

When the cutting is on a hillside the upper edge should be protected by an underdrain to carry off the rainfall of the ground above, and prevent it from percolating through the bank. When the bank is spongy, or infested with springs, it should be drained in the same way as has been described for the sub-drainage of a similar road-bed. A light covering of fertile earth applied on the bank, and seeded with some suitable hardy grass, as June or Blue Grass, will produce in a few months a tough sod which will prevent the washing down of dirt, and hinder any tendency to the formation of water-ruts on the sides. This seeding or other sodding should be applied to all embankments or approaches to bridges, to prevent the growth of weeds or the washing away of the clay.

The width of a road is an important consideration in its construction. As a general rule, narrow roads are more economical than wide ones, and consequently roads should be made only wide enough to suit the convenience of the traffic over them. For an entrance to a town, where there is considerable traffic both ways, the road-covering should be wide enough to allow two vehicles to meet and pass without leaving the metalled portion, and if the traffic is very great, still wider. For this purpose sixteen feet to seventeen feet will be sufficient. On the ordinary concession roads of a township, where the bulk of the traffic is in one direction, provision for the width of one vehicle is sufficient, the unloaded ones conceding the right of way to the loaded ones. As the metalled portion is put in the centre of the road allowance, the sides should be wide enough to allow the easy passage of those turning off. Eight feet of metal and ten feet of side will give sufficient room for these purposes, so that we will have a total width between side-drains of $10 + 8 + 10 = 28$ feet. A common width prescribed is thirty feet, and this may be taken as the best for all common roads. The transverse form best for roads has given rise to a good deal of discussion among engineers. The arc of a circle or of an ellipse is recommended by some, while others prefer two inclined planes sloping towards the side-drains, and connected in the centre by a short convex curve. Objections are raised to the former that the centre will be nearly level, and will hold the water, unless it is carried off by a longitudinal slope; that carriages will keep on the centre in order to run on the level, thereby causing excessive wear along one line; and that the wear of the sides is great when traffic is forced on them, on account of the tendency to slide on the part of the wheels. For these reasons the second form is more generally adopted.

The highest point of the middle arc should be in the centre of the road, and it should be drawn to a radius of eighty-five or ninety feet. The degree of inclination of the flat slopes should be from one in twenty to one in thirty for township roads. Drainage is assisted by giving the surface a longitudinal slope of at least one in one hundred and twenty-five, which can always be done, even where the surface of the ground is level, at little extra expense.

Where sidewalks are constructed on the side of the road, the water from the gutter, between the sidewalk and road, is conveyed into the side drains by small covered drains running under the sidewalk.

They may be near the surface, but not rising higher than the surface of the sidewalk, and should have a fall of one in ten to one in twenty, so