THE USE OF SPEED BUMP TO INCREASE ALERTNESS AND REDUCE USERS' VEHICLE SPEED CASE STUDY: RAILWAY CROSSING WHICH DOES NOT HAVE A LATCH AT JL. TEMBOK LOR - TEGAL, CENTRAL JAVA,INDONESIA

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Abstract

Railway crossings in Indonesia especially in Tegal regency which does not have a latch potentially causing accident. There are 75 railways crossing, and 63 of them have not been equipped latch (in Tegal). This research studies applied the use of speed bump to raise user alertness and decrease the speed of passing vehicles in the railway crossing without latch at Jl. Tembok Lor - Tegal. The hypothesis of this study were differences in the level of alertness wasaffected by whether or not the installation of speed bump at the railway crossings without latch. This experimental research design with instruments that was a form about there is whether or not the influence of installation the speed bump. Data were collected through observation and documentation. Data were needed of the vehicle speed difference and alertness level data . Perform analysis on the data using hypothesis testing using different test independent.

Keywords: speed bump,railway crossing without latch and alertness.

1. Definitions

1.1.Backgound

Railway level crossing create serious potential conflict points for collisions between road vehicle and trains. Safety at level crossing is a worldwide issue, which increasing attracts the attention of relevant transport authorities, the rail industri and the public. According to a report Source: Ministry of National Development Planning (Bappenas) / Jakarta, June 19, 2014.The findings of the Global Burden of Disease for the year 2010 showed that worldwide deaths due to traffic accidents werethe leading cause of death and the number 8 in the age group 10-29 years of traffic accidents is the leading cause of death number 1 or number two (2). Without this new initiative is ongoing, there will be more than 75 million deaths and 750 million serious injuries over the first 50 years of the 21st century. Would save about 5 million lives and avoid 50 milion serious injury, as well as the sum of US $ 3 trillion in social benefits.In 2013, the number of traffic accidents reached 101 106 with the death toll to 26 416 lives.

These accidents not only cause fatalities, loss and injury of human but also incur huge property, social, moral and economic losses. The financial cost of collisions has been estimated at Rp material losses reached Rp. 254.6 billion per year excluding rail operators and infrastructure. Based on data from the Central Bureau of Statistics in 2012 it is known that in 2002 there were a number of accidents in Indonesia 12 267 accidents and in 2012 it increased to 117 949, or nearly tenfold accidents in ten years. And the factors that cause accidents are as follows: Human: 65.67%, Natural: 1.28%, Airworthiness Vehicle: 9.78%, Airworthiness Street: 10.47%, and Road Infrastructure: 12.80%. Crossing in railway are amongst the most complex of road safety issue, due to the addition of road vehicles with trains operations, trains, and infrastructure. The factors that contributory to collisions is very complex.

2. Methodology

The research uses (used) experimental methods. Firstly we want to know the real condition in field before we give treatment after that we give treatment and observe the different before and after we give treatment. The data were collected with camera to make video recording.

2.1. Field video recording

2.1.1. Setting Camera

Data were collected using camera. The camera erected before railway crossing to capture 20 meters drivers behaviors before railway crossing. The selected study sites were carefully investigated so that the camera was installed in such a way that it was hidden from drivers attention, which may have affected their driving behaviour.

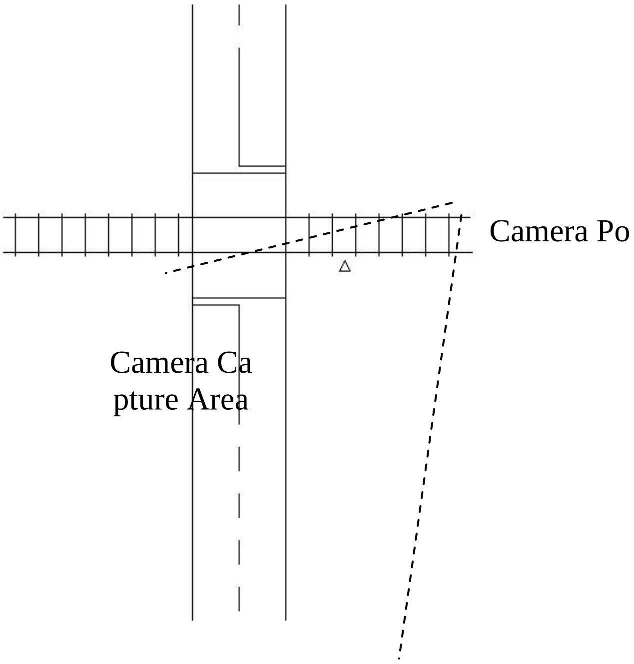

Fig 1. The location of the camera to get the video

Video footage was captured under normal daylight conditions from 15.00 to 15.30 p.m. Data were collected for all vehicle types including passenger vehicles, motorcycles and trucks.

2.2 Speed bump

2.2.1 Speed bump design

There were many kind of traffic calming but in this occasion, speed bumps felt better than other traffic calming. Speed bump was more humanis because even drivers pass speed bumps felt comfortable. Drivers also did not shock when pass the way.

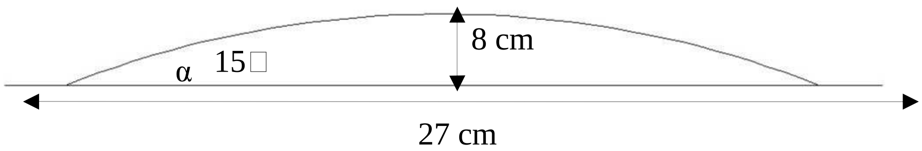

Fig 2. Design of Speed Bump

(look from side)

In other side, speed bumps also can reduce speed from driver until 15 mph to 20 mph. It was efectif to increase driver’s awareness when drivers will pass railway crossing. Lower speed from the driver it could make driver visibilty will be more spacious and can see surrounding clearly.

Materials for speed bumps can be made from concrete, rubber and wood. In this research using wood as material for speed bumps because the wood can be easily moved and did not instal permanently. The Wood shaped like a circular. It can make driver feel comfort and not give shocking effect for the drivers

2.2.2. Choosing distance speed bumps from railway crossing

The other treatment from this research is give difference distance speed bumps from stop line. Give difference distance also make changes in drivers bahavior. There are 2 difference distance, 10 meters and 20 meters from stop line. After data colected, data will compare and observe what the treatment more effectif for make changes drivers bahavior

2.3 Analysis dataFrom the field video recording survey, the time was encoded on each video frame and distances marked during the recording(intervals 10 meters and 20 meters from the stop line or landmarks) The primary data retrieved were:

1) Obey the rules when pass at railway crossing for every vehicle. The rule when pass at railway is a) Have to stop before pass railway,b) Have to reduce speed, c) Have to turning to left and rigt. All of the rule we checked with drivers behaviors. Rule in this

could be become indicator, when the drivers obey the rule it was mean drivers know safety behavior when drivers pass at railway crossing.

2) Obeserving effect speed bumps influence drivers to reduce speed of the vehicle before pass railway crossing. Speed bumps is kind of traffic calming for reduce speed vehicle when lower speed from the driver it can make driver visibilty will be more spacious and can see surrounding clearly
3) Obesrveing where the distance can make effective effect for drivers decrease speed. Location of speed bumps also make different for drivers behavior, distance too far from stop line could be make little effect or the drivers could drive too fast when pass at railway croosing.
4) Level of the awareness from the drivers before and after give treatment with match the rule and behaviors drivers when pass at railway crossing.

3. All colected data will presented with statistic data

The population of this research is all vehicle users who crossings by taking a sample by simple random sampling. Independent variables of this research is the treatment given at level railway crossings without latch and the dependent variable is the level of alertness of road users passing. Data collected through observation and documentation. Data needed on the use of the vehicle speed difference and alertness level data . Perform analysis on the data using hypothesis testing using different test independent sample test.

3.1 Field results

From the video recording, data on site 1 and site 2 is equal there are 50 vehicles were analysed. Fig. 3shows the comparison of compliance behaviour of drivers approaching the crossings at Sites 1 (before give the treatment), 2 (After give the treatment 1 with distance 10 m from the rail ways without latch) and 3 (treatment 2 with distance 1 rail ways). For Site 1 there are so much different result between low, medium and high, because there is not device to control their Alertness and so that their speed. After the treatement have put in some meters from the rail ways without latch, the first data in Site 1 had changed.

The compliance percentage for high score have a good improvement then other, the data can increase from 5 and then 8 and the last is 18 for the last treatment. That means that both of the experimen with different distance for put speed bump is better in 15 meter than 10 meter. For other reason the Chi-squared tests (contingency table technique) performed indicate that driver compliance at speed bump in 20 meter were statistically different at the 2 % confidence level from at the 10 meter (between Sites 1 and 2, X^2 = 14,58 %; between Sites 1 and 3, X^2 = 16,68 %), Such an observation was expected, given the greater rominence of train approach of active systems. as drivers have been found to be unable to accurately judge the speed and distance of an oncoming train (Cohn and Nguyen, 2003; Cooper and Ragland, 2008).

In one of the classical papers that underpin our present road safety strategies, (*Updated Guidelines for the Design and Application of Speed Bumps Margaret Parkhill, P.Eng*., Rudolph Sooklall, M.A.Sc, Geni Bahar, P.Eng.) Within typical residential operational speed ranges, vehicles slow to about 20 mph (32 km/h) on streets with properly spaced speed bumps. Traffic calming activities are carried out to reduce traffic speeds and volumes. Based on the experience of most agencies, it is critical to obtain the support of a substantial majority of all residents in a neighborhood targeted for traffic calming measures, including speed bumps, prior to implementation. Therefore, it is important for agencies to develop a working relationship with communities and have well defined administrative procedures in place. Based on a survey of agencies in North America and around the world, the large majority of agencies (77%) have a formal public consultation process for implementing speed bumps.

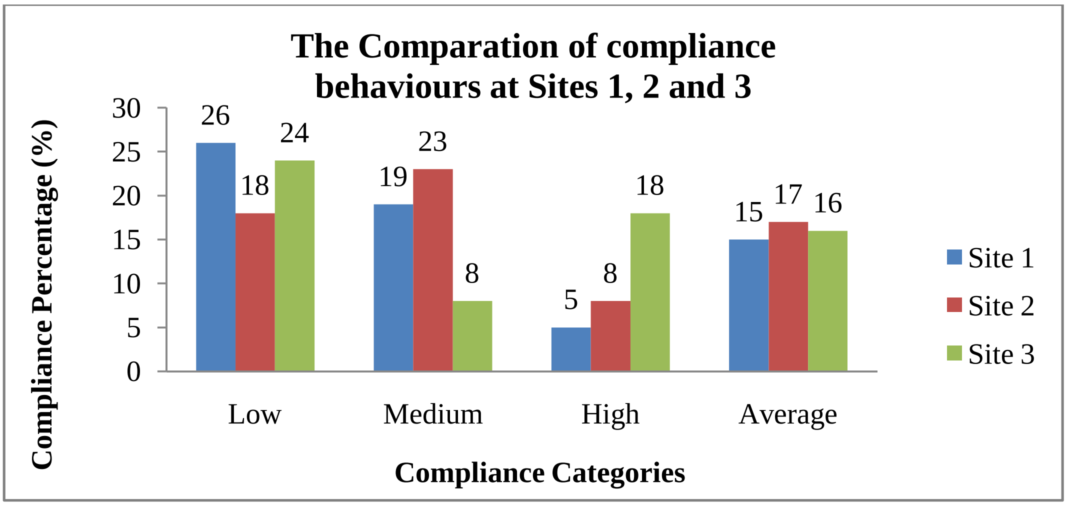

Fig 3. The Comparation of Compliance Behaviours at Sites 1, 2, and 3

From the explanation of the last experiance and the standard have proven with average in site 1 (as real condition before speed bump setting in there) and site 2 or site 3 (as real condition after speed bump setting), althought the result in the table is not so far, but give so many impact and alteration to the behavior of society. Because existence of speed bump will make the driver more distrubed and give shocked efect if the driver or rider is not consentration or nor in focus condition.

Carroll, Multer, and Markos (1995) point out that a search for a train approaching from the rear quadrant takes the driver's eyes completely off the road in front. They go on to say ''If the motor vehicle is still moving forward, it can be quite a dangerous task.'' In the context of railway crossings (Leibowitz, 1985; Richards, 1990; Russell & Kent, 1993),the designer expectation at passive crossings is that drivers of motor vehicles will look in both directions to see if a train is approaching, at a speed that enables them to stop if necessary.

3.2 The Impact of the treatment

Some reasons for non-compliant behaviours were reported in previous studies such as driver familiarity with particular level crossings (Abraham et al., 1998; Caird et al., 2002; Pickett andGrayson, 1996; Wallace, 2008; Wigglesworth, 1979), traffic control devices used (Abraham et al., 1998; Jeng, 2005; Smith, 2004), and drivers' intentional action or/and unintended error (Anandaraoand Martland, 1998; Caird et al., 2002; Cairney, 2003; Davey et al.,2007; Pickett and Grayson, 1996; Wigglesworth, 2001; Witte andDonohue, 2000). The non – compliant behaviours is showed by the score from the experiment have so high in low and medium part, for exactly in Site 1 when the speed bump is not placed ih the area, and the number of score is 26 percent. This score have a meaning that the object still has low in allertness and still using high speed when crossing the rail way, because this score is composite from all of the items that have introduce in the methodology.

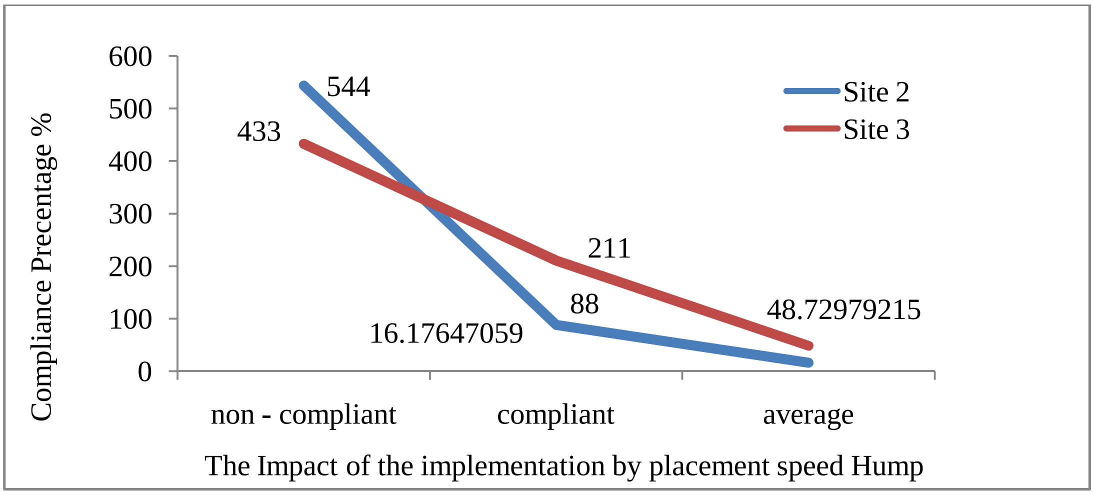

Fig 4. The Impact of the implementation by placement speed Bumps

From Fig 2. That the average is more high Site 3 with the score is 49 % rather then Site 2 16 %, the distance give real impact in the behaviour from the driver. From this research can now and get a knowledge that if the distance is more far from the rail ways infrastructur is more better than the nearer distance (Site 3 is placed in 20 meter and site 2 is placed in 10 meter).

The actions of the driver will more increase about their allertness when they pass speed bumps in 20 meter before the rail ways and they will do decreasing of using their speed in twice that is before pass the speed bumps and before pass the rail way, Because when the speed bumps is place in 10 meter before the rail way the driver just will take one time to decrease the speed and they will focus in the ways to pass the speed bump without focus with the condition that show their allertness. The score of compliant in site 3 is more high then in site 2, and the different is about 41,13 %, almost a half of the score in site 3. That is mean that with 20 meter about the distance is more effective than 10 meter, because the driver and rider has more opportunity to focus in other site, with this ways they can increasing their allertness.

Conclusion

Driver behaviours are important in determining candidate increasing allertness and decreasing speed using for pass railway crossings without latch. The results of this paper

Result	Site 1	Site 2	Site 3
Average for Allertness	8	16	49
Mean	14,58	16,68 %	15,98 %
Standard deviation	3,81	4,08	3,99
Score	729	834	799

Fig 4. The result of used speed

reveal the weaknesses of the placement of the speed bump in 20 meter in site 3 obtaining drivers' respect in compliance and slower reaction to reduce speed. unfortunately, the gaps in the data preclude detailed analysis. Although there have been increases in average for allertness, there are no data on the overall number of crossings nor any breakdown by type of engineering protection, nor on the number of deaths at each type of crossing. It is not possible therefore to update the data of Figure 3 of this paper.

It would be helpful if a similar evaluation could be carried out on the effectiveness of the new ways with right placement reported here. It would be helpful if a similar evaluation could be carried out on the effectiveness of the new ways with right placement reported here. Unfortunately, the data are inadequate. The obvious alternative strategy is to carry out a series of small ''before and after'' field studies. This experiment is very easy and cheap if want to improve.Hence, if an attempt were made at field study evaluation by direct sustainable observation, the study would be severely hampered by the small number of observations each day. Even if, to save cost, the observations were made by, for instance, vehicle-activated video recording, the resulting data would record multiple observations of the behavior of the same small cohort of local drivers who may or may nor be representative of the driving population generally. In these circumstances, this author suggests that there is now a need not only to propose effective low-cost treatments that will help to reduce the risk of injury and death at passive crossings, but also to identify one or more surrogate measures that will allow reliable laboratory or other assessment of the effectiveness of those treatments.

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