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Have you ever been driving down the road and approach a turn too fast? What happens? You and the car undergo centrifugal force and you as well as the car are pushed away from the turn, or up the grade also know as a superelevation. An engineer must balance this force raising the grade on one side of the road. It should be noted that under theoretical observations steering would be effortless but in order to provide these ideal conditions the friction factor would be zero and the vehicle weight would balance the centrifugal force¹. In the real world we have friction and cannot afford to build the extremely steep [slope](#) of $\sim 30^\circ$ every time we need an off [ramp](#) or horizontal curve.

In order for the operator to comfortably maneuver a curve there are several variables that must be accounted for, the radius of the curve, friction and [velocity](#). Radius length may depend on sight distance and right of way, or property lines as well as sight distance. Friction depends on the surface properties of various materials and climate. The slope and velocity are usually dependent on the variables just described. While building and designing these roads, it is industry standard to put 1/3 of the change in grade within the horizontal curve and 2/3 of the transition length on the tangent. In Layman's terms, by the time the car approaches the first part of the curve, 2/3 of the grade has already been built. This assures smooth transition for the driver to maneuver the curve³.

In order to get a better idea of what kind of friction coefficients are used in Alaska, we can look at the Badger Road Interchange construction project on the Richardson Highway². The northbound on ramp (from Badger Road) will have a speed limit of

35 mph

a radius of 135 meters and a superelevation of 5.5%. From this data one may find the friction coefficient, (μ) to be equal to 0.10. Another example taken from the same project, observed from the off ramp in the south bound lane will have a radius of 253 meters, a super of 6% and a speed limit of

45 mph

μ was observed to be 0.09, which is just enough traction to make these corners at the posted limit. A friction coefficient that small leads the author to assume the engineers designed these turns to be taken under extremely slick conditions.

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