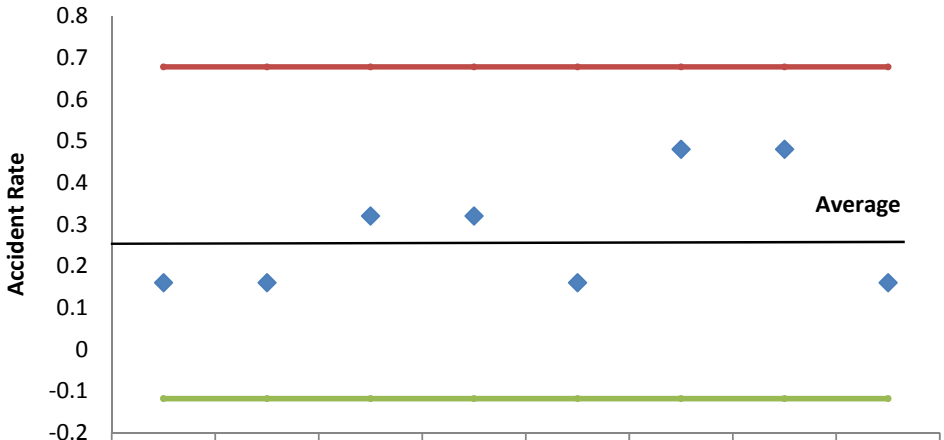


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra				0.168691954	0.337383908	0.674767817	0.506075862	0.337383908
Upper control limit	0.647290817	0.647290817	0.647290817	0.647290817	0.647290817	0.647290817	0.647290817	0.647290817
Under control limit	-0.141214954	-0.141214954	-0.141214954	-0.141214954	-0.141214954	-0.141214954	-0.141214954	-0.141214954

Average Accident rate = 0.253037931

Figure 4.14 Accident Distribution Semarang Highway Section A Report Year 2006

From the analysis in section A in 2006 from figure 4.14 is define the lowest accident in 2006 in section A are at mile 0+000 – 1+000,1+00 – 2+00, and 2 + 000 – 3 + 000, where is the accident rate is zero, and the most accidents are at mile 5 + 000 -6 + 000 which were total accident is 4 where that the accident rate is 0,674 with the upper control limit of 3,526 and under the control limit of -3,020 where is the highest value that the accident rate is in mile 5+000 – 6+000 are positioned above the upper control limit, which means bad and cannot be tolerated.

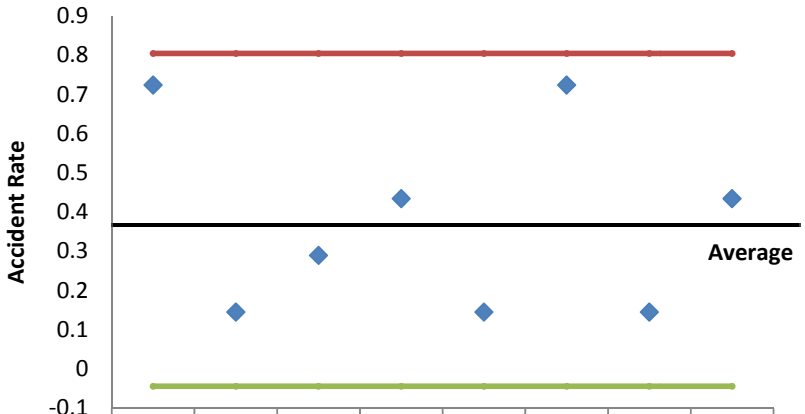


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.16013361	0.16013361	0.32026723	0.32026723	0.16013361	0.48040084	0.48040084	0.16013361
Upper control limit	0.67805592	0.67805592	0.67805592	0.67805592	0.67805592	0.67805592	0.67805592	0.67805592
Under control limit	-0.1175882	-0.1175882	-0.1175882	-0.1175882	-0.1175882	-0.1175882	-0.1175882	-0.1175882

Average Accident rate = 0.280233827

Figure 4.15 Accident Distribution Semarang Highway Section A Report Year 2007

From the analysis in section A in 2007 from figure 4.15 is define the lowest accident in 2007 in section A are at mile 0+000 – 1+000, 1+00 – 2+00, 4 + 000 – 5 + 000, and 7+000 – 8 + 000 where is the accident rate is one, and the most accidents are at mile 5 + 000 -6 + 000 and 6+000 – 7+000 which were total accident is 3 where that the accident rate is 0,480 with the upper control limit of 0,678 and under the control limit of –0,117 where the accident rate value is still in critical area that's middle of under control limit and upper control limit.

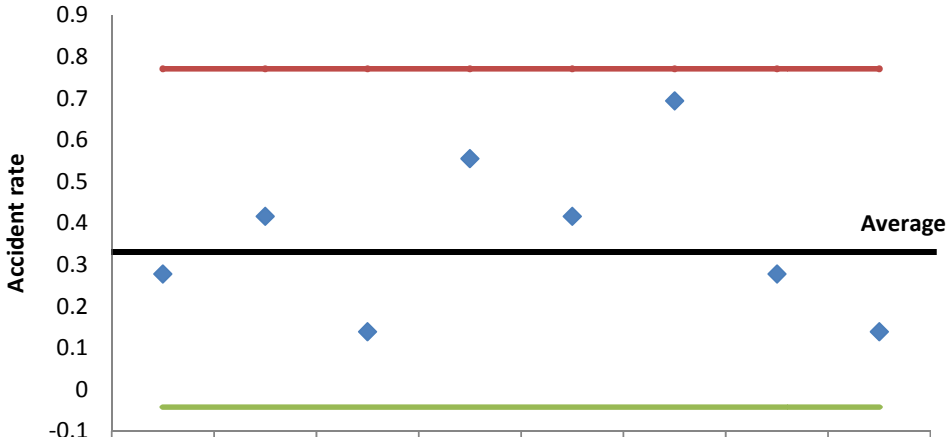


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.723	0.144	0.289	0.434	0.144	0.723	0.144	0.434
Upper control limit	0.804	0.804	0.804	0.804	0.804	0.804	0.804	0.804
Under control limit	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04

Average Accident rate = 0.380055003

Figure 4.16 Accident Distribution Semarang Highway Section A Report Year 2008

From the analysis in section A in 2008 from figure 4.16 is define the lowest accident in 2008 in section A are at mile 1+00 – 2+00, and 4 + 000 – 5 + 000 and 6+000 – 7+000, where is the accident rate is one, and the most accidents are at mile 0+000 – 1+000, and 5 + 000 -6 + 000 which were total accident is 5 where that the accident rate is 0,723 with the upper control limit of 0,804 and under the control limit of -0,044 where the accident rate value is still in critical area that's middle of under control limit and upper control limit.

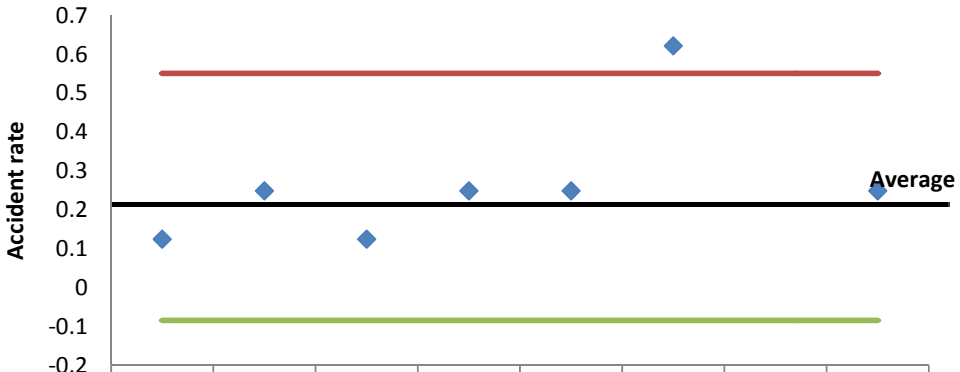


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.27766555	0.41649833	0.13883277	0.55533110	0.41649833	0.69416388	0.27766555	0.13883277
Upper control limit	0.77125464	0.77125464	0.77125464	0.77125464	0.77125464	0.77125464	0.77125464	0.77125464
Under control limit	-0.0423825	-0.0423825	-0.0423825	-0.0423825	-0.0423825	-0.0423825	-0.0423825	-0.0423825

Average Accident rate = 0.36443604

Figure 4.17 Accident Distribution Semarang Highway Section A Report Year 2009

From the analysis in section A in 2009 figure 4.17 is define the lowest accident in 2006 in section A are at mile 2 + 000 – 3 + 000 and 7+000 – 8+000, where is the accident rate is one, and the most accidents are at mile 5 + 000 -6 + 000 which were total accident is 5 where that the accident rate is 0,694 with the upper control limit of 0,771 and under the control limit of -0,042 where the accident rate middle of under control limit and upper.

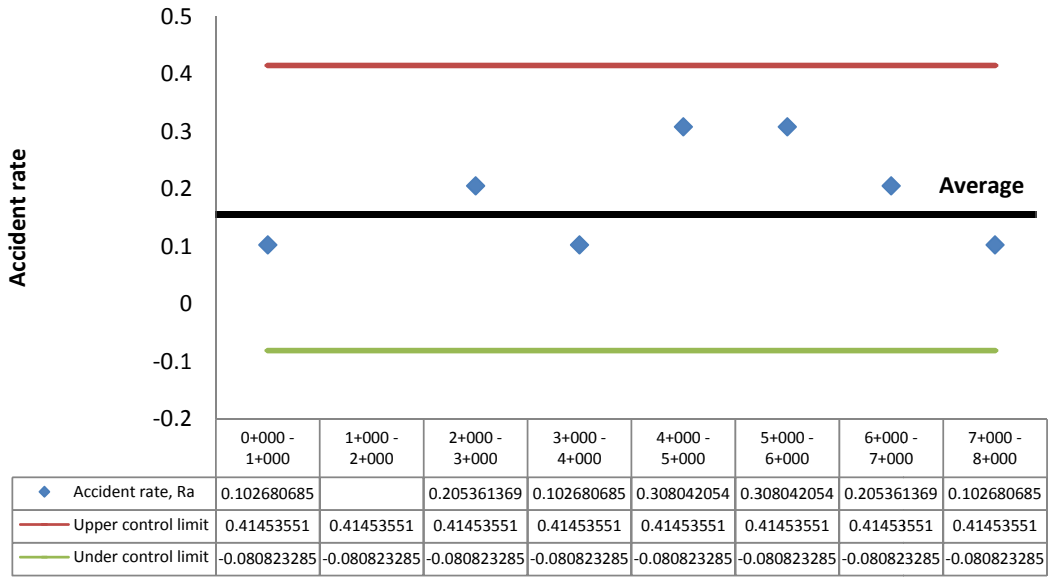


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.12443684	0.24887369	0.12443684	0.24887369	0.24887369	0.62218422		0.24887369
Upper control limit	0.55112576	0.55112576	0.55112576	0.55112576	0.55112576	0.55112576	0.55112576	0.55112576
Under control limit	-0.0844875	-0.0844875	-0.0844875	-0.0844875	-0.0844875	-0.0844875	-0.0844875	-0.0844875

Average Accident rate = 0.233319085

Figure 4.18 Accident Distribution Semarang Highway Section A Report Year 2010

From the analysis in section A in 2010 from figure 4.18 is define the lowest accident in 2010 in section A are at mile 6+000 – 7+000, where is the accident rate is zero, and the most accidents are at mile 5 + 000 -6 + 000 which were total accident is 5 where that the accident rate is 0,622 with the upper control limit of 0,551 and under the control limit of -0,084 where is the highest value that the accident rate is in mile 5+000 – 6+000 are positioned above the upper control limit, which means bad and cannot be tolerated.

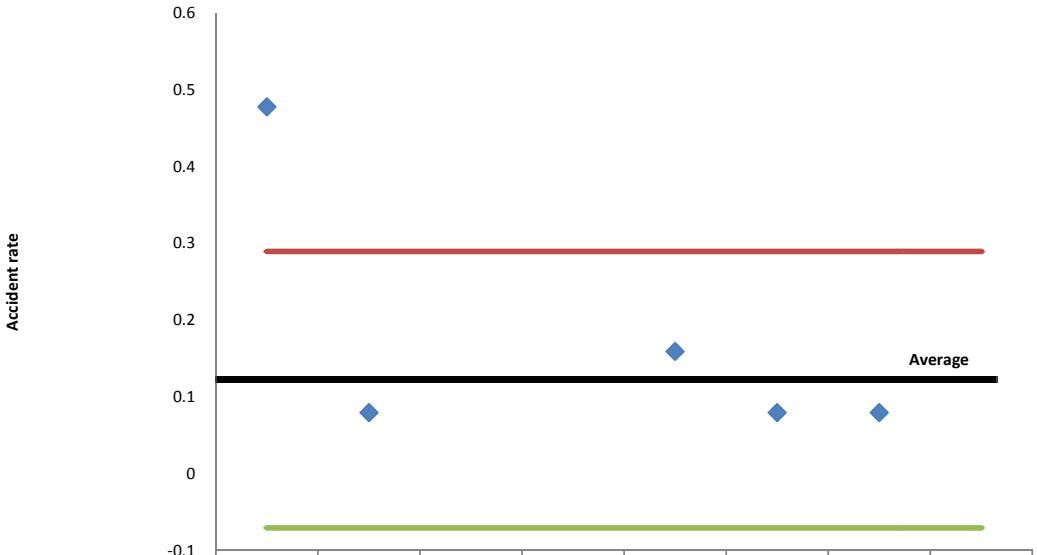


	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.102680685		0.205361369	0.102680685	0.308042054	0.308042054	0.205361369	0.102680685
Upper control limit	0.41453551	0.41453551	0.41453551	0.41453551	0.41453551	0.41453551	0.41453551	0.41453551
Under control limit	-0.080823285	-0.080823285	-0.080823285	-0.080823285	-0.080823285	-0.080823285	-0.080823285	-0.080823285

Average Accident rate = 0.166856113

Figure 4.19 Accident Distribution Semarang Highway Section A Report Year 2011

From the analysis in section A in 2011 from figure 4.19 is define the lowest accident in 2011 in section A are at mile 1+000 – 2+000, where is the accident rate is zero, and the most accidents are at mile 4+000 – 5+000 and 5 + 000 -6 + 000 which were total accident is 3 where that the accident rate is 0,308 with the upper control limit of 0,414 and under the control limit of -0,080 where the accident rate value is still in critical area that's middle of under control limit and upper control limit.



	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
Accident rate, Ra	0.477789745	0.079631624			0.159263248	0.079631624	0.079631624	
Upper control limit	0.289373829	0.289373829	0.289373829	0.289373829	0.289373829	0.289373829	0.289373829	0.289373829
Under control limit	-0.070386863	-0.070386863	-0.070386863	-0.070386863	-0.070386863	-0.070386863	-0.070386863	-0.070386863

Average Accident rate = 0.109493483

Figure 4.20 Accident Distribution Semarang Highway Section A Report Year 2012

From the analysis in section A in 2012 from figure 4.20 is define the lowest accident in 2012 in section A are at mile 2+000 – 3+000, 3+000 – 4+000, 7+000 – 8+000 where is the accident rate is zero, and the most accidents are at mile 0 + 000 - 1+ 000 which were total accident is 6 where that the accident rate is 0,477 with the upper control limit of 2,893 and under the control limit of -0,070 where is the highest value that the accident rate is in mile 0+000 – 1+000 are positioned above the upper control limit, which means bad and cannot be tolerated.

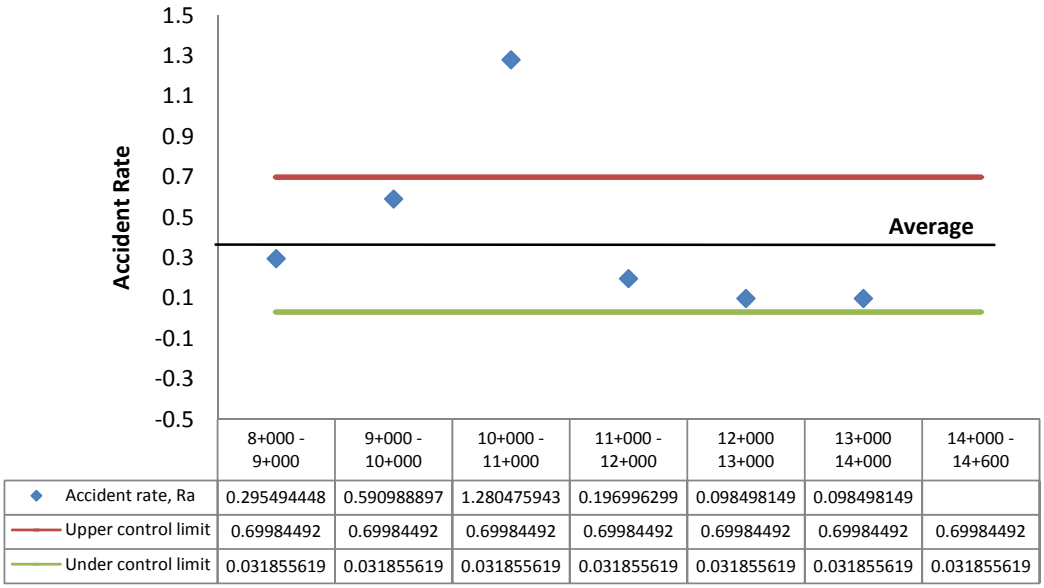
4.2.2 Accident Rate section B

	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.31450134	0.94350402	0.83867024	0.20966756	0.20966756	0.10483378	
Upper control limit	0.72399908	0.72399908	0.72399908	0.72399908	0.72399908	0.72399908	0.72399908
Under control limit	0.02481363	0.02481363	0.02481363	0.02481363	0.02481363	0.02481363	0.02481363

Average Accident rate = 0.37440636

Figure 4.21 Accident Distribution Semarang Highway Section B Report Year 2003

From the analysis in section B in 2003 from figure 4.21 is define the lowest accident in 2003 in section B are at mile 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 9 + 000 – 10 + 000 which were total accident is 9 where that the accident rate is 0,943 with the upper control limit of 0,723 and under the control limit of 0,024 where is the two highest value that the accident rate is in mile 9+000 – 10+000 and 10+000 – 11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

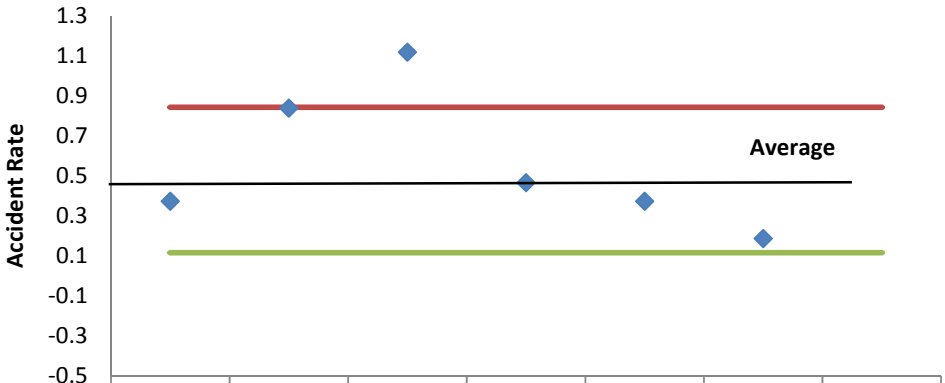


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.295494448	0.590988897	1.280475943	0.196996299	0.098498149	0.098498149	
Upper control limit	0.69984492	0.69984492	0.69984492	0.69984492	0.69984492	0.69984492	0.69984492
Under control limit	0.031855619	0.031855619	0.031855619	0.031855619	0.031855619	0.031855619	0.031855619

Average Accident rate = 0.365850269

Figure 4.22 Accident Distribution Semarang Highway Section B Report Year 2004

From the analysis in section B in 2004 from figure 4.22 is define the lowest accident in 2004 in section B are at mile 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 13 where that the accident rate is 1,280 with the upper control limit of 0,699 and under the control limit of 0,031 where is the highest value that the accident rate is in mile 10+000 – 11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

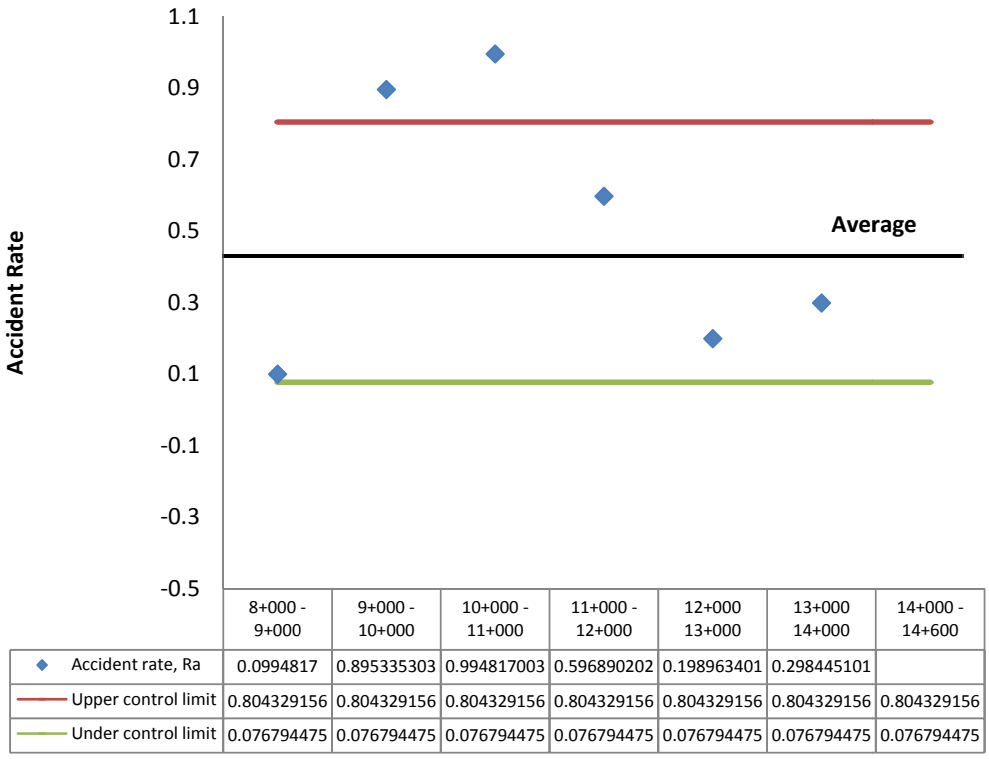


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.373043677	0.839348274	1.119131032	0.466304597	0.373043677	0.186521839	
Upper control limit	0.843501873	0.843501873	0.843501873	0.843501873	0.843501873	0.843501873	0.843501873
Under control limit	0.115753297	0.115753297	0.115753297	0.115753297	0.115753297	0.115753297	0.115753297

Average Accident rate = 0.479627585

Figure 4.23 Accident Distribution Semarang Highway Section B Report Year 2005

From the analysis in section B in 2005 from figure 4.23 is define the lowest accident in 2005 in section B are at mile 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 12 where that the accident rate is 1,119 with the upper control limit of 0,843 and under the control limit of 0,115 where is the highest value that the accident rate is in mile 10+000- 11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated, andthen the second highest number accident rate in mile 9+000- 10+000 is 0,839 approach with upper control limit that's positioned danger.

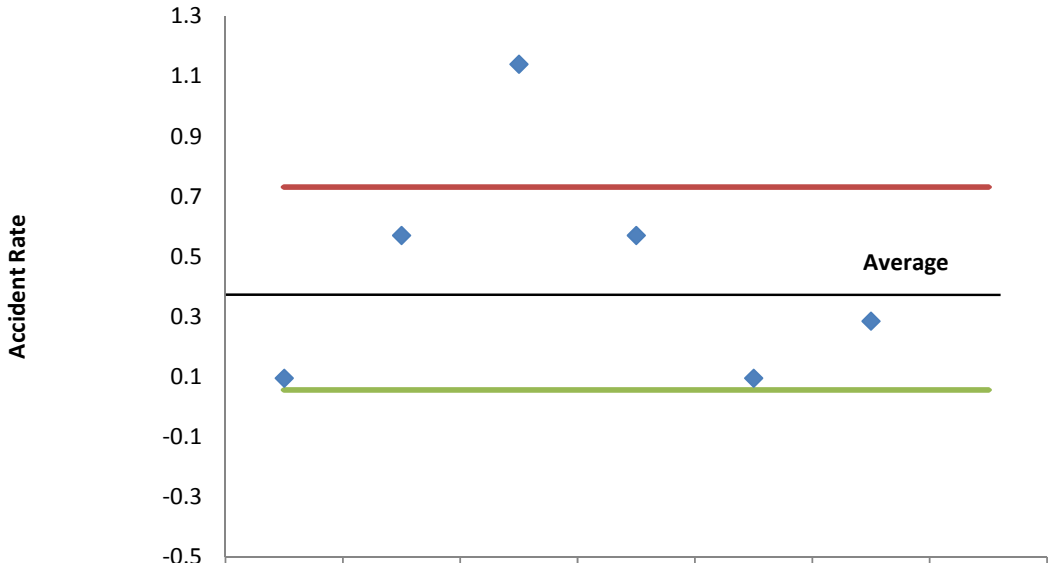


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.0994817	0.895335303	0.994817003	0.596890202	0.198963401	0.298445101	
Upper control limit	0.804329156	0.804329156	0.804329156	0.804329156	0.804329156	0.804329156	0.804329156
Under control limit	0.076794475	0.076794475	0.076794475	0.076794475	0.076794475	0.076794475	0.076794475

Average Accident rate = 0.440561816

Figure 4.24 Accident Distribution Semarang Highway Section B Report Year 2006

From the analysis in section B in 2006 figure 4.24 is define the lowest accident in 2006 in section B are at mile 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 10 where that the accident rate is 0,994 with the upper control limit of 0,804 and under control limit of where 0,0767 where is the highest value that the accident rate is in 9+000-10+000 and 10+000-11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

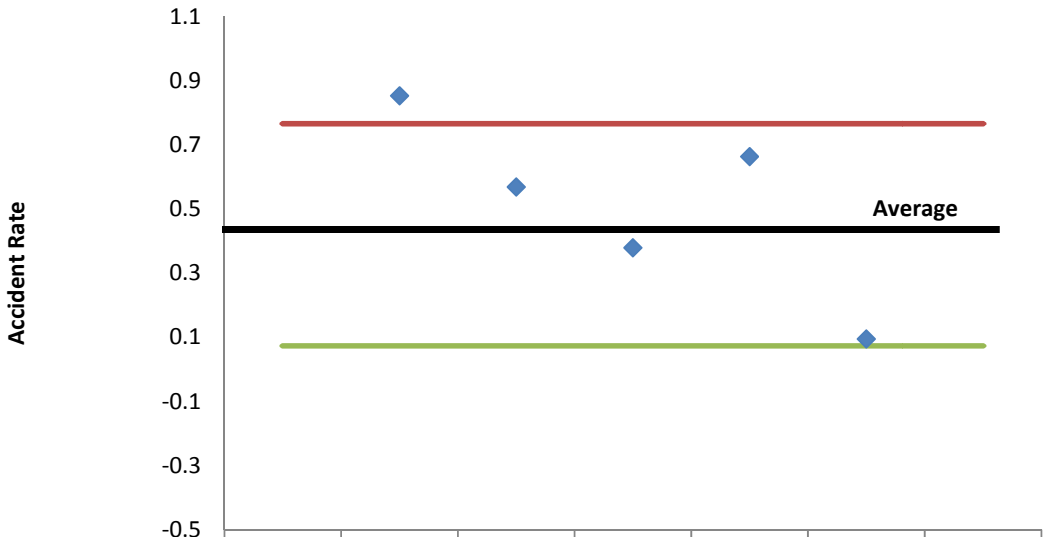


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.095023794	0.570142764	1.140285527	0.570142764	0.095023794	0.285071382	
Upper control limit	0.731299185	0.731299185	0.731299185	0.731299185	0.731299185	0.731299185	0.731299185
Under control limit	0.056040822	0.056040822	0.056040822	0.056040822	0.056040822	0.056040822	0.056040822

Average Accident rate = 0.393670004

Figure 4.25 Accident Distribution Semarang Highway Section B Report Year 2007

From the analysis in section B in 2007 from figure 4.25 is define the lowest accident in 2007 in section B are at mile 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 12 where that the accident rate is 1,140 with the upper control limit of 0,731 and under the control limit of 0,056 where is the highest value that the accident rate is in mile 10+000-11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

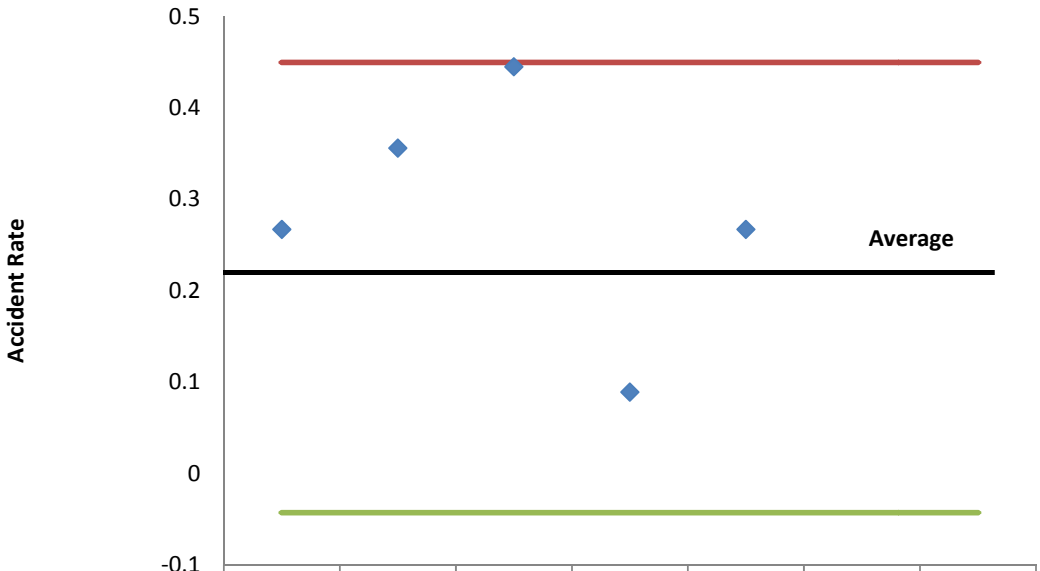


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra		0.851993167	0.567995445	0.37866363	0.662661352	0.094665907	
Upper control limit	0.765392522	0.765392522	0.765392522	0.765392522	0.765392522	0.765392522	0.765392522
Under control limit	0.073076944	0.073076944	0.073076944	0.073076944	0.073076944	0.073076944	0.073076944

Average Accident rate = 0.419234733

Figure 4.26 Accident Distribution Semarang Highway Section B Report Year 2008

From the analysis in section B in 2008 from figure 4.26 is define the lowest accident in 2008 in section B are at mile 8+000 – 9+000 and 14+000 - 14+600 where is the accident rate is zero (0), and the most accidents are at mile 9 + 000 – 10 + 000 which were total accident is 9 where that the accident rate is 0,851 with the upper control limit of 0,765 and under the control limit of 0,073 where is the highest value that the accident rate is in 9+000-10+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

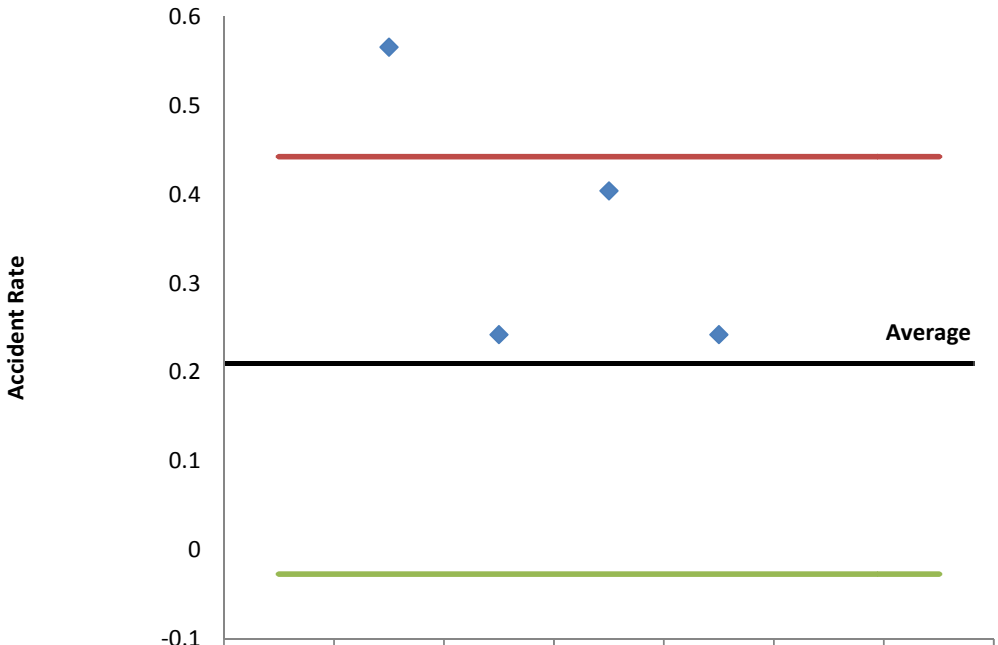


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.266865096	0.355820128	0.444775159	0.088955032	0.266865096		
Upper control limit	0.449534354	0.449534354	0.449534354	0.449534354	0.449534354	0.449534354	0.449534354
Under control limit	-0.042882779	-0.042882779	-0.042882779	-0.042882779	-0.042882779	-0.042882779	-0.042882779

Average Accident rate = 0.203325787

Figure 4.27 Accident Distribution Semarang Highway Section B Report Year 2009

From the analysis in section B in 2009 from figure 4.27 is define the lowest accident in 2009 in section B are at mile 13+000 – 14+000 and 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 5 where that the accident rate is 0,444 with the upper control limit of 0,449 and under the control limit of -0,042 where is the highest value that the accident rate is in 10+000-11+000 are positioned approach the upper control limit, which that's danger positioned.

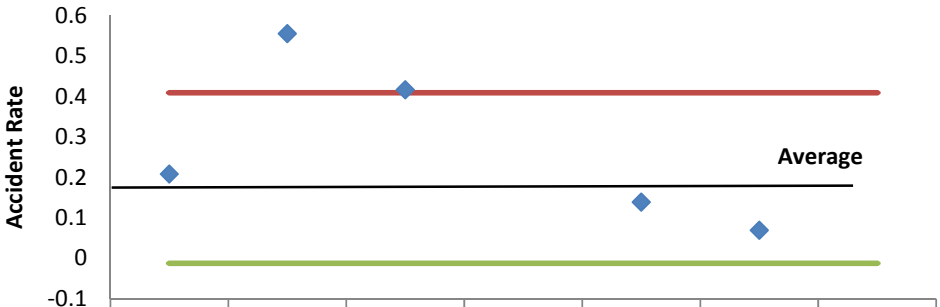


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra		0.565224939	0.24223926	0.4037321	0.24223926		
Upper control limit	0.442230357	0.442230357	0.442230357	0.442230357	0.442230357	0.442230357	0.442230357
Under control limit	-0.026963055	-0.026963055	-0.026963055	-0.026963055	-0.026963055	-0.026963055	-0.026963055

Average Accident rate = 0.207633651

Figure 4.28 Accident Distribution Semarang Highway Section B Report Year 2010

From the analysis in section B in 2010 from figure 4.28 is define the lowest accident in 2010 in section B are at mile 8 +000 – 9+000, 13 +000 – 14+000 and 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 9 + 000 – 10 + 000 which were total accident is 7 where that the accident rate is 0,565 with the upper control limit of 0,442 and under control limit of -0,026 where is the highest value that the accident rate is in mile 9+000-10+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

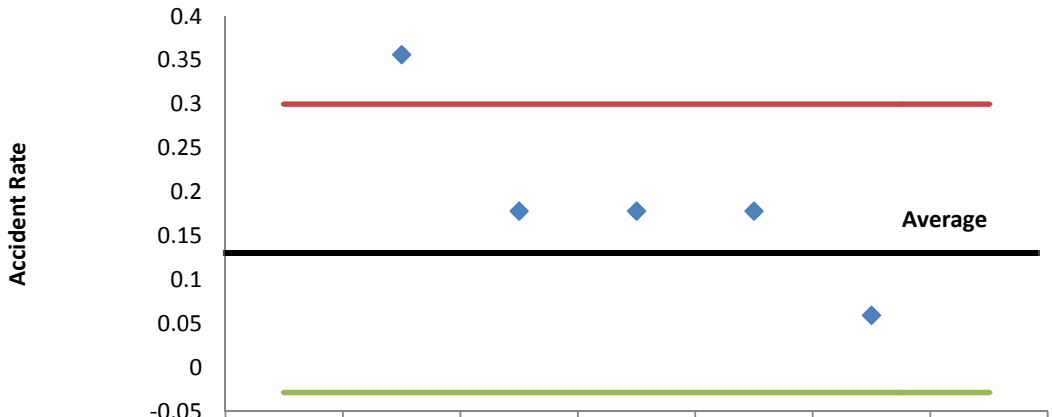


	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra	0.208402294	0.555739451	0.416804588		0.138934863	0.069467431	
Upper control limit	0.409344177	0.409344177	0.409344177	0.409344177	0.409344177	0.409344177	0.409344177
Under control limit	-0.01238742	-0.01238742	-0.01238742	-0.01238742	-0.01238742	-0.01238742	-0.01238742

Average Accident rate = 0.198478375

Figure 4.29 Accident Distribution Semarang Highway Section B Report Year 2011

From the analysis in section B in 2011 from figure 4.29 is define the lowest accident in 2011 in section B are at mile 11+000 – 12+000 and 14+000 - 14+600 where is the accident rate is zero (0), and the most accidents are at mile 9 + 000 – 10 + 000 which were total accident is 8 where that the accident rate is 0,555 with the upper control limit of 0,409 and the under control limit of -0,012 where is the highest value that the accident rate is in mile 9+000 – 10+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.



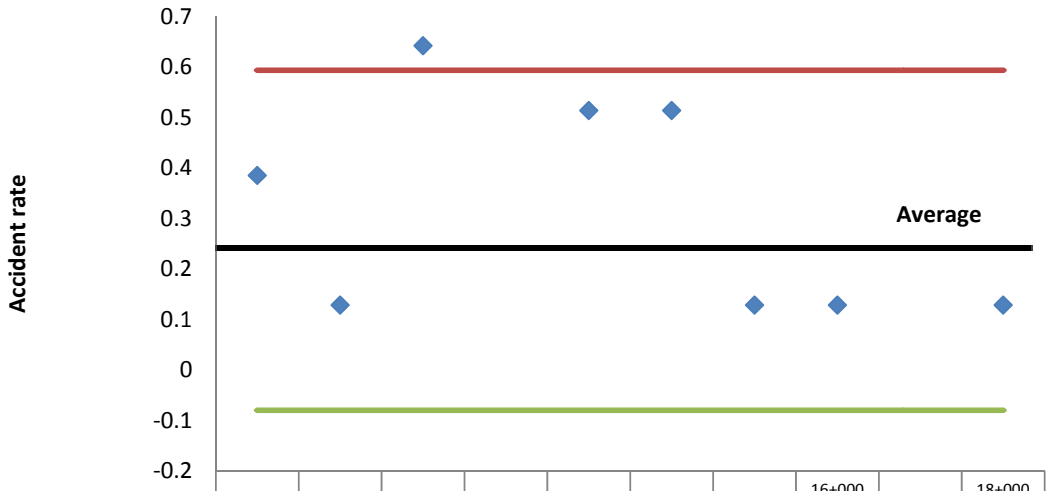
	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
Accident rate, Ra		0.356178631	0.178089315	0.178089315	0.178089315	0.059363105	
Upper control limit	0.299991518	0.299991518	0.299991518	0.299991518	0.299991518	0.299991518	0.299991518
Under control limit	-0.028617324	-0.028617324	-0.028617324	-0.028617324	-0.028617324	-0.028617324	-0.028617324

Average Accident rate = 0.135687097

Figure 4.30 Accident Distribution Semarang Highway Section B Report Year 2012

From the analysis in section B in 2012 from figure 4.30 is define the lowest accident in 2012 in section B are at mile 8+000 – 9+000 and 14+000 - 14+600 where is the accident rate is zero, and the most accidents are at mile 9 + 000 – 10 + 000 which were total accident is 6 where that the accident rate is 0,356 with the upper control limit of 0,299 and the under control limit of -0,028 where is the highest value that the accident rate is in mile 9+000 -10+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

4.2.3 Accident Rate Section C

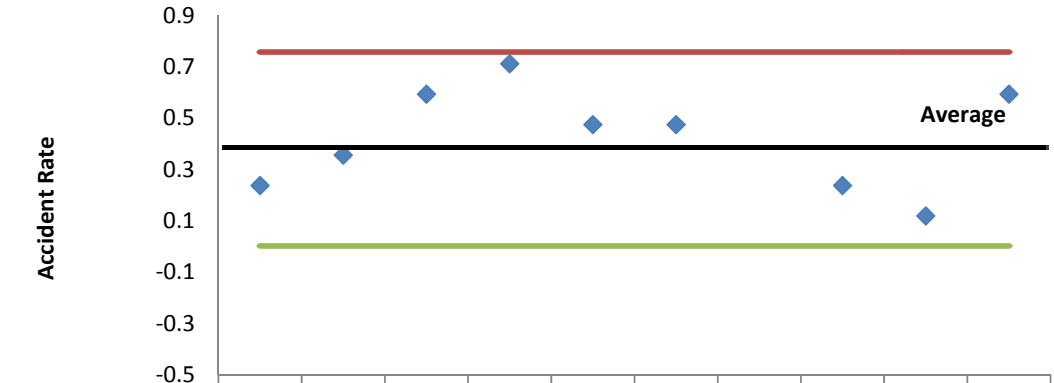


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.3851175	0.1283725	0.6418625		0.5134900	0.5134900	0.1283725	0.1283725		0.1283725
Upper control limit	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504	0.5932504
Under control limit	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760	-0.079760

Average Accident rate = 0.256745012

Figure 4.31 Accident Distribution Semarang Highway Section C Report Year 2003

From the analysis in section C in 2003 figure 4.31 is define the lowest accident in 2003 in section C are at mile 12+000 – 13+000 and 17+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 11 + 000 – 12 + 000 which were total accident is 5 where that the accident rate is 0,641 with the upper control limit of 0,593 and under the control limit of -0,079 where is the highest value that the accident rate is in mile 11+000 – 12+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

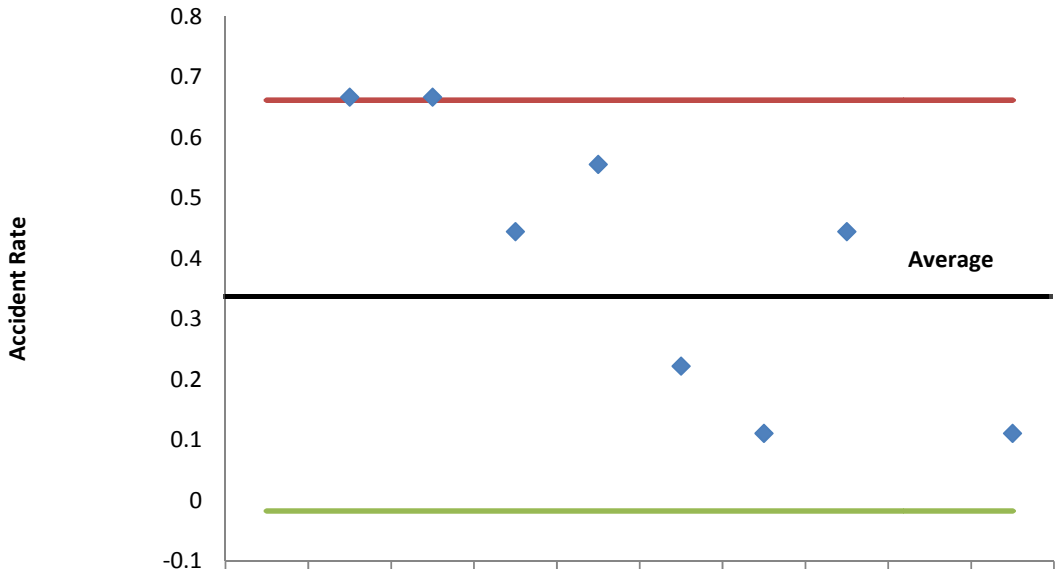


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.23719	0.35579	0.59298	0.71158	0.47439	0.47439		0.23719	0.11859	0.59298
Upper control limit	0.75704	0.75704	0.75704	0.75704	0.75704	0.75704	0.75704	0.75704	0.75704	0.75704
Under control limit	0.00198	0.00198	0.00198	0.00198	0.00198	0.00198	0.00198	0.00198	0.00198	0.00198

Average Accident rate = 0.379512718

Figure 4.32 Accident Distribution Semarang Highway Section C Report Year 2004

From the analysis in section C in 2004 from figure 4.32 is define the lowest accident in 2004 in section C are at mile 15+000 - 16+000 where is the accident rate is zero, and the most accidents are at mile 12 + 000 – 13 + 000 which were total accident is 6 where that the accident rate is 0,711 with the upper control limit of 0,757 and under the control limit of 0,0019 where is the highest value that the accident rate is in mile 12+000 – 13+000 are positioned Approach the upper control limit, which that's means danger position.



	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra		0.666410	0.666410	0.444273	0.555342	0.222136	0.111068	0.444273		0.111068
Upper control limit	0.661347	0.661347	0.661347	0.661347	0.661347	0.661347	0.661347	0.661347	0.661347	0.661347
Under control limit	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715	-0.01715

Average Accident rate = 0.322098572

Figure 4.33 Accident Distribution Semarang Highway Section C Report Year 2005

From the analysis in section C in 2005 figure 4.33 is define the lowest accident in 2005 in section C are at mile 9+000 – 10+000 and 17+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 10+000 – 11+000 and 11 + 000 – 12 + 000 which were total accident is 6 where that the accident rate is 0,666 with the upper control limit of 0,661 and under control limit of -0,017 where is the highest value that the accident rate is in mile 10+000- 11+000 and 11+000 – 12+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

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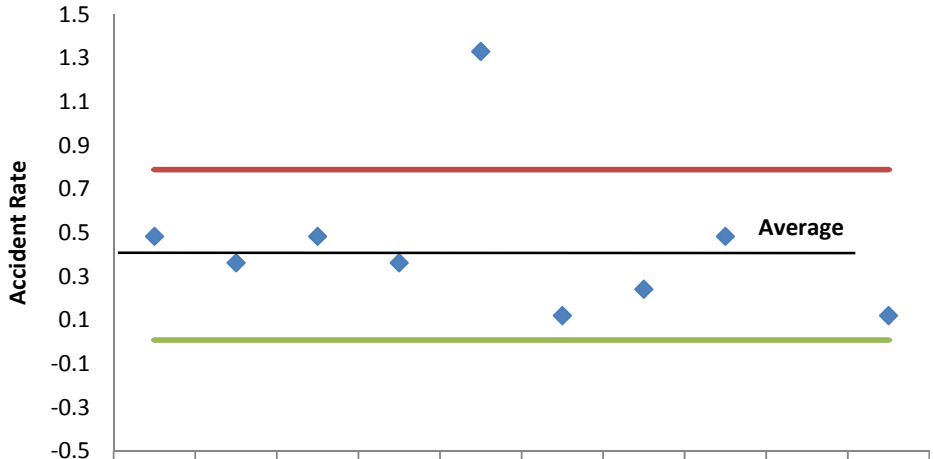
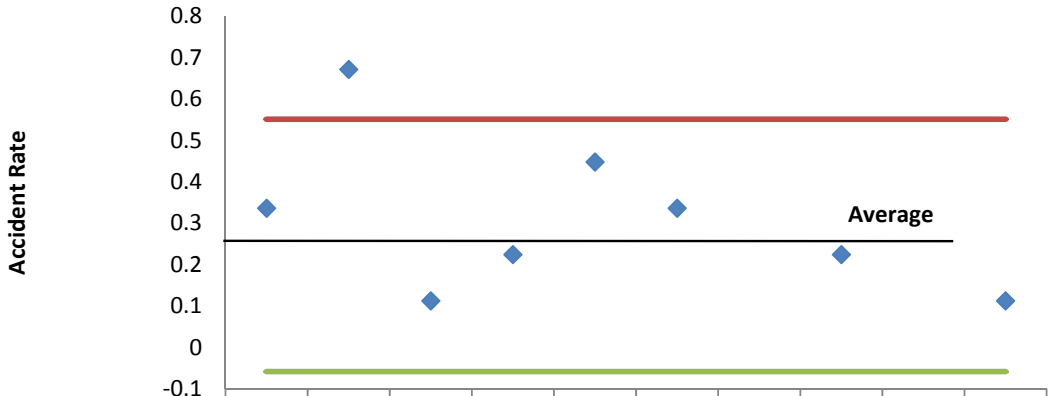


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.48381	0.36286	0.48381	0.36286	1.33049	0.12095	0.24190	0.48381		0.12095
Upper control limit	0.78921	0.78921	0.78921	0.78921	0.78921	0.78921	0.78921	0.78921	0.78921	0.78921
Under control limit	0.00908	0.00908	0.00908	0.00908	0.00908	0.00908	0.00908	0.00908	0.00908	0.00908

Average Accident rate = 0.399147759

Figure 4.34 Accident Distribution Semarang Highway Section C Report Year 2006

From the analysis in section C in 2006 from figure 4.34 is define the lowest accident in 2006 in section C are at mile 17+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 13 + 000 – 14 + 000 which were total accident is 11 where that the accident rate is 1,330 with the upper control limit of 0,789 and under the control limit of 0,00908 where is the highest value that the accident rate is in mile 13+000-14+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

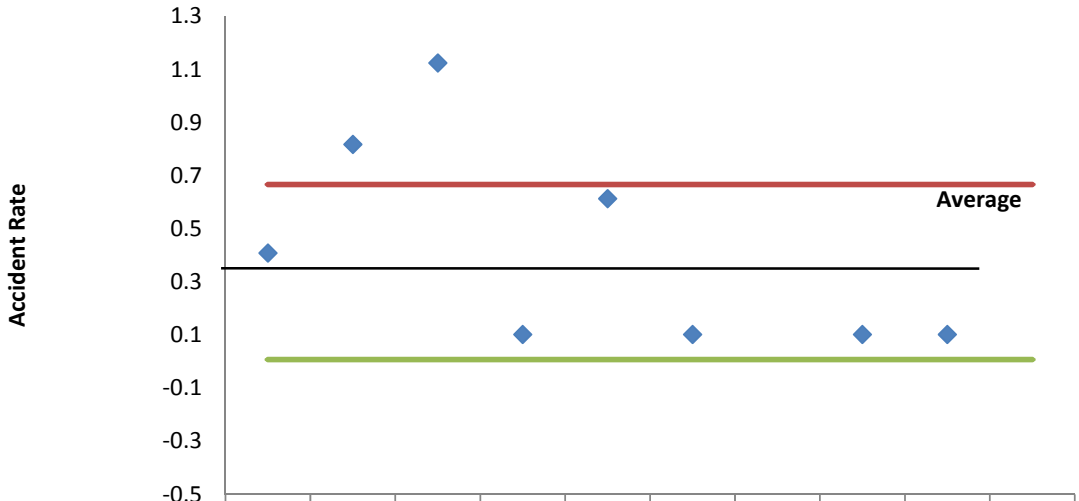


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.335805	0.671611	0.111935	0.223870	0.447740	0.335805		0.223870		0.111935
Upper control limit	0.551265	0.551265	0.551265	0.551265	0.551265	0.551265	0.551265	0.551265	0.551265	0.551265
Under control limit	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875	-0.05875

Average Accident rate = 0.246257446

Figure 4.35 Accident Distribution Semarang Highway Section C Report Year 2007

From the analysis in section C in 2007 from figure 4.35 is define the lowest accident in 2007 in section C are at mile 15+000 – 16+000 and 17+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 which were total accident is 6 where that the accident rate is 0,671 with the upper control limit of 0,551 and under the control limit of -0,0587 where is the highest value that the accident rate is in mile 10+000 – 11+000 are positioned above the upper control limit, which that's means bad and cannot be tolerated.

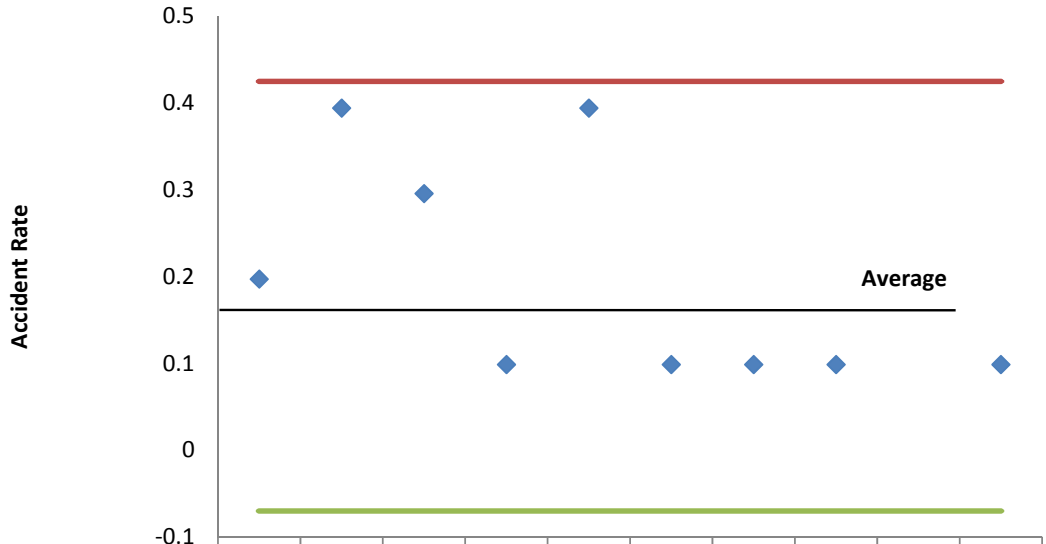


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.4088380	0.8176761	1.1243046	0.1022095	0.6132570	0.1022095		0.1022095	0.1022095	
Upper control limit	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053	0.6669053
Under control limit	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774	0.0076774

Average Accident rate = 0.337291397

Figure 4.36 Accident Distribution Semarang Highway Section C Report Year 2008

From the analysis in section C in 2008 figure 4.36 is define the lowest accident in 2008 in section C are at mile 15+000 – 16+000 and 18+000 - 19+000 where is the accident rate is zero, and the most accidents are at mile 11 + 000 – 12 + 000 which were total accident is 11 where that the accident rate is 1,124 with the upper control limit of 0,666 and under the control limit of 0,0076 where is the highest value that the accident rate is in mile 11+000-12+000 are positioned highest above the upper control limit after that the second above upper control limit about mile 10+000-11+000 is 0,8176 which that's means bad and cannot be tolerated andthen for the Km 6 accident rate about 0,102 approach upper control limit that's danger postioned.

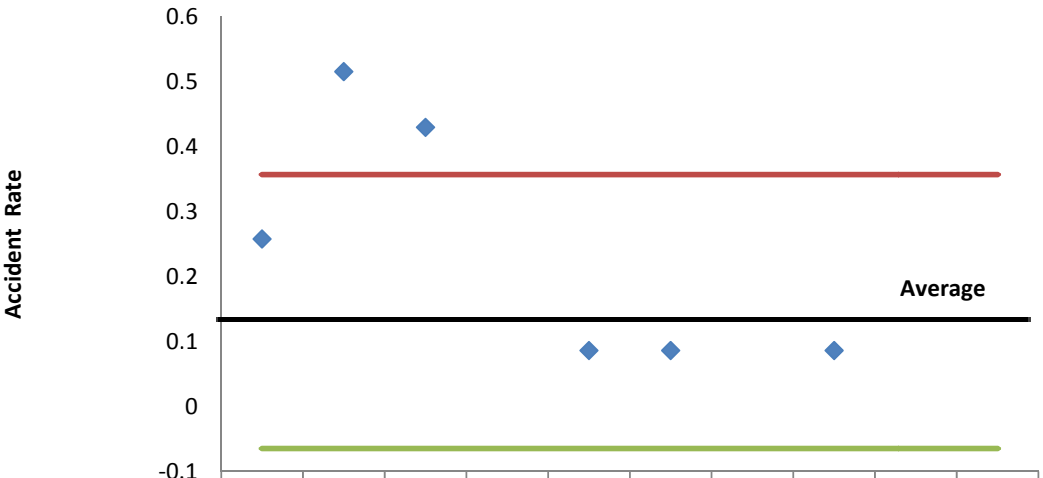


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.1970884	0.3941768	0.2956326	0.0985442	0.3941768	0.0985442	0.0985442	0.0985442		0.0985442
Upper control limit	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680	0.4249680
Under control limit	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208	-0.070208

Average Accident rate = 0.177379572

Figure 4.37 Accident Distribution Semarang Highway Section C Report Year 2009

From the analysis in section C in 2009 from figure 4.37 is define the lowest accident in 2009 in section C are at mile 17+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 and 13+000 – 14+000 which were total accident is 4 where that the accident rate is 0,394 with the upper control limit of 0,424 and under the control limit of -0,070 where is the highest value that the accident rate is in mile 10+000 -11+000 and 13+000-14+000 are positioned approach the upper control limit, which that's danger postioned.

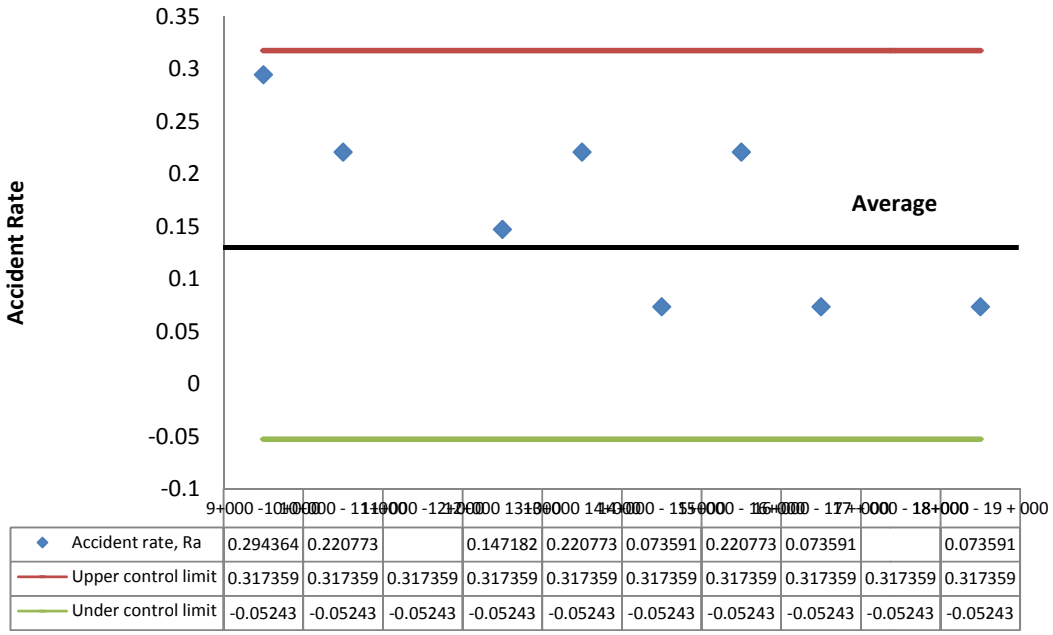


	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.257485	0.51497	0.429141		0.085828	0.085828		0.085828		
Upper control limit	0.356682	0.356682	0.356682	0.356682	0.356682	0.356682	0.356682	0.356682	0.356682	0.356682
Under control limit	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486	-0.06486

Average Accident rate = 0.145908156

Figure 4.38 Accident Distribution Semarang Highway Section C Report Year 2010

From the analysis in section C in 2010 from figure 4.38 is define the lowest accident in 2010 in section C are at mile 12+000 – 13+000, 15+000- 16+000, 17+000 - 18+000 and 18+000 – 19+000 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11 + 000 and which were total accident is 6 where that the accident rate is 0,5149 with the upper control limit of 0,356 and under the control limit of -0,064 where is the highest value that the accident rate is in mile 10+000-11+000 are positioned above the upper control limit andthen the second accident rate 11+000-12+000 about 0,429 above upper control limit, which that's means bad and cannot be tolerated.

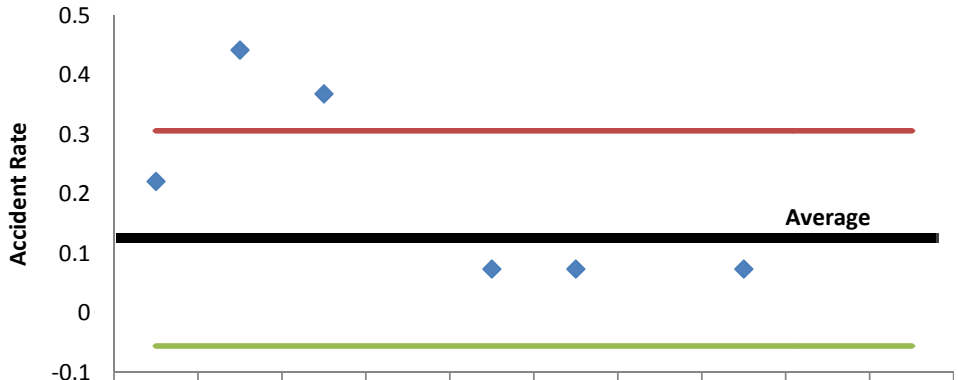


	9+000 -10+000	10+000 - 11+000	11+000 -12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17+000	17+000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.294364	0.220773		0.147182	0.220773	0.073591	0.220773	0.073591		0.073591
Upper control limit	0.317359	0.317359	0.317359	0.317359	0.317359	0.317359	0.317359	0.317359	0.317359	0.317359
Under control limit	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243	-0.05243

Average Accident rate = 0.132464123

Figure 4.39 Accident Distribution Semarang Highway Section C Report Year 2011

From the analysis in section C in 2011 from figure 4.39 is define the lowest accident in 2011 in section C are at mile11+000 – 12+000, and 16+000 - 18+000 where is the accident rate is zero, and the most accidents are at mile 9 + 000 – 10+ 000 and which were total accident is 4 where that the accident rate is 0,294 with the upper control limit of 0,317 and under the control limit of -0,052 where is the highest value that the accident rate is in mile 9+000-10+000 are positioned Approach the upper control limit, which that's danger positioned.



	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
Accident rate, Ra	0.22077	0.44154	0.36795		0.07359	0.07359		0.07359		
Upper control limit	0.30582	0.30582	0.30582	0.30582	0.30582	0.30582	0.30582	0.30582	0.30582	0.30582
Under control limit	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556	-0.0556

Average Accident rate = 0.125105005

Figure 4.40 Accident Distribution Semarang Highway Section C Report Year 2012

From the analysis in section C in 2012 from figure 4.40 is define the lowest accident in 2012 in section C are at mile 12+000 – 13+000, 15+000 – 16+000, 16+000 - 18+000, and 18+000 – 19+000 where is the accident rate is zero, and the most accidents are at mile 10 + 000 – 11+ 000 and which were total accident is 6 where that the accident rate is 0,441 with the upper control limit of 0,305 and under the control limit of -0,055 where is the highest value that the accident rate is in mile 10+000-11+000 are positioned above the upper control limit andthen the second highest accident rate at mile 11+000-12+000 about 0,367 the positioned above upper control limit, which that's means bad and cannot be tolerated.

4.3 Evaluated analysis by year

Based on this case study conducted , it has been found that from length in Km, average daily traffic and then accident per Km after that we will found the significant factor vehicle miles Km, accident rate, upper control limit, and under control limit. The study has shown that, during 2003 to 2012 at Semarang toll way from the section A the accident roommates ranging 0,308 to 1,147, while for section B and the accident rate was very high for every year roommates ranging 0,356 to 1,280 and for the last section was section C the accident rate was very high for every year roommates ranging 0,294 to 1,124. It can be concluded that the section B On the critical area Km accident rate, it was shown that during 2003 to 2012 at Semarang toll way.

The section A in 2003 from the eight Km are the smallest accident rate of 0,1925 occurred at mile 0+000- 1+000, 3+000- 4+000 and 7+000- 8+000 and the greatest rate of 0,5777 Accident occurred at 5+000- 6+000 after that in 2004 an increase in the accident rate for the smallest occurred at mile 4+000- 5+000 about 0,358 and for the accident rate is greatest in 1,076 after a decline Accident rate back in 2005 that is equal to the smallest occurred at mile 2+000- 3+000 about 0,163 and for the largest Accident rate in the previous year there was an increase in the amount of 1,147 occurred at mile 5+000- 6+000 and this is the greatest accident rate in section A of the 2003 - 2012. in 2006 there was a slight increase in the accident rate that is equal to the smallest occurred at mile 3+000 – 4+000 about 0,168 and a decrease in accident rate occurred in the largest being 0,674 miles 5+000 -6+000 while in 2007 there was a slight decrease in accident rate is the smallest amount that occurred at miles 0+000 – 1+000, 1+000 – 2+000, 4+000- 5+000 and 7+000 – 8+000 about 0,160 and the largest decrease for the accident rate to be happening at miles 5+000 – 6+000 and 6+000- 7+000 about 0,480 in 2008 here in after smallest accident rate fell back to 0,144 occurred at miles 0+000-1+000, 4+000-5+000, 6+000- 7+000 for the greatest accident rate increased to 0,723 which occurred at mile 0+000 – 1+000 and 5+000 – 6+000 in 2009 there was a slight decrease in return for the smallest accident rate happened to be 0.138 at miles 2+000 – 3+000 and 7+000 – 8+000, while for the greatest accident rate decreased slightly to 0,694 happening in miles 5+0000 – 6+000 and in 2010 for the smallest accident rate decreased again to 0,124 happening in miles 0+000 - 1+000 and 2+000 – 3+000 while the accident rate for the largest also experienced a slight decrease from the previous year to 0,622 happening in mile 5+000 – 6+000 for the 2011 accident rate fell back into the smallest occurring at miles 0+000 – 1+000, 3+000 – 4+000,

7+000 – 8+000 about 0.102 for the greatest accident rate also decreased from a year earlier to 0.308 happening in miles 4+000 – 5+000 and 5+000 – 6+000, while in 2012 the smallest accident rate fell back to 0.079 which occurred at miles 1+000 – 2+000, 5+000 – 6+000, and 6+000 – 7+000 and for the greatest accident rate an increase from a year earlier to 0,477 happening in mile 0+000 – 1+000. On The Section A was very high for every year roommates area 5 +000 - 6 +000 is an area of about 61,5% the highest accident rate spot rate and then after that is the area 0 +000 - 1 +000 and 6 +000 - 7 +000 about 15,3% and the last area for section A is 4 +000 - 5 +000 about 7,69%.

section B for the accident rate in 2003 which is the smallest amount that occurred at mile 13+000 – 14+000 about 0,104 while the largest is the accident rate happened to miles 9+000-10+00 and 10+000 – 11+000 about 0,943 while in 2004 for the smallest accident rate decreased slightly to that occurred at miles 12+000 – 13+000, and 13+000 – 14+000 about 0,098 while for the greatest increase occurring in 1,280 area 10+000 – 11+000 is the accident rate is greatest in 2003 to 2012. And in 2005 the smallest accident rate increased to an increase in mile 13+000 – 14+000 about 0,186 and for the greatest accident rate decreased to 1,119 in area 10+000 – 11+000 subsequent accident rate in 2006 fell to 0.099 smallest occurring in area 8+000 – 9+000 and the accident rate The biggest decline is also occurring at mile 10+000 – 11+000 about 0.994, in 2007 the smallest accident rate has decreased slightly going back to 0,095 in the miles 8+000 – 9+000 and 12+000 – 13+000 while the greatest accident rate has increased from a year earlier to 1,190 occurring in mile 10+000 – 11+000. In 2008 the smallest accident rate slightly decreased to 0,094 happening in area 13+000 – 14+000 and the greatest accident rate also decreased to 0,851 happening in mile 9+000 – 10+000. In 2009 the accident rate has decreased again be the smallest occurring at mile 11+000 – 12+000 about 0,088, while the greatest accident rate also decreased to 0,444 happening in area 10+000 – 11+000. In 2010 the smallest accident rate increased to 0,242 which occurred at mile 10+000 -11+000 and 12+000 – 13+000 while the greatest accident rate also increased from a year earlier to 0,565 happening in area 9+000 – 10+000. In 2011 the accident rate decreased to 0,069 smallest occurring in mile 13+000 – 14+000 and for the largest reduction in accident rate happened to be 0,555 area 9+000 – 10+000 where as last year is 2012 for the smallest accident rate fell back to 0,059 which occurred at mile 13+000 – 14+000 and for the greatest accident rate also decreased to 0,356 happening in area 9+000 – 10+000. On critical area of section B Km accident rate

was very high roommates area 9 +000 - 10 +000 and 10 +000 - 11 +000 and then about 50% every Km.

For section C accident rate in 2003 is the smallest amounts occurred at miles 10+000 – 11+000, 15+000 – 16+000, 16+000 – 17+000 and 18+000 – 19+000 about 0,128 and for the greatest accident rate that is equal to 0,641 which occurred at area 11+000 – 12+000 subsequent to the 2004 at section C the smallest accident rate decreased to 0,118 occurring mile 17+000 – 18+000 and became the greatest accident rate that occurred at mile 12+000 – 13+000 about 0,711 and for 2005, a decline from the previous year for the smallest accident rate is going to be 0,111 in miles 15+000 – 16+000 and 18+000 – 19+000 while for the greatest accident rate that occurred at miles 10+000 – 11+000 and 11+000 – 12+000 about 0,666. In 2006 there was an increase for the smallest accident rate happened to be 0,120 area 14+000 – 15+000 and 18+000 – 19+000 while the greatest accident rate happened to be 1,330 mile 13+000 – 14+000 This is the greatest accident rate that occurred in the year 2003 to 2012 that occurred in section C. later in 2007, a decline in the accident rate to occur at miles 11+000 – 12+000 and 18+000 – 19+000 about 0,111 while for the greatest accident rate happened to be 0,671 area 10+000 – 11+000. And in 2008 a decline back to the smallest accident rate that occurred at miles 12+000 – 13+000, 14+000 – 15+000, 16+000 – 17+000, and 18+000 – 19+000 about 0,102 and for the greatest accident rate hike from the previous year to 1,124 happening in area 11+000 – 12+000. In 2009 the smallest accident rate decreased from the previous year to 0,098 happening in miles 12+000 – 13+000, 14+000 – 15+000, 16+000 – 17+000, and 18+000 – 19+000 while for the greatest accident rate happened to be 0,394 miles 10+000 – 11+000 and 13+000 – 14+000. In 2010 the smallest accident rate decreased again going back to 0,085 in the miles 13+000 – 14+000, 14+000 – 15+000 and 16+000 – 17+000 while the accident rate was greatest increase from the previous year to 0,514 happening in area 10+000 – 11+000. In 2011 the accident rate decreased again from a year earlier to 0,073 happening in miles 16+000 – 17+000 and 18+000 – 19+000 and for the greatest accident rate, a decline from a year earlier to 0,294 happening in area 9+000 – 10+000. And for the last accident in 2012 has the smallest rate the same position as the previous year at that occurred at area 13+000 – 14+000, 14+000 – 15+000, and 16+000 – 17+000 about 0,073 while the greatest accident rate increased to 0,441 which occurred at mile 10+000 – 11+000. The last section was very high C roommates area 10 +000 -11 +000 about 41,6% after 11 +000 - 12 +000 about 25% after that area miles 13 +000 - 14 + 000 about 16,6% and area 9 +000 - 10 +000

and 12+000 – 13 +000 about 8,3%. has the highest accident rate maximum is 1,280 of the third section.

4.4 Evaluated accident analysis with field conditions

Section A

Source : Survey, 2013

Figure 4.71 Location KM 1

According to the previous analysis found that in section A miles 0+000 – 1+000 need particular note because the results in the year 2012 the value of accident rate is very bad and can not tolerate the accident rate is above the upper control limit while in the field conditions seen in the figure is a factor that affects 4.71 accident according to an interview with the head of the PT. Jasa Marga is due to road conditions and cornering sharply declined slightly.

Source : Survey, 2013

Figure 4.72 Location KM 6

In mile 5+000 – 6+000 section A in 2003, 2005, 2006, 2010 also in getting the results of the analysis of accident rates which are above the upper control limit, which means very bad and can not be tolerated again, if you look at the condition of the field at Km 6 can be seen from the figure 4.72 that which affects the accident from interviews obtained from the head PT. Jasa Marga is a very uphill road conditions caused the truck - the truck can not go up and sometimes can not be controlled, and some are due to the uphill road conditions caused the vehicle exhaust be pitch black so the impact to the vehicle behind him and is also the cause of the accident factor.

Source : Survey, 2013.

Figure 4.73 Location KM 7

At mile 6+000 – 7+000 section A of the analysis of the results obtained in the 2004 accident rate is above the upper control limit, which means the value of accident rate is bad and can not be tolerated again, if you look at the condition of the field Km 7 is a very sharp curved road that can be seen in 4.73 figure that the cause of accident occurs based on interviews conducted by the head of the PT. Jasa Marga.

Section B

Source : Survey, 2013.

Figure 4.74 Location KM 10

In section B mile 9+000 – 10+000 which means it is at KM 10 of the analysis in 2003, 2006, 2008, 2010, 2011, and 2012 obtained accident rate is above the upper control limit which means it is bad and can not be tolerated and can be seen in Figure 4.74 that the condition of the field is the way that the sharp drop of the interview were made known (PT. Jasa Marga) that the accident occurred because of the many factors trucks or large vehicles who have problems with the brakes so that the vehicle can not control, and can be seen in the figure that PT. Jasa marga has provided a means that road safety as a reduction in fatality rate in accidents.

Source : Survey, 2013.

Figure 4.75 Location KM 11

In Section B mile 10+000 – 11+000 of the analysis in 2003, 2004, 2005, 2006, 2007 and 2011 found that the accident rate is above the upper control limit that is in poor condition and can not be tolerated, and if you look at the condition in the field can be seen in Figure 4.75 is in the form of a very sharp turn and continued down the road so that the position of the interviews conducted by the head of the PT. Jasa Marga many drivers who fail at high speed which could not control the vehicle.

Section C

Source : Survey, 2013.

Figure 4.76 Location KM 11

In section C area 10+000 – 11+000 precisely located at Kilometer 11 of the analysis in 2003, 2005, 2007, 2008, 2010, and 2012 found that the accident rate is above the upper control limit which means the number is bad and can not be tolerated again, and can be seen from the field in Figure 4.76 of the condition of the road is a steep downhill road conditions and ending with turning, so that the results of interviews conducted by the head of the PT Jasa Marga is a lot of use of vehicles, especially trucks and buses are less able to control the vehicle to brake and thus accidents.

Source : Survey, 2013.

Figure 4.77 Location KM 12

In section C 2005, 2008, 2010, and 2012 obtained the results of the analysis at mile 11+000 – 12+000 that is precisely located at KM 12 that the accident rate on the analysis above the upper control limit, which means these are bad and can not be tolerated again so that it can be seen in Figure 4.77 that road conditions in the field that the frequent occurrence of the accident according to the interview of the head of PT Jasa Marga is near the tunnel because of the road conditions are sharp cornering so many drivers who fail at high speed that can not be controlled vehicle resulting in an accident.

Source : Survey, 2013.

Figure 4.78 Location KM 14

In section C mile 13+000 – 14+000 exactly Km 14 when the field is obtained from the analysis in 2006, the value of accident rate is above the upper control limit, which means the number of accident is bad and can not be tolerated again, and when seen in Figure 4.78 state road conditions are the branches door followed by the sharp twists based on the results of interviews conducted by the head of the PT. Jasa Marga known that the accident occurred because the driver was negligent is usually a path that will be chosen.

CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusions Obtained From The Research

The main objective of this study have been successfully Achieved. The first objective was way Determine source of accident rate per km at Semarang toll way and after that Secondly determining the standard maximum critical area is the upper control limit and the minimum critical area under control limit per Km at Semarang toll way.

a. From investigate the accident on toll way in semarang the contribute problem for vehicle about the truck condition because of overload, human factor about neglecting on the semarang toll way drive, and Road While the analysis of the link between the results of the analysis are obtained and the conditions on the ground in section A at kilometer 6 is because there is a sharp rise, kilometer 7 is due to very sharp curved road and kilometer 1 is due to due to road conditions and cornering sharply declined slightly. While in section B at kilometer 10 of the road there is a condition field is the way that the sharp drop, while the 11 kilometer road which is the very sharp turn and continued down the road, and in section C is located at mile 11 because the road is a steep downhill road conditions and ending with turning. At kilometer 12 which contained the tunnel Because of the road conditions are sharp cornering and the latter is a 14 kilometer road that is the path that will be chosen.
b. On semarang toll way treatment undertaken to improve toll way safety needs improvement based on corner alignment superelevasi, lighting on semarang toll way, and given information sigh on the before critical area.
c. The accident critical area From the analytical results obtained for section A from 2003 to 2012 kilometer area that needs to be very aware of is mile 5+000 – 6+000 accident occurred in the year (2003, 2005, 2006, 2010) mile 6+000 – 7+000, namely in 2004 and area 0+000 – 1+000, which occurred in 2012, because the point - the point is beyond the point of the upper control limit, which means very bad and indicates there is a problem at that point. For section B from 2003 to 2012 kilometer area that needs to be very noticed because it exceeds the upper control limit which means it is very bad and can not tolerate the area 9+000 – 10+000 accidents in the year (2003, 2006, 2008, 2010, 2011, 2012) and area 10+000 – 11+000 accidents in the year (2003, 2004, 2005, 2006, 2007, and 2011). And the next is section C on the toll way semarang in 2003 to 2012 in the area that needs to be highly noticed in the analysis because it exceeds the upper control limit line which means it is very bad and not biased in tolerance is mile

10+000 – 11+000 accidents occurred in the year (2003, 2005, 2007, 2008, 2010, 2012). Area 11+000 – 12+000 occurred in the year (2005, 2008, 2010, 2012) and area 13+000 – 14+000 that occurred in 2006. Upper control limit and under limit control aspect at toll way during 2003 - 2012 shown that, for section A upper control limit ranging about 0,289 to 0,996 and for under control limits ranging about -0,042 to -0,2020. Section B for the upper control limit ranging about 0,0286 to 0,843 and then under the control limit about -0,0123 to 0,115 and then for the last section C upper control limit ranging about 0,3058 to 0,789 and then for under control limit of about -0,0017 to 0,0098.

5.2 Recommendation

By applying this research in Semarang toll way, Recommendations were drawn:

a. There were needs to be a means of supporting facilities and services in the areas of traffic after the accident that the highest specially section A Km 1, 6,and 7, section B Km 10, and 11. For section C 11, 12, 14 to the area above the upper control limit to be from the analysis result and the area Km approach from the upper control limit analysis result for the accident faster signed. need to be added in the form highway lighting fasillitas A kilometer on section 6, needs improvement based on corner alignment superelevasi contained A kilometer section 1, and 7 section B at kilometer 10, and 11, section C 11, and 12 as well as the need for additional signs - traffic signs in accordance with the existing road conditions.

b. To minimize the accident toll way is Necessary to pay special attention to the location of the accident area specially mile for section A, 0+000 – 1+000, 5+000 – 6+000, 6+000 – 7+000, section B 9+000 – 10+000, 10+000 – 11+000 and Section C 10+000 – 11+000, 11+000 – 12+000, 13+000 – 14+000 to the area above the upper control limit to be from the analysis result and the area approach upper control limit from the analysis result with the highest standards of safety driving instruction in toll way authority given by such signs regarding safety driving.

c. The models developed shows fluctuations in the situation between the time (2003-2012) in which there is a Km from the third section (A, B, and C) there is a poor correlation circumstances and the number of very bad accident fatality

rate roomates corresponds to the Ra factor that more than the upper control limit for all three sections a, namely Km 1, 6, and 7 section B, namely Km 10 and 11 and for section C the Km 11, 12 and 14 so it needs special attention and Km are approaching the point of having upper the control limit for section C the Km 10 and 13 so it should also be a concern for the coming year.

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APPENDIX

(SECTION A, B AND C)

Appendix 1 Methods Of Rangking Highway Section A to Accident report Year 2003

No	Basic data	0+000 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in Km	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	142,25	142,25	142,25	142,25	142,25	142,25	142,25	142,25
3	Accidents	1	0	0	1	0	3	0	1
	Rates								
5	Accidents per Km	1	0	0	1	0	3	0	1
6	Vehicle-miles (km) x 10¯ = M	5,192125	5,192125	5,192125	5,192125	5,192125	5,192125	5,192125	5,192125
7	Accident rate, Ra	0,192599369	0	0	0,192599369	0	0,577798108	0	0,192599369
8	Upper control limit	0,490943131	0,490943131	0,490943131	0,490943131	0,490943131	0,490943131	0,490943131	0,490943131
9	Under control limit	-0,202044077	-0,202044077	-0,202044077	-0,202044077	-0,202044077	-0,202044077	-0,202044077	-0,202044077

Appendix 2 Methods Of Rangking Highway Section A to Accident report Year 2004

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in Km	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	152,68	152,68	152,68	152,68	152,68	152,68	152,68	152,68
3	Accidents	3	0	3	3	2	4	6	0
	Rates								
5	Accidents per Km	3	0	3	3	2	4	6	0
6	Vehicle-miles (km) x 10¯ = M	5,57282	5,57282	5,57282	5,57282	5,57282	5,57282	5,57282	5,57282
7	Accident rate, Ra	0,538327095	0	0,538327095	0,538327095	0,35888473	0,71776946	1,076654189	0
8	Upper control limit	0,996852179	0,996852179	0,996852179	0,996852179	0,996852179	0,996852179	0,996852179	0,996852179
9	Under control limit	-0,054779764	-0,054779764	-0,054779764	-0,054779764	-0,054779764	-0,054779764	-0,054779764	-0,054779764

Appendix 3 Methods Of Rangking Highway Section A to Accident report Year 2005

NO	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10^{2}	167,17	167,17	167,17	167,17	167,17	167,17	167,17	167,17
3	Accidents	3	0	1	3	4	7	2	2
	Rates								
5	Accidents per (Km)	3	0	1	3	4	7	2	2
6	Vehicle-miles (km) x 10^{-} = M	6,101705	6,101705	6,101705	6,101705	6,101705	6,101705	6,101705	6,101705
7	Accident rate, Ra	0,491665854	0	0,163888618	0,491665854	0,655554472	1,147220326	0,327777236	0,327777236
8	Upper control limit	0,940305799	0,940305799	0,940305799	0,940305799	0,940305799	0,940305799	0,940305799	0,940305799
9	Under control limit	-0,038918399	-0,038918399	-0,038918399	-0,038918399	-0,038918399	-0,038918399	-0,038918399	-0,038918399

Appendix 4 Methods Of Rangking Highway Section A to Accident report Year 2006

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10^{2}	162,41	162,41	162,41	162,41	162,41	162,41	162,41	162,41
3	Accidents	0	0	0	1	2	4	3	2
	Rates								
5	Accidents per (Km)	0	0	0	1	2	4	3	2
6	Vehicle-miles (km) x 10^{-} = M	5,927965	5,927965	5,927965	5,927965	5,927965	5,927965	5,927965	5,927965
7	Accident rate, Ra	0	0	0	0,168691954	0,337383908	0,674767817	0,506075862	0,337383908
8	Upper control limit	0,647290817	0,647290817	0,647290817	0,647290817	0,647290817	0,647290817	0,647290817	0,647290817
9	Under control limit	-0,141214954	-0,141214954	-0,141214954	-0,141214954	-0,141214954	-0,141214954	-0,141214954	-0,141214954

Appendix 5 Methods Of Rangking Highway Section A to Accident report Year 2007

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000

1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	171,09	171,09	171,09	171,09	171,09	171,09	171,09	171,09
3	Accidents	1	1	2	2	1	3	3	1
	Rates								
5	Accidents per (Km)	1	1	2	2	1	3	3	1
6	Vehicle-miles (km) x 10¯ = M	6,244785	6,244785	6,244785	6,244785	6,244785	6,244785	6,244785	6,244785
7	Accident rate, Ra	0,160133615	0,160133615	0,320267231	0,320267231	0,160133615	0,480400846	0,480400846	0,160133615
8	Upper control limit	0,678055927	0,678055927	0,678055927	0,678055927	0,678055927	0,678055927	0,678055927	0,678055927
9	Under control limit	-0,117588273	-0,117588273	-0,117588273	-0,117588273	-0,117588273	-0,117588273	-0,117588273	-0,117588273

Appendix 6 Methods Of Rangking Highway Section A to Accident report Year 2008

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	189,23	189,23	189,23	189,23	189,23	189,23	189,23	189,23
3	Accidents	5	1	2	3	1	5	1	3
	Rates								
5	Accidents per (Km)	5	1	2	3	1	5	1	3
6	Vehicle-miles (km) x 10¯ = M	6,906895	6,906895	6,906895	6,906895	6,906895	6,906895	6,906895	6,906895
7	Accident rate, Ra	0,723914291	0,144782858	0,289565717	0,434348575	0,144782858	0,723914291	0,144782858	0,434348575
8	Upper control limit	0,804308993	0,804308993	0,804308993	0,804308993	0,804308993	0,804308993	0,804308993	0,804308993
9	Under control limit	-0,044198987	-0,044198987	-0,044198987	-0,044198987	-0,044198987	-0,044198987	-0,044198987	-0,044198987

Appendix 7 Methods Of Rangking Highway Section A to Accident report Year 2009

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10^{2}	197,34	197,34	197,34	197,34	197,34	197,34	197,34	197,34
3	Accidents	2	3	1	4	3	5	2	1
	Rates								
5	Accidents per (Km)	2	3	1	4	3	5	2	1
6	Vehicle-miles (km) x 10^{-} = M	7,20291	7,20291	7,20291	7,20291	7,20291	7,20291	7,20291	7,20291
7	Accident rate, Ra	0,277665555	0,416498332	0,138832777	0,555331109	0,416498332	0,694163887	0,277665555	0,138832777
8	Upper control limit	0,77125464	0,77125464	0,77125464	0,77125464	0,77125464	0,77125464	0,77125464	0,77125464
9	Under control limit	-0,04238256	-0,04238256	-0,04238256	-0,04238256	-0,04238256	-0,04238256	-0,04238256	-0,04238256

Appendix 8 Methods Of Rangking Highway Section A to Accident report Year 2010

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10^{2}	220,17	220,17	220,17	220,17	220,17	220,17	220,17	220,17
3	Accidents	1	2	1	2	2	5	0	2
	Rates								
5	Accidents per (Km)	1	2	1	2	2	5	0	2
6	Vehicle-miles (km) x 10^{-} = M	8,036205	8,036205	8,036205	8,036205	8,036205	8,036205	8,036205	8,036205
7	Accident rate, Ra	0,124436846	0,248873691	0,124436846	0,248873691	0,248873691	0,622184228	0	0,248873691
8	Upper control limit	0,55112576	0,55112576	0,55112576	0,55112576	0,55112576	0,55112576	0,55112576	0,55112576
9	Under control limit	-0,08448759	-0,08448759	-0,08448759	-0,08448759	-0,08448759	-0,08448759	-0,08448759	-0,08448759

Appendix 9 Methods Of Rangking Highway Section A to Accident report Year 2011

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000

1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	266,82	266,82	266,82	266,82	266,82	266,82	266,82	266,82
3	Accidents	1	0	2	1	3	3	2	1
	Rates								
5	Accidents per (Km)	1	0	2	1	3	3	2	1
6	Vehicle-miles (km) x 10¯ = M	9,73893	9,73893	9,73893	9,73893	9,73893	9,73893	9,73893	9,73893
7	Accident rate, Ra	0,102680685	0	0,205361369	0,102680685	0,308042054	0,308042054	0,205361369	0,102680685
8	Upper control limit	0,414535 51	0,414535 51	0,414535 51	0,414535 51	0,414535 51	0,414535 51	0,414535 51	0,414535 51
9	Under control limit	-0,080823285	-0,080823285	-0,080823285	-0,080823285	-0,080823285	-0,080823285	-0,080823285	-0,080823285

Appendix 10 Methods Of Rangking Highway Section A to Accident report Year 2012

No	Basic Data	0+000 - 1+000	1+000 - 2+000	2+000 - 3+000	3+000 - 4+000	4+000 - 5+000	5+000 - 6+000	6+000 - 7+000	7+000 - 8+000
1	Length in (Km)	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	344,05	344,05	344,05	344,05	344,05	344,05	344,05	344,05
3	Accidents	6	1	0	0	2	1	1	0
	Rates								
5	Accidents per (Km)	6	1	0	0	2	1	1	0
6	Vehicle-miles (km) x 10¯ = M	12,557825	12,557825	12,557825	12,557825	12,557825	12,557825	12,557825	12,557825
7	Accident rate, Ra	0,477789745	0,079631624	0	0	0,159263248	0,079631624	0,079631624	0
8	Upper control limit	0,289373829	0,289373829	0,289373829	0,289373829	0,289373829	0,289373829	0,289373829	0,289373829
9	Under control limit	-0,070386863	-0,070386863	-0,070386863	-0,070386863	-0,070386863	-0,070386863	-0,070386863	-0,070386863

Appendix 11 Methods Of Rangking Highway Section B to Accident report Year 2003

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	261,34	261,34	261,34	261,34	261,34	261,34	261,34
3	Accidents	3	9	8	2	2	1	0

	Rates							
5	Accidents per (Km)	3	9	8	2	2	1	0
6	Vehicle-miles (km) x 10^{-} = M	9,53891	9,53891	9,53891	9,53891	9,53891	9,53891	9,53891
7	Accident rate, Ra	0,31450 1342	0,943504 027	0,838670 246	0,209667 562	0,20966 7562	0,10483 3781	0
8	Upper control limit	0,72399 9086	0,723999 086	0,723999 086	0,723999 086	0,72399 9086	0,72399 9086	0,723999 086
9	Under control limit	0,02481 3634	0,024813 634	0,024813 634	0,024813 634	0,02481 3634	0,02481 3634	0,024813 634

Appendix 12 Methods Of Rangking Highway Section B to Accident report Year 2004

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	278,15	278,15	278,15	278,15	278,15	278,15	278,15
3	Accidents	3	6	13	2	1	1	0
	Rates							
5	Accidents per (Km)	3	6	13	2	1	1	0
6	Vehicle-miles (km) x 10^{-} = M	10,1524 75	10,15247 5	10,15247 5	10,15247 5	10,1524 75	10,1524 75	10,15247 5
7	Accident rate, Ra	0,29549 4448	0,590988 897	1,280475 943	0,196996 299	0,09849 8149	0,09849 8149	0
8	Upper control limit	0,69984 492	0,699844 92	0,699844 92	0,699844 92	0,69984 492	0,69984 492	0,699844 92
9	Under control limit	0,03185 5619	0,031855 619	0,031855 619	0,031855 619	0,03185 5619	0,03185 5619	0,031855 619

Appendix 13 Methods Of Rangking Highway Section B to Accident report Year 2005

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	29377	29377	29377	29377	29377	29377	29377
3	Accidents	4	9	12	5	4	2	0
	Rates							
5	Accidents per (Km)	4	9	12	5	4	2	0
6	Vehicle-miles (km) x 10^{-} = M	10,7226 05	10,72260 5	10,72260 5	10,72260 5	10,7226 05	10,7226 05	10,72260 5
7	Accident rate, Ra	0,37304	0,839348	1,119131	0,466304	0,37304	0,18652	0

		3677	274	032	597	3677	1839	
8	Upper control limit	0,84350 1873	0,843501 873	0,843501 873	0,843501 873	0,84350 1873	0,84350 1873	0,843501 873
9	Under control limit	0,11575 3297	0,115753 297	0,115753 297	0,115753 297	0,11575 3297	0,11575 3297	0,115753 297

Appendix 14 Methods Of Rangking Highway Section B to Accident report Year 2006

		8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	27540	27540	27540	27540	27540	27540	27540
3	Accidents	1	9	10	6	2	3	0
	Rates							
5	Accidents per (Km)	1	9	10	6	2	3	0
6	Vehicle-miles (km) x 10¯ = M	10,0521	10,0521	10,0521	10,0521	10,0521	10,0521	10,0521
7	Accident rate, Ra	0,09948 17	0,895335 303	0,994817 003	0,596890 202	0,198963 401	0,298445 101	0
8	Upper control limit	0,80432 9156	0,804329 156	0,804329 156	0,804329 156	0,804329 156	0,804329 156	0,804329 156
9	Under control limit	0,07679 4475	0,076794 475	0,076794 475	0,076794 475	0,076794 475	0,076794 475	0,076794 475

Appendix 15 Methods Of Rangking Highway Section B to Accident report Year 2007

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	28832	28832	28832	28832	28832	28832	28832
3	Accidents	1	6	12	6	1	3	0
	Rates							
5	Accidents per (Km)	1	6	12	6	1	3	0
6	Vehicle-miles (km) x 10¯ = M	10,5236 8	10,52368	10,52368	10,52368	10,5236 8	10,5236 8	10,52368
7	Accident rate, Ra	0,09502 3794	0,570142 764	1,140285 527	0,570142 764	0,09502 3794	0,28507 1382	0
8	Upper control limit	0,73129 9185	0,731299 185	0,731299 185	0,731299 185	0,73129 9185	0,73129 9185	0,731299 185
9	Under control limit	0,05604 0822	0,056040 822	0,056040 822	0,056040 822	0,05604 0822	0,05604 0822	0,056040 822

Appendix 16 Methods Of Rangking Highway Section B to Accident report Year 2008

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	28941	28941	28941	28941	28941	28941	28941
3	Accidents	0	9	6	4	7	1	0
	Rates							
5	Accidents per (Km)	0	9	6	4	7	1	0
6	Vehicle-miles (km) x 10¯ = M	10,563465	10,563465	10,563465	10,563465	10,563465	10,563465	10,563465
7	Accident rate, Ra	0	0,851993167	0,567995445	0,37866363	0,662661352	0,094665907	0
8	Upper control limit	0,765392522	0,765392522	0,765392522	0,765392522	0,765392522	0,765392522	0,765392522
9	Under control limit	0,073076944	0,073076944	0,073076944	0,073076944	0,073076944	0,073076944	0,073076944

Appendix 17 Methods Of Rangking Highway Section B to Accident report Year 2009

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	30799	30799	30799	30799	30799	30799	30799
3	Accidents	3	4	5	1	3	0	0
	Rates							
5	Accidents per (Km)	3	4	5	1	3	0	0
6	Vehicle-miles (km) x 10¯ = M	11,241635	11,241635	11,241635	11,241635	11,241635	11,241635	11,241635
7	Accident rate, Ra	0,266865096	0,355820128	0,444775159	0,088955032	0,266865096	0	0
8	Upper control limit	0,449534354	0,449534354	0,449534354	0,449534354	0,449534354	0,449534354	0,449534354
9	Under control limit	-0,042882779	-0,042882779	-0,042882779	-0,042882779	-0,042882779	-0,042882779	-0,042882779

Appendix 18 Methods Of Rangking Highway Section B to Accident report Year 2010

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	33930	33930	33930	33930	33930	33930	33930
3	Accidents	0	7	3	5	3	0	0
	Rates							
5	Accidents per (Km)	0	7	3	5	3	0	0
6	Vehicle-miles (km) x 10¯ = M	12,38445	12,38445	12,38445	12,38445	12,38445	12,38445	12,38445
7	Accident rate, Ra	0	0,565224939	0,24223926	0,4037321	0,24223926	0	0
8	Upper control limit	0,442230357	0,442230357	0,442230357	0,442230357	0,442230357	0,442230357	0,442230357
9	Under control limit	-0,026963055	-0,026963055	-0,026963055	-0,026963055	-0,026963055	-0,026963055	-0,026963055

Appendix 19 Methods Of Rangking Highway Section B to Accident report Year 2011

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	39439	39439	39439	39439	39439	39439	39439
3	Accidents	3	8	6	0	2	1	0
	Rates							
5	Accidents per (Km)	3	8	6	0	2	1	0
6	Vehicle-miles (km) x 10¯ = M	14,395235	14,395235	14,395235	14,395235	14,395235	14,395235	14,395235
7	Accident rate, Ra	0,208402294	0,555739451	0,416804588	0	0,138934863	0,069467431	0
8	Upper control limit	0,409344177	0,409344177	0,409344177	0,409344177	0,409344177	0,409344177	0,409344177
9	Under control limit	-0,012387426	-0,012387426	-0,012387426	-0,012387426	-0,012387426	-0,012387426	-0,012387426

Appendix 20 Methods Of Rangking Highway Section B to Accident report Year 2012

No	Basic Data	8+000 - 9+000	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 14+600
1	Length in (Km)	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	46152	46152	46152	46152	46152	46152	46152
3	Accidents	0	6	3	3	3	1	0
	Rates							
5	Accidents per (Km)	0	6	3	3	3	1	0
6	Vehicle-miles (km) x 10¯ = M	16,84548	16,84548	16,84548	16,84548	16,84548	16,84548	16,84548
7	Accident rate, Ra	0	0,356178631	0,178089315	0,178089315	0,178089315	0,059363105	0
8	Upper control limit	0,299991518	0,299991518	0,299991518	0,299991518	0,299991518	0,299991518	0,299991518
9	Under control limit	-0,028617324	-0,028617324	-0,028617324	-0,028617324	-0,028617324	-0,028617324	-0,028617324

Appendix 21 Methods Of Rangking Highway Section C to Accident report Year 2003

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in Km	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	213,42	213,42	213,42	213,42	213,42	213,42	213,42	213,42	213,42	213,42
3	Accidents	3	1	5	0	4	4	1	1	0	1
	Rates										
5	Accidents per Km	3	1	5	0	4	4	1	1	0	1
6	Vehicle-miles (km) x 10¯ = M	7,78983	7,78983	7,78983	7,78983	7,78983	7,78983	7,78983	7,78983	7,78983	7,78983
7	Accident rate, Ra	0,385117519	0,12837250 6	0,641862531	0	0,513490025	0,513490025	0,12837250 6	0,128372506	0	0,128372506
8	Upper control limit	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474	0,593250474
9	Under control limit	-0,079760 45	-0,079 76045	-0,079 76045	-0,079760 45	-0,079760 45	-0,079 76045	-0,079 76045	-0,079760 45	-0,079760 45	-0,079760 45

Appendix 22 Methods Of Rangking Highway Section C to Accident report Year 2004

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in Km	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	231,01	231,01	231,01	231,01	231,01	231,01	231,01	231,01	231,01	231,01
3	Accidents	2	3	5	6	4	4	0	2	1	5
	Rates										
5	Accidents per Km	2	3	5	6	4	4	0	2	1	5
6	Vehicle-miles (km) x 10¯ = M	8,431865	8,431865	8,431865	8,431865	8,431865	8,431865	8,431865	8,431865	8,431865	8,431865
7	Accident rate, Ra	0,23719548	0,3557931733	0,5929886211	0,7115863 45	0,4743908 97	0,4743908 97	0	0,237195448	0,118597724	0,592988621
8	Upper control limit	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668	0,757042668
9	Under control limit	0,0019827 67	0,0019827 67	0,0019827 67	0,0019827 67	0,0019827 67	0,0019827 67	0,0019827 67	0,0019 82767	0,0019 82767	0,0019 82767

Appendix 23 Methods Of Rangking Highway Section C to Accident report Year 2005

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	246,67	246,67	246,67	246,67	246,67	246,67	246,67	246,67	246,67	246,67
3	Accidents	0	6	6	4	5	2	1	4	0	1
	Rates										
5	Accidents per (Km)	0	6	6	4	5	2	1	4	0	1
6	Vehicle-miles (km) x 10¯ = M	9,003455	9,003455	9,003455	9,003455	9,003455	9,003455	9,003455	9,003455	9,003455	9,003455
7	Accident rate, Ra	0	0,666410839	0,666410839	0,444273893	0,555342366	0,222136946	0,111068473	0,444273893	0	0,111068473
8	Upper control limit	0,661347	0,661347	0,661347	0,661347	0,661347	0,661347	0,661347	0,661347	0,661347	0,661347
9	Under control limit	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856	-0,017149856

Appendix 24 Methods Of Rangking Highway Section C to Accident report Year 2006

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	22651	22651	22651	22651	22651	22651	22651	22651	22651	22651
3	Accidents	4	3	4	3	11	1	2	4	0	1
	Rates										
5	Accidents per (Km)	4	3	4	3	11	1	2	4	0	1
6	Vehicle-miles (km) x 10¯ = M	8,267615	8,267615	8,267615	8,267615	8,267615	8,267615	8,267615	8,267615	8,267615	8,267615
7	Accident rate, Ra	0,48381546	0,36286159	0,48381546	0,36286159	1,33049253	0,12095386	0,24190773	0,483815466	0	0,120953866
8	Upper control limit	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107	0,789210107
9	Under control limit	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411	0,009085411

Appendix 25 Methods Of Rangking Highway Section C to Accident report Year 2007

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	24476	24476	24476	24476	24476	24476	24476	24476	24476	24476
3	Accidents	3	6	1	2	4	3	0	2	0	1
	Rates										
5	Accidents per (Km)	3	6	1	2	4	3	0	2	0	1
6	Vehicle-miles (km) x 10¯ = M	8,93374	8,93374	8,93374	8,93374	8,93374	8,93374	8,93374	8,93374	8,93374	8,93374
7	Accident rate, Ra	0,335805609	0,6716112118	0,1119352003	0,2238704006	0,4477408012	0,335805609	0	0,223870406	0	0,1119352003
8	Upper control limit	0,55126515 3	0,55126515 3	0,55126515 3	0,55126515 3	0,55126515 3	0,55126515 3	0,55126515 3	0,551265153	0,551265153	0,551265153
9	Under control limit	-0,0587502 6	-0,058 75026	-0,058 75026	-0,0587502 6	-0,0587502 6	-0,058 75026	-0,058 75026	-0,05875026	-0,05875026	-0,05875026

Appendix 26 Methods Of Rangking Highway Section C to Accident report Year 2008

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	26805	26805	26805	26805	26805	26805	26805	26805	26805	26805
3	Accidents	4	8	11	1	6	1	0	1	1	0
	Rates										
5	Accidents per (Km)	4	8	11	1	6	1	0	1	1	0
6	Vehicle-miles (km) x 10¯ = M	9,783825	9,783825	9,783825	9,783825	9,783825	9,783825	9,783825	9,783825	9,783825	9,783825
7	Accident rate, Ra	0,408838057	0,817676113	1,124304656	0,102209514	0,613257085	0,102209514	0	0,102209514	0,102209514	0
8	Upper control limit	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358	0,666905358
9	Under control limit	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435	0,007677435

Appendix 27 Methods Of Rangking Highway Section C to Accident report Year 2009

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	27802	27802	27802	27802	27802	27802	27802	27802	27802	27802
3	Accidents	2	4	3	1	4	1	1	1	0	1
	Rates										
5	Accidents per (Km)	2	4	3	1	4	1	1	1	0	1
6	Vehicle-miles (km) x 10¯ = M	10,14773	10,14773	10,14773	10,14773	10,14773	10,14773	10,14773	10,14773	10,14773	10,14773
7	Accident rate, Ra	0,19708841 3	0,39417682 6	0,29563261 9	0,09854420 6	0,39417682 6	0,09854420 6	0,09854420 6	0,0985 44206	0	0,0985 44206
8	Upper control limit	0,424 968065	0,424 968065	0,424 968065	0,424 968065	0,424 968065	0,424 968065	0,424 968065	0,4249 68065	0,4249 68065	0,4249 68065
9	Under control limit	-0,070 208922	-0,070 208922	-0,070 208922	-0,070 208922	-0,070 208922	-0,070 208922	-0,070 208922	-0,0702 08922	-0,0702 08922	-0,0702 08922

Appendix 28 Methods Of Rangking Highway Section C to Accident report Year 2010

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	31921	31921	31921	31921	31921	31921	31921	31921	31921	31921
3	Accidents	3	6	5	0	1	1	0	1	0	0
	Rates										
5	Accidents per (Km)	3	6	5	0	1	1	0	1	0	0
6	Vehicle-miles (km) x 10¯ = M	11,651165	11,651165	11,651165	11,651165	11,651165	11,651165	11,651165	11,651165	11,651165	11,651165
7	Accident rate, Ra	0,25748481	0,5149699962	0,4291416315	0	0,0858282727	0,0858283277	0	0,0858283277	0	0
8	Upper control limit	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199	0,35668199
9	Under control limit	-0,06486567 8	-0,06486567 8	-0,06486567 8	-0,06486567 8	-0,06486567 8	-0,06486567 8	-0,06486567 8	-0,0648656 78	-0,0648656 78	-0,0648656 78

Appendix 29 Methods Of Rangking Highway Section C to Accident report Year 2011

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	37229	37229	37229	37229	37229	37229	37229	37229	37229	37229
3	Accidents	4	3	0	2	3	1	3	1	0	1
	Rates										
5	Accidents per (Km)	4	3	0	2	3	1	3	1	0	1
6	Vehicle-miles (km) x 10¯ = M	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585
7	Accident rate, Ra	0,29436471 9	0,22077353 9	0	0,14718235 9	0,22077353 9	0,07359118	0,22077353 9	0,07359118	0	0,07359118
8	Upper control limit	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5	0,31735910 5
9	Under control limit	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9	-0,05243085 9

Appendix 30 Methods Of Rangking Highway Section C to Accident report Year 2012

No	Basic Data	9+000 - 10+000	10+000 - 11+000	11+000 - 12+000	12+000 13+000	13+000 14+000	14+000 - 15+000	15+000 - 16+000	16+000 - 17 + 000	17 + 000 - 18+000	18+000 - 19 + 000
1	Length in (Km)	1	1	1	1	1	1	1	1	1	1
2	Average daily traffic X 10 ²	44934	44934	44934	44934	44934	44934	44934	44934	44934	44934
3	Accidents	3	6	5	0	1	1	0	1	0	0
	Rates										
5	Accidents per (Km)	3	6	5	0	1	1	0	1	0	0
6	Vehicle-miles (km) x 10¯ = M	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585	13,588585
7	Accident rate, Ra	0,22077353 9	0,441547078	0,36795589 8	0	0,07359118	0,07359118	0	0,07359118	0	0
8	Upper control limit	0,30582733 4	0,305827334	0,30582733 4	0,30582733 4	0,30582733 4	0,305827334	0,305827334	0,305827334	0,305827334	0,305827334
9	Under control limit	-0,05561732 3	-0,055617323	-0,05561732 3	-0,05561732 3	-0,05561732 3	-0,055617323	-0,055617323	-0,055617323	-0,055617323	-0,055617323