# Speed Limit Presentation

Our proposed speed limit is 30km per hour in consideration of three factors: human, nature and engineering.

### Human

The first one is human factor, which consists of human ability and human safety.

One thing about human ability is that the faster you drive, the more information the brain receives, but because the brain can only process a certain amount of information at any given time, the field of vision decreases as speed increases.

Human ability also includes human reaction time, which is 2.3s according to A controlled study.

There are two things about human safety. One is to make sure that the car won’t get off the ground, so we calculated the speed when centrifugal force equals to gravity, and that is the largest possible speed.

So we use the formula…, we get…

To know the R, the radius of the bridge, we see the bridge as a circle, since the slope is 5, the angle here is 5, this is 10, so the radius can be calculated by…, because the total length of the bridge is about 48m as we measured.

Then we get the radius.

Then we plug in, and get v should be less than 52m per second.

The second thing about human safety is basically whether the car will hit the obstacle.

So what we should do is to make sure that the total stopping distance is less than the shortest possible distance in which a driver can see the obstacle.

To determine the shortest possible distance, we see the bridge as the graph of a quadratic function.

(draw the bridge) so this is the bridge, and if we assume that both the driver and the obstacle are only 1.5m each, we can draw another quadratic function here and that represents every possible position of the driver and the obstacle.

Then we can draw a tangent line to the first function, and it is obvious that when the line is horizontal, the distance is smallest, because this line is longer than this one.

To calculate this distance, we see the bridge as a triangle.

(draw triangle)

With angle 5, 5 and 170 degrees, because the slope is 5 degree as we measured, and the height is 1.5, we can calculate the distance using this formula…, and the result is 34, so the total stopping distance should be no longer than 34m.

### Nature

The second factor is nature.

And that is composed of weather, location and visibility.

Weather has an impact on the kinetic coefficient of friction of the road, and in the worst scenario, the coefficient is 0.45.

Also location. The bridge is near a school, and the speed limit near a school is usually 30km per hour.

For visibility, even when it is raining or fogging, the visibility should be normally greater than 34m, so it won’t have much impact on the final result.

### Engineering

The third and last one is engineering.

That is made up of factors like traffic flow, road material and shoulder space.

The traffic flow is smooth, the road is made up of concrete, and the shoulder space is wide enough for two cars to pass the bridge at the same time.

### Calculation

Now since we’ve considered most of the factors, we may start the calculation.

Suppose the initial speed of car is u m/s, the reaction stopping distance is 3u.

There are three possibilities.

First, when 2.3u < 17, then the speed is less than 7.4m/s.

Second, the speed equals to 7.4m/s.

Third, the speed is greater than 7.4m/s.

We can first look at the second possibility, u = 7.4.

We can use the formula v^2 = u^2 + 2as

Plug it in and we will get…

Then we solve for s, we get s = 7.7m.

So it is obvious that the speed should be greater than 7.4m/s

Then we get…

So the final result is v = 9m/s, which is about 32km/h.

In conclusion, take all of these factors into consideration, we would like to use 30km/h as our final proposed speed.