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Human Factors and Safety

Palisades Drive

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Introduction

Human factors play a large role in the majority of road accidents. Accidents can occur anywhere and anytime, under a variety of different circumstances. The only constant in every road accident is that at least one human is involved at every step of the process. This report focuses its analysis on one specific stretch of an individual road: the canyon section of Palisades Drive, located in the Pacific Palisades, CA. While this might seem small by scale, the proper analysis of just this road could lead to the future prevention of many accidents while greatly reducing the number of deaths that result from those accidents.

Located in the Pacific Palisades, Palisades Drive is the road that leads cars from Sunset Blvd. up to and around the Palisades Highlands (a subsection of the Pacific Palisades). It serves as the only access road that leads to and from the Palisades Highlands. This creates a high volume of daily traffic going both ways at all times throughout the day by all different types of people (young, old; male, female). While this traffic is never a problem in terms of congestion, it does amount to a healthy number of cars.

As a resident of the Palisades Highlands for the past 18 years, I have driven on that road more times than I can count. My experience with the road and with the lack of human safety preparation serves as my inspiration for this analysis. Because of my vast experience driving on Palisades Drive, I can account for all the different driving situations that can arise while on the road. While there are many scenarios that can occur (rain, mudslides, etc.), I want to focus on one of the simplest and most frequent situations – ones which occur hundreds of times a day. The act of navigating the canyon section of Palisades Drive, at day and at night, going uphill or downhill, has proven to be the source of many accidents, some of which have resulted in death. Many, if not all of these accidents, could have been prevented or at least mitigated if the proper human safety precautions had been taken on Palisades Drive.

User Needs and Profile

In order to properly evaluate Palisades Drive and recommend the proper human factor and safety precautions, we must first understand the drivers and their habits. I positioned myself at the most dangerous curve in the canyon, which also includes the steepest gradient that the canyon offers, and recorded the number of cars that drove in either direction. At three different time intervals on Friday, November 21, 2008, I noted the number of cars, the estimated speed (described by amount of miles per hour over speed limit), and the direction in which they were going in. This data can be found in Tables 1 and 2 below.

Hour	# of Cars Traveled Downhill	# of Cars Traveled Uphill
7:00 – 7:30am	119	47
5:00 – 5:30pm	57	131
10:15 – 11:00pm	49	29

Table 1: Number of cars traveling on Palisades Drive at specific times (with direction noted)

Table 1 above notes what I assumed to be two of the most heavy-traffic times, and one late night time slot. I chose these times because I wanted to evaluate the cars on the road during the two peak times (chosen based upon when people go to and return from work). This allows me to better evaluate the average population, and takes into account a variety of different driving conditions. The morning evaluates people traveling mostly downhill and accounts for a variety of different speeds, as it considers adults traveling to work and teens traveling to school. The afternoon evaluates cars traveling mostly uphill, and takes into account people returning from work along with teens returning from school or sports.

These hours did present one problem that could possibly skew the data. Often times during the morning or late afternoon, police officers position themselves in hiding places in order to catch and ticket speeders. Because of this, some drivers only drive at the speed limit during these hours, but will consistently speed during other times. Since this could invalidate some of my data, findings, and results, I also observed a late night time slot in which cops never present themselves. This allows me to observe drivers that, with this knowledge, often treat the speed limit as more of a suggestion than a requirement. This also is closest to the average time in which most accidents and deaths have occurred on Palisades Drive, therefore making this time slot one of the most important and accurate when evaluating and offering solutions to the dangers present.

While the number of cars traveled during my observed times is important, the estimated speeds of those cars is even more important when evaluating the danger presented with each situation. While I did not have access to a radar gun to properly record the speed of each car traveling on the road, I did estimate the speeds of the vehicles within certain ranges. This information can be found in Table 2 below.

Hour	Speed Limit or Below	1 – 5 mph over	6 – 15 mph over	16+ mph over
7:00 – 7:30am	33	65	56	12
5:00 – 5:30pm	48	71	61	8
10:15 – 11:00pm	9	16	37	16

Table 2: Number of cars traveling at estimated speeds while on Palisades Drive at specific times

As Table 2 shows, the majority of the cars traveling at any given time presented with some sort of speeding. While it is almost accepted to drive between 1 and 5 mph over the speed limit, there were an alarming number of people that drove this fast or faster. Especially on a road such as this, where speed play such a large roll in the ability to control one's vehicle around the turns presented throughout the canyon, the amount of cars that speed in excess of 5 mph is alarming.

Design

An understanding of the canyon section of Palisades Drive is essential when determining and evaluating the associated human safety factors. While the road itself is simple and, when handled at the proper posted speeds, quite easy to navigate, there are still problems that present themselves that result from the layout of the 4 lanes. When speeding drivers are entered into the situation, the resulting problems increase dramatically.

First let us begin with the road itself. The canyon section of Palisades Drive is a 4-lane road that stretches for a little less than 2 miles. As it is the only road that allows for daily access to the Palisades Highlands, it is heavily traveled on a daily basis (especially when comparing it to other residential roads). While the majority of Palisades Drive uses a center median to separate each side of the road, the canyon section uses no such thing. Rather, it has all 4 lanes placed side-by-side. This means that on-coming traffic is only inches away, when traveling in the left lane. Figure 1 below shows the lanes in the canyon on Palisades Drive.



Figure 1: A part of Palisades Drive canyon section, with 4 lanes, sidewalk, and gutter showing

Also shown in Figure 1 above is the lack of any sort of shoulder. The right lane in each direction ends with a water drainage system (small gutter) that transitions into the

sidewalk. This is important for three reasons. First, there is no safe area where cars can pull over in the event of an emergency. While the lack of a shoulder is nothing new for many roads, and is not a requirement by any means, it does present with an added risk due to the close proximity of the sidewalk. That brings up the second risk: pedestrians. Pedestrians frequent this sidewalk as a means of exercising. Often times one can see many pedestrians running or walking through the canyon. The last point to note is that bikers often use Palisades Drive. People riding bicycles often times ride off to the side of the right lane. While occasionally on the sidewalk, they mostly ride in the street – as is prohibited by law.

Evaluation

The task being evaluated is simple: what are the human factors and safety issues surrounding the canyon stretch of Palisades Drive? In order to make the best recommendations possible, it is necessary to evaluate this task in two different ways.

The first step is to learn from previous accidents, and the second step is to evaluate the road. As mentioned before, there have been many accidents on Palisades Drive – some resulting in deaths. These accidents should have been serving as learning tools to prevent future problems. While accidents cannot be prevented, their impact can be minimized and their frequency can be lessened if the proper precautions are taken and implemented. People often try to associate accidents with bad luck, especially if the person was speeding or doing something similar. However, “accidents happen, even to people who are careful, but many accidents may be avoidable if simple precautions are taken” (Preston).

In June 2007, an 18 year old male was driving down through the canyon stretch of Palisades Drive at around 11:35pm when his 1990 Acura Integra crossed over the center line, spun out, and was hit by another car that was travelling in the opposite direction (up the hill). The Acura was torn in half from the impact. According to LAPD detective Fisher, “the most likely cause of the crash was excess speed. There was no indication of alcohol or drugs” (Pascoe).

The 18 year old driver was pronounced dead at the scene, while the driver and passenger of the second vehicle involved only suffered minor injuries. While tragic, this accident was not the first of its kind. One Highlands resident said that “he was not surprised that another accident had occurred at that location in the canyon” (Pascoe). He said, “If you look at where most of the wrecks take place on Palisades Drive, it is at the s-curve [...] I’ve seen a BMW rolled there and a Ford Victoria sedan” (Pascoe). Another resident noted, “last year, a car crossed the center line (at the same location as the accident) and ran me off the road” (Pascoe). An odd-angle view of the s-curve mentioned above can be seen in Figure 2 below:



Figure 2: Picture of s-curve where accident in June 2007 took place, with accident side noted by flowers

While the police report said that speeding was the only culprit present in this accident, speeding alone did not result in this death or in the many other accidents over the years. Speeding probably raised the chances on this already dangerous stretch of road; however, that does not mean that responsibility does not exist to provide a safer situation to drivers on this road. To understand where the dangers lie, this accident can be used to evaluate the different causes and design flaws that helped lead to this accident. The easiest and most glaring to deal with is the one everybody knows about – speeding. Yes, it is the driver’s responsibility to travel at the posted speeds, but as I noted in Table 2 above, many drivers do not. While these drivers should be following the law, policy makers and street planners should take into account the amount of excess speed. While road conditions allow the driver to control vehicle speed if watched properly, the road also promotes excessive speeding due to its steep downhill slope. “Although the posted speed limit is 45 mph, the downhill slope and remote location can easily cause a driver to pick up speed” (Pascoe). This downhill slope is steep enough that a driver doesn’t even have to touch the gas in order to travel at the posted speed – yet many do. They don’t even realize that the slope in the road is making them drive at a much faster speed that they expect. And with nothing to slow them down, their cars pick up these high speeds while heading into the most dangerous section of Palisades Drive, often taking these turns at least 5 mph over the speed limit.

As with speeding, the natural curves in the road serve as a possible cause for accidents. “Multiple accidents have happened in [this] area due to speeding, even though the speed limit is 45 mph, because of the downhill slope, curves in the road, and a lack of lighting” (Chi). As the police report showed, the 18 year old mentioned above was speeding downhill when he crossed into oncoming traffic. While excessive speed could have caused him to lose control, it also could have just allowed him with less time to react to his inability to properly see the road at night. This lack of visibility and awareness could have been the reason he crossed onto the other side of the road. The canyon section of Palisades Drive is loaded with many tight turns, often one after the other. At night, with no lights and not many cars on the road, the canyon can get very dark. And if visibility is in any way impaired, it can be difficult to see where one lane ends and where one lane begins. The driver might not have even noticed he was driving on the wrong side of the road until it was too late. The tight curves would have prevented him from making a drastic, life-saving maneuver without rolling his car anyways.

Another cause that might have led to the accident, along with a major problem the canyon section of Palisades Drive presents, is the lack of proper lighting. Especially at night, this road is dark. Because of the natural layout of the canyon, no lights or fixtures have been installed. On many nights, the car headlights can be enough; but on other nights, especially when visibility is lower, the curves in the canyon can be especially hard to see. Figure 3 below shows how hard it is to see the curves while driving in the canyon at night.

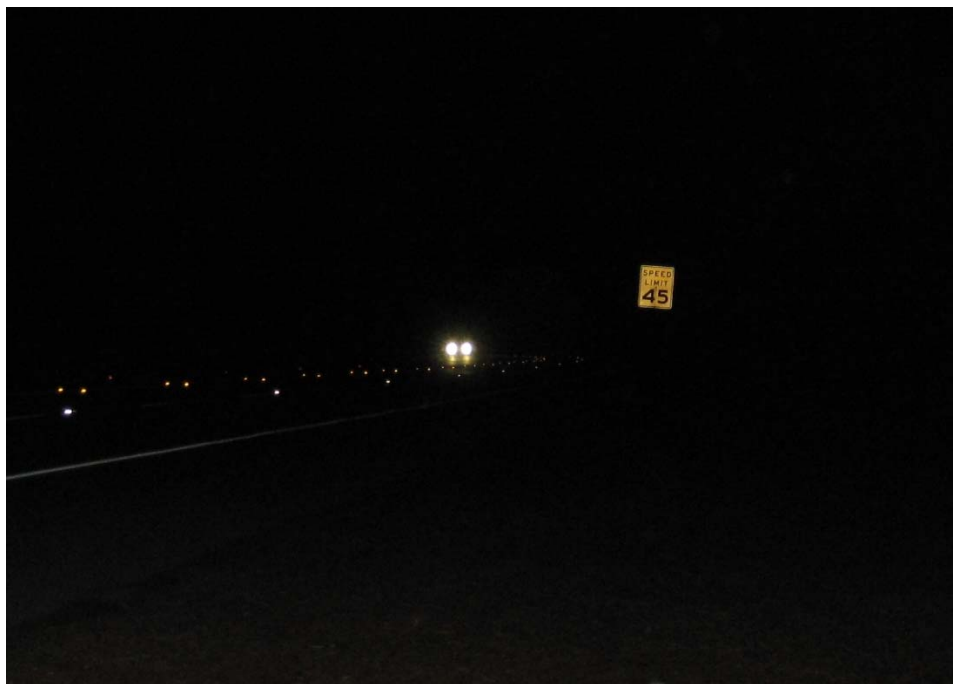


Figure 3: S-curve on Palisades Drive, shown at night

As Figure 3 shows, one can barely see where the car on the opposite side of the road is coming from, let alone when the lane begins to swerve and turn into that dreaded s-curve. Couple this lack of lighting with the increased speeds that are often present, and the

reaction time for a driver to correct any mistakes or errors in judgment is most times shorter than necessary.

With all these natural dangers that are present due to the physical layout and location of the canyon, one would expect there to be proper signage posted along the road. Yet there is not. With respect to the speed limit signs and one sign placed at the entrance of the canyon that warns of sharp turns, there is nothing posted that informs the driver that a hard s-curve is ahead, or that the downhill slope of the road is enough to increase a vehicles speed. “We have to do something; it’s a chronic problem there. There are no reflectors, no street lights – it is pitch black. We need signs or something that might influence a driver to slow down” (Pascoe). Despite the frequency of these actions and calls for signs from local residents, no signs have been installed.

The last cause associated with that fateful accident in June of 2007 is one that has nothing to do with the layout of the road or a driver’s ability to safely maneuver the curves. As mentioned above, accidents do happen. Even if every possible measure had been already taken into account, problems can still occur. That is why we call them accidents. And once something has gone wrong, people must be prepared and equipped with the proper means to deal with the problem at hand. In the case of an accident, the proper authorities must be notified immediately that there has been an accident, so that the paramedics can arrive on the scene and administer any emergency help required. However, the canyon section of Palisades Drive is also a dead zone for cell phones. When looking at the June 2007 accident, it was noted that “the lack of cell phone reception in that part of the canyon caused a delay in calling the paramedics” (Chi). One witness who arrived on the scene first noticed that no emergency vehicles had arrived. In order to get the attention of the paramedics, this witness had to drive down the hill. He described it saying, “It was dark and I pounded on the windows and doors to get their attention. Within a minute, the lights came on inside and they started to dispatch” (Pascoe). Often times in accidents, lives are decided in a matter of seconds. In this case, it took many valuable minutes before the paramedics were even informed that an accident had occurred.

Recommended Design Changes

Based upon the evaluation presented above, there are many design recommendations that can be made in regards to the canyon section of Palisades Drive. While these changes are important and offer what I believe to be advancements in the awareness and prevention of human safety factors, they must be considered in accordance with the current condition of the road and surrounding areas. For years, people have been crying out to the public that changes need to be made, yet these cries always fall on deaf ears. “Palisades Drive has always been a treacherous two-mile stretch, but residents wonder if anything will change” (Pascoe). This is because these accidents only become personally relevant to the few involved. One resident stated, “The fact that most people don’t know the people involved in an accident or didn’t see the horror of the accident allows them to chalk it up to bad luck” (Pascoe). “Unfortunately, these accidents don’t discriminate and we are all closer to tragedy than we like to think” (Pascoe). Residents like to point out the flaws and problems found in the canyon, but when it comes time to pass legislation that will

enact measures to prevent further actions, they often times complain about the costs associated or the resulting un-naturalization of the canyon mountainside. Taking this into account, there are changes that must be made.

The first issue to address is speed control. As Paul Glasgall, chairman of the Palisades Highlands Presidents' Council said, "It's a four-lane modern road through a winding canyon" (Pascoe). Because of this, something like speed bumps to control speed would be out of the question. Not only would they be dangerous and damaging to the health of the vehicles on the road, but they would also serve as another risk. People who take the speed bumps at too high of a speed could present with greater risk for an accident with those around them. As a major road, the intense drop in speed required to safely ascent a speed bump would be too drastic a measure to implement. Proper signs are the method that would ensure the proper success. Similar to signs found on freeways, where steep gradients occur, there should be placed at the entrance to the canyon section a warning that a steep gradient exists up ahead. This will warn drivers of the drastic increase in downhill speed that can occur. By doing this, drivers will be more aware to watch their own speed as they descend the canyon. An example of such a sign can be found in Figure 4 below:



Figure 4: Example of a steep gradient sign

Also, a radar device should be placed at a strategically placed position in the canyon. Often times, the police use these stationary, self-functioning units as a means to record average speeds to help determine the risk associated with a certain road. By implementing one of these permanently at a certain point, drivers will be alerted by the sign as to their current speed. While they have this information readily available on their dashboard, making it stand out on a sign off to the side of the road will add to the importance of their speed. Stressing this will reinforce in the drivers mind the need to slow down, and will also call to attention their current speed. Often times, drivers who are in a rush or not paying attention will tend to neglect what is going on inside their vehicle. People will, however, notice signage on the road.

While the issue of speed is hardest to control, other problems are not. In order to properly protect/warn against the steep s-curves found throughout the canyon, proper warnings should be placed a safe distance before each curve, and before entering the canyon. The standard “curve” sign should be forgone in favor of a more drastic, informative sign, one that stresses the danger associated with the curves ahead. Another measure that should be taken into effect to help protect against the dangers associated with the curves in the road is the installation of a center divide. While something similar to that found on a freeway will take up too much space, the yellow rubber dividers with reflectors would enable drivers to better distinguish between one side of the road and the other. Currently, there have been installed reflectors on the lane lines that, when light is shone upon them, reflect red to show that the red side is the wrong side of the road. While this might help to educate the driver, it does nothing in terms of accident prevention. By installing dividers like the ones shown below in Figure 5, the driver would not only be warned (by the reflectors), but they would also see the divider and be prevented from crossing over.



Figure 5: Example of possible road dividers to be used to separate center lanes

If an accident were still to occur, and a car were to crash into the dividers, they would be able to serve as a preventative measure from keeping the car from crossing into oncoming traffic. Their ability to give way when impacted would also soften the blow, adding to the protection of the driver impacting the dividers.

Also, without the installation of any road-side lighting devices, these reflectors would serve to help show the drivers the path the road takes while ascending or descending in the dark. The reflectors would always be lit by the car’s own headlights, enabling the driver to safely navigate the turns. While lighting would be most ideal, this canyon has no structural setup in place for the installation of electricity lines or light fixtures. Undertaking such a project would require much more analysis than currently being performed.

The last human safety issue to be addressed is the ability to properly assist and act in the event on an accident. As was discussed earlier, accidents still happen. Until people are 100% taken out of the process of driving, accidents will always occur. The best way to prevent them is to plan for them and plan for ways to lessen their impact as much as possible. This includes making available the proper means to respond in the event of an emergency. During the June 2007 accident, almost 5-10 minutes were wasted because an individual had to find the accident, drive down to the local firehouse, bang on the doors, instruct the emergency crew as to what had happened, and then wait for their response. Had cell phone reception been available, someone could have immediately called 911 upon seeing the accident, and precious minutes could have been saved. Often times in accident situations, lives are decided in a matter of seconds, let alone 10 minutes. All it would take is the simple construction of a cell tower at the top of the canyon to provide cell reception throughout. If not, place emergency phones at places of predetermined interest, so that in the event of an accident, there is an accessible emergency phone close by.

Conclusion

Overall, Palisades Drive presents us with many possibilities for change. Human factors are present everywhere, and safety issues are abundant. However, as with the accidents, it takes human influence to make any changes occur. The need for change must be pushed forward and imposed upon those in charge. Every time there is an accident and/or death, people complain that changes must be made; yet when it comes time to take action, nothing is done. How can individuals expect safety improvements if they do not advocate for them? By taking these changes into consideration, and then testing their success considerably, I believe that safety can be improved upon Palisades Drive. Imposing stronger methods of protection and awareness will help to alleviate the errors associated with the human aspect of the many dangerous sections of Palisades Drive.

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