

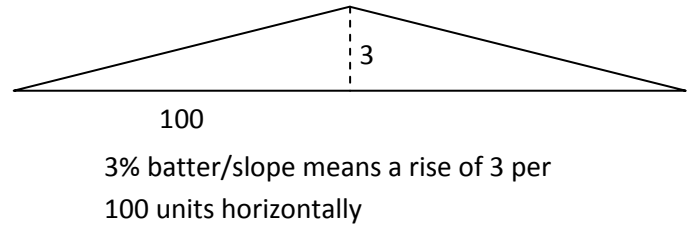
Re-sealing and widening a 10m wide road

Task: How much does it cost for materials to widen and reseal 100m of road if the existing road is 10m wide. (Widen the road by 60cm)

Prior knowledge: Scale factors or ratio, area of triangle, rectangle, (parallelogram,), Volume of prisms, metric units.

Specifications

- Widen road by 60cm (i.e.: 30cm each side).
- 3% batter (slope) so water runs off it
- New top-seal must be a minimum of 150mm thick
- New Base layer on each side must be 300mm deep



Assumptions

- Old road is flat
- No need for new base under old road

Cost of materials

- \$90 /m³ Top-seal
- \$80 /m³ Base layer

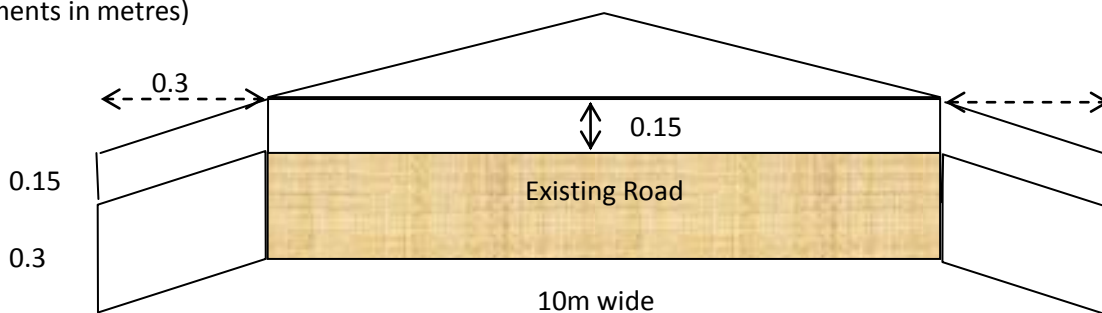
Variations

- Make the new road flat
- New road is flat, with a edge of sloping base material outside the newly widened road lanes made of base material (a “run off” edge)



Design:

(Measurements in metres)



The triangle needs to go above the road by 150mm as the specifications have minimum of 150mm thickness. Base layer can be a right-angled trapezium, but increases materials

$$\begin{aligned}
 \text{Area of Top-seal} &= \text{triangle} + \text{Rectangle} + \text{parallelogram (small)} \times 2 \\
 &= 2.34\text{m}^2 \\
 \text{Area of Base layer} &= \text{parallelogram (large)} \times 2 \\
 &= 0.18\text{m}^2 \\
 \text{Cost for 100m} &= 2.34 \times 100\text{m of road} \times \$90 + 0.18 \times 100\text{m} \times \$80 \\
 &= \$22\,500
 \end{aligned}$$



What costs have NOT been factored in?

- Transport of materials
- Labour and supervision
- Machinery and transporting machinery to site
- Design, consultation



Approximate costs for a 10m wide rural road is \$450 per linear metre -> 100m costs \$45 000

Highway robbery