

REPORT OF DEPARTMENT OF TRAFFIC AND SAFETY

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SAFETY ZONES

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SYNOPSIS

Pedestrian safety islands and street car safety zones are becoming increasingly necessary, especially on wider thoroughfares. The accident record of well lighted zones is very good but that of poorly lighted ones is very bad. Unless properly built and adequately lighted they constitute a real traffic hazard. Well lighted zones promote safety. Practically all collisions at well lighted zones are the fault of reckless or intoxicated drivers and not the fault of the zone for being there. The paper describes a number of both good and bad installations that have been used in American cities.

Safety zones, like other facilities for the safety and convenience of pedestrians while in the public highway are the unloved stepchildren of those charged with the duty of highway construction and the preservation of street safety. Highway engineers thinking almost solely in terms of unobstructed automotive mileage, have given practically no consideration whatever to the needs of other than motor traffic. As a result, streets and highways are raging torrents of traffic without a single stepping stone on which the adventurous pedestrian may pause for refuge. Similarly, so little attention has been given to foot traffic moving in the same directions along the highway as motor traffic, that for every 10,000 miles of paved rural highway there is a scant two miles of surfaced walk on which the pedestrian may travel with reasonable security.

The lack of interest in safety islands goes back, I believe to a widely held

theory that any obstruction in the paved way is an unmitigated nuisance. Some few voices, however, have continued to cry out in the wilderness urging such unorthodox things as permanent obstructions in the form of paved areas or marker signals of substantial construction in the throats of intersecting streets. But because these were in the general category of "obstructions" the majority of engineers would have nothing to do with them until very recently. Now there seems to be a very definite swing in favor of some of these obstructions when they are properly placed, marked and lighted. As an indication of this, the Manual on Uniform Traffic Control Devices of the National Conference on Street and Highway Safety, recently published, devotes considerable space to safety zones, both for pedestrians and jointly for pedestrians and street car patrons. It is the latter type which I propose to discuss primarily, but the paper will show also

how experience with these can be used to advantage in the construction of pedestrian islands

EXTENT OF SAFETY ZONE USE

At the present time there are approximately 3,000 safety zones of the so-called "protected" type in the 90 cities of over 100,000 population in the United States in which there is local electric railway service. Included in this number are only those zones having any one or all of the following features:

- 1 Raised platform
- 2 End abutment or warning beacon
- 3 Permanently inserted posts

WHO BEARS SAFETY ZONE COST?

Most of these safety zones have been built and are lighted and maintained by the city, although in some cases the railway company bears the expense. Specifically, safety zones are constructed at the expense of the city in 69 per cent of the places, at the expense of the company in 28 per cent and jointly by the city and company in 3 per cent. Eighty-five per cent of the cities light safety zones at their own expense and the remainder are lighted by the railway companies.

It seems to me quite clear that the expense of safety zone construction is an obligation of the city rather than of the railway company. Safety zones are constructed for the convenience and safety of the traveling public, motorists, pedestrians and street car passengers. Each group benefits through the proper use of protected zones. The speed of motor traffic is increased by eliminating the necessity for stopping frequently behind standing street cars, the street car passenger is provided a safe place to await the arrival of a street car or an opportunity to pass to the curb after having

alighted and pedestrians bound from one side of the street to the other are given added protection. In addition the speed of street car operation may be increased due to faster loading and unloading, especially on streets where the motor traffic is so heavy that street car passengers prefer to wait at the curb for the arrival of the car.

It seems reasonable, therefore, that safety zones should be constructed by the public through the agency of the municipal government, just as are other adjuncts of the street system which are useful to all groups, such as sidewalks, street name signs, direction signs, street lights and traffic signs and signals.

SAFETY ZONE COLLISIONS

Objections to safety zones usually come from motorists and are based on two principal grounds: (a) that they reduce the width of pavement for moving traffic, and (b) that they are a frequent source of accidents.

That the first objection is not valid can easily be proved. Safety zones considerably expedite the flow of traffic by enabling automobiles to pass standing street cars. In addition, if automobiles are allowed to pass to the left of the zones, the effective width of pavement for moving traffic is no less than in mid-block when parking is allowed. As passing to both the left and right has come to be the general rule, little objection can longer be raised on this score.

From the standpoint of accidents, on the other hand, the safety zone has both advantages and disadvantages. While zones effectually protect pedestrians from motor traffic, collisions between vehicles and zones are bound to occur at times. Generally the safety zone is said to have "caused" the accident, on the reasoning

that it would not have occurred in the absence of the zone. However, the fact that a motorist is so unaware of things about him that he can strike a well marked and lighted safety zone is good evidence that he would have followed the same course if there had been no zone, resulting in death or injury to persons who might be standing in the street at that point.

Similarly there are doubtless numerous other instances in which the motorist observes the zone just in time to swerve and avoid hitting it when, in the absence of a clearly marked and lighted obstruction, he would have driven through the car-loading area without observing the pedestrians waiting there.

It is this elusive nature of the accidents which have been prevented by zones, as compared with the definitely ascertainable accidents which are said to be caused by them, which makes it so difficult to prove, statistically, the necessity for safety zones on city streets.

An attempt was made, in this survey, to secure information with respect to accidents involving protected safety zones in order to ascertain the characteristics of zones which affect accident frequency. This was found to be impossible because of the scarcity of accurate data. Scattering information which gives a fair indication of the extent to which safety zones are involved in motor vehicle accidents was secured from a few cities but the information is too meager for the formulation of definite conclusions.

Of 19 cities in which data on safety zone collisions resulting in fatalities are recorded, 13 reported no safety zone fatalities. The number of safety zones in these cities ranged from 1 to 80 each. In the remaining 6 cities there were 35 fatal accidents comprising from 0.7 per

cent to 6.0 per cent of the total fatal accidents in the cities. The number of safety zones in these cities ranged from a minimum of 11 to a maximum of 1019.

In 16 cities in which data on collisions with safety zones resulting in personal injuries were recorded, four reported no personal injury accidents. The number of zones in these cities ranged from 1 to 80. In the other 12 cities safety zone collision injury accidents amounted to from 0.2 per cent to 6.9 per cent of the total injury accidents. The number of zones in these cities ranged from 4 to 1019.

A clearer indication of the extent to which safety zones are involved in accidents is obtainable from the accident rate per zone. Information submitted by 9 cities having more than 50 zones each, was sufficiently complete for this analysis. In these cities the average annual number of fatal accidents ranged from none to 0.047 per zone, with a median of 0.016. Expressed another way, there was, in 1934, one fatal accident for each 21 zones in the city with the worst record. The median city had 1 fatal accident for each 62 safety zones.

The personal injury accident rate per zone ranged from a minimum of none to a maximum of 0.82 with a median of 0.28. In other words in the city with the highest personal injury accident rate per zone there was 1 personal injury accident for each 1.2 zones while in the median city there was 1 personal injury accident for each 3.6 zones. The city with no safety zone accidents is Milwaukee with its so-called "bumperless zone" which will be described later.

Interesting information with respect to the action or condition of drivers involved in safety zone accidents in 1934 was furnished for St. Louis. A report by Charles

G Gonter, Traffic Engineer, showed 98 safety zone collisions resulting in 72 injuries of which two were fatal. Of 64 accidents for which full information was available, the report shows that the driver had been drinking or was drunk or asleep at the wheel in 34 instances, amounting to 53 per cent of all collisions in which the cause of the accident was known. The fact that so many of these accidents occurred when the driver was, in effect, completely unfitted to operate an automobile serves to show the urgent need of some physical protection for the intending passenger. It is quite probable that the elimination of such drivers from the highway, even though it was accomplished in a rather vigorous manner, may have been the means of preventing death or injury to innocent parties.

Adequate marking and lighting of safety zones are credited, in a number of cities, with having appreciably reduced the objections to them and decreased the number of accidents. In Detroit, Mich., in 1926, a survey of the time of occurrence of safety zone accidents revealed that, during January, February and March no safety zone collisions resulting in injury or death occurred between 8 a. m. and 4 p. m., which roughly includes the hours of unimpaired visibility at that time of the year. More than 50 per cent of all safety zone accidents were found to have happened in the five hours from midnight to 5 a. m. when traffic is at its lowest ebb. Inadequate illumination was deemed to be responsible and experiments were conducted in improving the lighting which have resulted in a considerable decrease in the hazard to motorists.

Some rather absurd things were tried such as the Neon skull and crossbones. Needless to say, it was sufficiently striking to accomplish the desired purpose but

it has certain psychological disadvantages and its use was never extended.

Probably no less effective safety zone warning marker than the following was ever used. About four feet above the pavement and on either side of the pedestal were two steady or flashing amber lights visible to the motorist just before reaching the zone. On top of the pedestal at a height of about 9 feet was a globe, usually red. This was generally a steady light and caused all sorts of confusion. There is a story about a visitor to Detroit who stopped for 13 red lighted safety zones, and then was arrested for passing a red traffic signal.

Under the upper light there was a reflector centered over the standard. Within this was an electric lamp supposed to flood light the pedestal. Obviously this could not have been located in a more useless position for the center of the light beam was directly over the center of the standard and it was practically impossible for any reflected light to show on the pedestal itself. This situation was somewhat improved by offsetting the reflector about 12 inches to the approach side of the pedestal so that light was reflected directly on the side towards motorists. However, the reflector itself was of very poor construction so that a large part of the light was absorbed and never reached the pedestal.

A somewhat similar experience in Cambridge, Mass., is worthy of mention because data are available as to the number of accidents on a fairly large number of zones, both before and after improved lighting was installed. Thirty-one safety zones were placed on Massachusetts Avenue in February 1930. After 168 days the Governor's Committee on Street and Highway Safety reported that accidents of all kinds to pedestrians had in-

creased 112 per cent, that all accidents had increased 50 per cent and that one person had been killed and 124 injured as compared with 31 injured and none killed in a period of similar length before the zones were installed. Eighteen collisions of automobiles with safety islands took place in the period.

After the islands had been in place for two years a more complete survey covering 18 months accident experience was conducted by the Governor's Committee on Street and Highway Safety under the direction of Harold F. Hammond, Traffic Engineer. The average annual number of collisions with safety zones was shown to be 90 for the entire group, at the rate of 2.9 accidents per year per zone with a maximum of 11 collisions at the zone with the highest frequency. The only illumination on the safety zones was a 40 watt hot wire flashing lamp with reflector showing towards approaching traffic. The lights should have flashed 30 times per minute but observation showed that the rate of flashing ranged from 35 to 70 per minute and that some of the flashers were out of commission and the lights were burning steadily.

The investigation showed that 91 per cent of all accidents occurred during hours of darkness and that 50 per cent occurred between 12 midnight and 5 a m. These figures are practically identical with those observed in Detroit.

In the conclusions of the report it is stated:

"1 The lack of proper illumination of island abutments and the improper operation of motorists were the causes of island collisions.

....

"3 The present warning flashes of the beacon blend into or are so counteracted

by other lights along Massachusetts Avenue that it is difficult to observe at a distance.

"4. Motorists not entirely familiar with Massachusetts Avenue during hours of darkness may fail to recognize the flashing beacons as a warning that they are approaching an island."

The survey recommended the retention of 22 zones and the removal of 9, the latter to be replaced by painted lines on the pavement.

It was recommended that each of the beacons on the remaining 22 zones be equipped with a flasher giving a uniform timing of 60 flashes per minute on the amber warning beacon, and that a reflector flood light, using a 75 watt lamp, be added on the approach side of the beacon pedestal to illuminate the pedestal and abutment. It was also recommended that the concrete abutments be painted with 4-in diagonal alternate black and white stripes. It was further recommended that parking limitations adjacent to and within 20 ft of each end of the safety islands be rigidly enforced.

These changes were made and in the first three weeks thereafter only one safety zone accident was reported, as compared with an average of $5\frac{1}{2}$ accidents in the same length of time before.

An analysis of safety zone accidents is included in the Traffic Accident Report of the City of Cincinnati for 1934, compiled by Mr. M. C. Condrey, Safety Engineer, for the City.

The entire analysis is quoted here verbatim with foot note references to other pertinent sections of the report.

"Because many persons believe loading platforms to be great traffic hazards, a special study of these accidents was made. Loading platform accidents comprised 24.7 per cent of the

fixed objects struck and 66 per cent of the total number of traffic accidents¹ Approximately 65 per cent of these accidents happened when the weather was clear and the streets were dry, and 75 per cent of them occurred after dark The worst hours for loading platform accidents were from 11 30 P M midnight to 4 30 A M Forty-five per cent of the total number of accidents and six of the eight fatal accidents happened during this five hour period² Without going further, this would indicate that excessive speed, under conditions of decreased visibility, and reckless driving caused most of these accidents. A study of the causes bears out this conclusion

"Reckless driving accounted for the largest number of accidents and fatalities This is a general classification which includes innumerable specific reckless or careless actions. Several drivers were trying to cut in between other vehicles and the platforms Others tried to pass vehicles without making sure the roadway ahead was clear; they were following the vehicles ahead too closely Three drivers were making turns too fast, one tried to pass three other vehicles that were running abreast, one man was watching bathers in the Ohio River and failed to see the platform and another was brushing ashes off of his clothes Drivers doing such things as these can hardly expect to avoid accidents

"Thirty-five drivers who struck platforms claimed that they were crowded into the platforms by other drivers or struck the platforms while trying to avoid hitting pedestrians This seems to be a standard excuse, but the curious thing is that in a large number of cases

¹ In another section of the report it is stated. "Over 75 per cent of the fixed objects struck were stationed not in the roadway but objects which drivers had to leave the roadway in order to strike Excessive speed and carelessness accounted for most of these accidents "

² The report, in another place, states that 17 per cent of the total accidents and 25 per cent of the fatalities occurred in the five hours 11 p m to 4 a m This variation between these percentages and the similar figures for safety zones indicates that safety zone accidents and fatalities occur relatively more frequently during night hours than do other traffic accidents

the car supposedly doing the crowding was on the left and the platform was also struck on the left side, that is, the side nearest the center of the road A driver isn't crowded just because another motorist tries to force him out of his lane of travel and he refused to move over Most of these accidents could be avoided if drivers would approach the platforms properly and keep to the right of them Too many motorists drive down the center of the road and then try to cut to one side or the other of the platform. If another driver happens to be alongside of them, they cannot always avoid striking either the platform or the other automobile.

"Neither can motorists hope to avoid a pedestrian who might be crossing to or from a platform if they approach the platforms at even normal speeds When passing platforms at times when passengers are boarding or leaving street cars, motorists should slow down and have their machines under complete control There is very little room to maneuver a car and a driver must depend upon brakes alone if a pedestrian does step out unexpectedly

"Thirty drivers involved in loading platform accidents went to sleep while driving They could have struck something else just as easily while in this condition, and no blame should be placed on the platforms

"Accidents due to skidding have been divided into two classes, those resulting from wet streets alone and those resulting from wet car rails The greater number of skidding accidents were caused by motorists driving in the car tracks Any experienced driver should know the hazard created by wet rails There is usually plenty of room to the right of the platform and driving in the rails is seldom necessary

"As in the case of drivers going to sleep, the loading platforms probably stopped the drivers who had been drinking before they had a chance to strike something else

"Glaring lights and defective machines accounted for fourteen of the platform accidents This is another indication of the need for compulsory motor vehicle inspection

"In studying the causes of these accidents it does not seem that the complaints about loading platforms are entirely justified Only a relatively few drivers seem to be troubled by them There are thousands of motorists who

pass them daily and never appear to have any trouble. There is no way of knowing how many pedestrians' lives these platforms save, but it is known that they greatly facilitate the movement of traffic and protect street car riders in boarding and leaving cars. One has but to try to board a car on Reading Road or some other heavily travelled highway at a point where there is no platform to realize this fact. *Everything possible and practicable should be done to make these platforms as conspicuous as possible to motorists, but they should not be eliminated.* They may prove hazardous to a small number of careless drivers but, on the other hand they furnish excellent protection for a large number of street car riders."

"It has also been the policy for the last few years to intensify the street lighting at such locations where safety islands are located, especially the street car type, so that people going to and from these islands would be more visible. In fact, this practice of lighting not only shows up the islands, but also all objects in the vicinity of the islands. Improving the entire illumination at an intersection neutralizes the effect of glaring headlights, thereby bringing out the objects in the background, whereas concentrating a great amount of light on the islands alone produces the opposite effect.

"Thus it appears, as nearly as can be determined, that the Milwaukee design realizes the double objective, firstly, of guiding motorists away from the pedestrians standing on the islands, and, secondly, of preventing accidents, injuries, and deaths to motorists due to the presence of the islands. The amber marker light unit supporting the standard at the end of the islands was also improved during the year 1934 in that two lamps and lenses in each direction were incorporated in the design so that a double safety factor is provided in the event of a lamp burn-out and also in providing two easily recognized indications denoting a rather definite type of obstruction ahead."

In a general way the experience in St. Louis, Detroit, Cambridge and Cincinnati appears to duplicate that of other cities where accurate information relative to safety zone accidents is maintained. Too large a proportion of accidents is caused by careless drivers and the acci-

dent experience during night hours exceeds, by too great an amount, the experience during daylight hours. The remedy for the first situation is more effective police enforcement to eliminate the reckless driver from the street, combined with safety zone abutment designs which tend to deflect the vehicle without damage or minimize the damage if a collision does occur. The second situation can be remedied, to a large extent, by better safety zone lighting and marking.

I cannot emphasize this latter point too strongly. The primary consideration in safety zone construction should be its lighting and it seems absurd, with all our accumulated knowledge of the importance of adequate illumination, that safety zones with inadequate lighting are still permitted. I can say quite confidently that, with proper illumination, the safety zone hazard would be entirely eliminated except to the reckless or intoxicated driver or drivers who momentarily fall asleep through fatigue or through continued exposure to carbon monoxide in tightly closed cars.

Now that devices are readily available whereby illumination intensity may be readily ascertained every city should undertake a thorough study of its safety zone lighting to determine wherein it is insufficient and to develop means for improvement. A relatively nominal expenditure is all that would be required and the resulting saving in lives, personal injuries and property damages will pay handsome returns.

Rather than to discuss at length the elements which go to make up good safety zone lighting, I propose to describe a number of entirely different lighting designs which, I believe, will accomplish the intended purpose.

CHICAGO, ILLINOIS

BALTIMORE, MARYLAND

The overhead lighting fixture contains two illuminating units, each consisting of three 200 volt, 200 watt lamps in series. One unit is placed in front of each of the upper amber lenses which are $8\frac{3}{8}$ in in diameter. Only one unit is lighted at a time and when one lamp in the working unit burns out, a change-over switch automatically lights the other set of lamps. The bulkhead lights are battery operated, behind $8\frac{3}{4}$ in combination bulls'

Following a number of serious motor vehicle collisions with safety zones in the late summer of 1934 a Baltimore newspaper began a campaign urging the removal of all safety zones. Almost immediately the editor began to receive a large number of letters on the subject, of which about two-thirds were in favor of retaining the zones. The situation attracted so much attention that the Governor finally asked a special committee of the

TABLE I
BALTIMORE SAFETY ZONE LIGHTING

Light	Height from Pavement	Lens		Character	Lamp Voltage
		Color	Size and Shape		
General Flood	About 12 ft	White	9-in round	Steady	100 ^b
Upper Beacon	8 ft -6 in	Amber	12-in square	Emergency Flasher ^a	25
Pedestrian Platform Flood ^c	8 ft -6 in	White	12-in square	Steady	60
Base Flood	7 ft -10 in	White	9-in round	Emergency Steady ^a	60
Lower Beacon	3 ft -6 in	Amber	5-in round	Emergency Steady ^a	25

(a) These lights to be used only if floodlight fails, in which case a relay cuts in the three emergency lights. Upper flashing beacon will be signal to police that flood lamp needs replacement.

(b) General floodlight equipped for 150 watt light, but 100 watt has been found adequate.

(c) On side opposite to upper beacon, throwing steady white light at an angle downwards to pedestrian area.

eye and spreader amber lenses, flashing alternately. Through the use of batteries in the lower lights, and the twin lighting units above, the possibility of complete lighting failure is very remote.

The lenses in both the upper and lower units were originally red, but amber are now being installed.

The abutment is designed for the purpose of deflecting vehicles which strike the zone either to the right or left of the center line. In the case of a vehicle striking the center line, the force of the collision will be broken by the rounded shape of the abutment end.

Baltimore Safety Council to make an investigation and report.

The Committee recommended retention of the zones with modifications to improve their visibility, especially during night hours. An experimental installation of the recommended design was made about November 1, 1934, and has been entirely free of accidents.

The zone has been so successful that the city has appropriated \$5,000.00 to reconstruct 47 of the 169 electrically illuminated zones to this type.³ The base

³ In addition to 169 electrically lighted zones in Baltimore, there are 55 flashing gas beacons.

and supports are striped alternately chrome yellow and black. Table I gives a brief general description of the lighting features of the zone.

PITTSBURGH, PENNSYLVANIA

The Pittsburgh zone differs from the others in that it has pipe-standard-and-chain side protection. The abutment is of the sloping front, rounded type, painted black and white in a checkerboard design. The beacon pedestal carries an illuminated safety zone sign mounted at a height of 4 ft. 6 in. above the pavement. The zones, when first installed, contained a 60 watt flood lamp in the base of the warning beacon somewhat similar to the reflector light which I stated had been found so useless in Detroit. This has since been removed and a 200 watt flood lamp has been installed, offset towards approaching traffic so as to light the abutment and beacon post more adequately. While accurate information relative to safety zone accidents is not available, city officials have stated that zones of this type are almost entirely free of accidents.

MILWAUKEE, WISCONSIN

This zone is of an entirely different kind. It is known as the "bumperless." The only physical protection is the extension of the concrete platform into the "dead" area 10 ft. in advance of the safety zone sign. All of Milwaukee's 80 zones are of this type.

The sign consists of a 14-in. diameter circular marker bearing the words "safety zone" mounted at a height of 5 ft. 6 in. above the pavement. Below it 1 ft. 6 in. is a square button reflecting unit mounted with the diagonals vertical and horizontal, and fitted with 36 yellow button reflectors.

The only electrical illumination on the sign standard is at the base, the lens centers being 8 in. above the pavement. Two 100 candle power steady burning lamps, behind 5 $\frac{3}{8}$ in. diameter amber lenses each equipped with a resistance in parallel and connected to a transformer in the municipal street lighting circuit, are used.

The following is a quotation in full from a report of the Bureau of Electrical Service, Public Safety Engineering Division, of the City of Milwaukee, dated April 10, 1935, relative to these zones.

"Milwaukee features 'bumperless' safety islands in contrast to the expensive unsightly 'bumper' type of safety islands in use in most cities, which, according to information received from many locations, annually reap a huge crop of accidents, injuries and fatalities.

"The only major change made in the design of Milwaukee's street car type traffic islands since 1933 has been to curve the ends to conform to the traffic flow. The dead unused area ahead of the island was used for this purpose. In addition to enhancing the appearance, this modification increases the distance between the end of the islands and the 'Safety Zone' standard. Thus a motorist who inadvertently strikes the end of the island can instantly bring his car under control without damaging the standard, his car, or injuring himself or people on the island. No records are available of how often the ends of islands are being slightly hit without doing any material damage or injury. It is, however, definitely known that standards have been bumped many times and slightly moved, but also without appreciable damage and without injury to driver or pedestrian on the island. Experience shows that motorists are only too glad to get out of serious damage to themselves or others. If the number of times that islands have been scraped plus the number of times that the standards have been hit were known, it undoubtedly would be a number of large proportions, and had 'bumper' islands with their impregnable fortifications existed, there would have been that many serious accidents, with appalling injuries and loss of life.

KANSAS CITY, MISSOURI

Five zones with an extended concrete prow have been constructed in Kansas City. It was in Kansas City that such zones were first used and designs of similar character have been adopted to a limited extent in other cities

Illumination is provided by a General Electric trolley loading platform luminaire with hood, Form 45-L, with a 3 by 4 in. red lens on the approach side. The unit, which is 18 in. in diameter, is mounted 15 ft. above the zone platform and uses a 250 candle power lamp throwing a steady light on the zone abutment. The illumination intensity on the front nose of the zone is about 5 foot candles, which gives high visibility. The abutment is painted with alternate 5-in. black and white stripes at an angle of 45 degrees with the pavement, and equipped with three red glass reflectors 3 in. in diameter, set 3 ft. 4 in. above the pavement. No collisions with any of these zones were reported in 1934

TORONTO, ONTARIO

When originally constructed in 1928 these zones were illuminated by a beacon mounted on four pipe supports with an 8-in. square amber lens and 60 watt lamp showing a steady light towards approaching traffic. Opposite to this was a 60 watt lamp with 8-in. round lens designed to floodlight the pedestrian area. In the bottom of the beacon head was a similar lens and lamp to floodlight the base, much as in the Pittsburgh zone before the offset reflector was added. Near the base of the pedestal and about 4 ft. 6 in. above the pavement were two 23 watt flashing red lamps in marine fittings. Inset in the face of the bumper was a 6 by 8-in. reflector

Although this arrangement was fairly

satisfactory, experiments were carried out to devise a lighting system which would not suffer so much from competition with street lighting. The warning beacon was raised from a height of 8 ft. above the pavement to 12 ft. so as to be visible to approaching traffic above preceding vehicles, and changed from a steady to a flashing amber light. An extension fitting was built near the top on the approach side of the beacon pedestal at a distance of 2 ft. 6 in. on which three 100 watt lamps with reflectors have been installed. The middle lamp is an angle reflector with a red bull's eye in the side toward approaching traffic. The two side lights are narrow beam floodlights directed to the edges of the abutment. The flood lamp in the lower part of the beacon has been eliminated as has the light showing towards the pedestrian platform, it being found that sufficient light is obtained for these purposes from the flood lamps. In order to provide additional reflecting surface, diagonal metal strips were welded to the beacon support pipe and the whole has been painted with aluminum paint. This arrangement gives an intensity of illumination of 20 foot candles on top of the buttress, 10 foot candles on the buttress face and 7.5 foot candles on the pavement immediately in front of the abutment. The abutment is now painted chrome yellow. Only three very minor collisions with these zones, 26 in number, have occurred in two years since the new lighting system was installed

CONCLUSION

I believe that these zones and the results obtained from their use, are adequate evidence that it is practicably possible to construct and maintain in the travelled highway permanent obstruc-

tions which, without adequate lighting, would be extremely hazardous and highly objectionable

I believe, too, there will be an increasing demand from pedestrians for devices of this sort on the wider highways and advantage should be taken of the experience gained in street car safety zones. I have with me a photograph of a six-lane street in a Pacific Coast city with two pedestrian islands in the center of the highway at each intersection and having on each island two pedestal mounted signals of a type which has been found to be entirely inadequate. Yet, from the photograph, it is quite apparent that the street has just been opened to traffic and that the islands are of very recent construction. While I should not wish to condemn these islands on the basis of photographic evidence alone, I feel quite strongly that they should never have been built in the way that they have. Certainly enough experience is available to have indicated the extreme undesirability of this particular type of construction.

Another city not so far west installed on one of its main thoroughfares at the time it was widened, well lighted pedes-

trian islands of the same type as used at street car stopping points and it is reported that accidents on this thoroughfare are less, in relation to the volume of traffic than on other similar streets without the center islands. Despite this result, dictates of economy forced the abandonment of the plan despite a strong demand upon the part of property owners along other highways for similar devices. Merchants report that their business has been adversely affected on these streets because pedestrians have learned that the crossing odds are heavy against them.

The recent edition of the Manual on Uniform Traffic Control Devices, contains semi-endorsement of pedestrian islands on wide thoroughfares but I understand that it has not received the unqualified approval of highway engineers. Perhaps this is because adequate study has not yet been given to the character of their construction and lighting. If this is the case then some responsible agency should undertake an investigation of the subject. I can recommend this as a worth while project which the Highway Research Board might properly encourage.

DISCUSSION ON SAFETY ZONES

MR WM S CANNING, *Keystone Automobile Club*. Mr Simpson mentioned the Baltimore safety zones. I do not know if he has included in his written text some very pertinent information regarding the effect of painting safety zones. An experimental installation of the recommended design was made about November 1, 1934, and was so successful that about 80 additional zones were flood lighted and repainted with alternate chrome yellow and black stripes.

Forty-six zones on North Avenue were

flood lighted and painted in June, 1935. In the three full months prior to that time,—March, April and May—there were 26 accidents resulting in property damage to 25 vehicles and injuries to 16 persons. In the first three full months thereafter—July, August and September—there was but one property damage accident.

Thirty-three zones on York Road (Greenmount Avenue) were flood lighted and painted in May 1935. In January, February, March and April of that year

there were 21 accidents at these zones resulting in property damage to 20 vehicles and injuries to 10 persons. In June, July, August and September of the same year there were but two property damage accidents and no injury accidents.

MR BURTON W MARSH, *American Automobile Association*. A Manual on Uniform Traffic Control Devices is just off the press. In connection with the safety zone subject which Mr Simpson has so interestingly presented, there are specifications and warrants and information of value set forth in a section of this Manual which is now available without charge through the National Conference on Street and Highway Safety, 1615 H Street N W, Washington, D C. My experience and study indicate that in the matter of safety zone design, primary attention should be directed to securing effective illumination. The Manual presents suitable recommendations therefor.

PROF R L MORRISON, *University of Michigan*. It is rather interesting that the Milwaukee safety zones were not flood lighted, it was, I believe, the only zone he showed that was not. I understand that the price of running over one of those safety zones in Milwaukee is one hundred dollars and that it has a deterrent effect. I should like to ask Mr Simpson to tell us what he considers, as a result of his studies, the best safety zone available.

MR SIMPSON. I doubt very much if I can answer that. I think the pictures shown represent a number of different ways of doing the thing right. Perhaps, as you suggested, the safety zone in Milwaukee may be a better type than the others, even though there is no flood lighting. It is my recollection, though I am not perfectly sure, that the street lighting intensity for about 100 or 200 feet from the zone in Milwaukee is increased to give better illumination at these points.

MOTOR VEHICLE INSPECTION

BY WILLIAM S CANNING

Engineering Director, Keystone Automobile Club

SYNOPSIS

As one means of decreasing the number of motor vehicle accidents, several states have adopted compulsory mechanical inspection. This report is an analysis of the effect of such inspection upon the accident rate. Several states, having a total motor vehicle registration of about 7,000,000 vehicles, have supplied material from which this study has been made.

It is found that about 6 per cent of all vehicles registered were involved in accidents and less than $\frac{1}{4}$ of one per cent of the vehicles were in accidents attributed to mechanical defects. Accident data are based upon such collisions as are required by law to be reported. These data are admittedly insufficient but are the only ones available.

The record of inspections for several years in a large group of states show a wide variation in the conditions of lights, brakes, steering, etc. It also shows generally that the condition of the vehicles has not improved from year to year.

That the accident toll incidental to the operation of the motor vehicle can and must be reduced, all of us will agree.

The railroads have clearly demonstrated that they can do so, and a certain large municipal street railway system has cut