SETION 137 – PRINCIPLES OF LOCATION

2915. **Ruling Points.** General alignment is controlled by:

a. Mountain passes, saddles, or cols.
b. Obstacle crossing, e.g. over rivers, gorges, glaciers, cliff faces, dangerous slopes.
c. Geological factors (see Chapter 4).
d. Important tactical features.

2916. **Gradient.**

a. The aim is to gain height rapidly and consistently.
b. Height once gained should never be lost.
c. An extra mile of good road hinders traffic less than 100 yards of steep gradient and bends.

2917. **Earthwork.**

a. Reduce earthwork to the practicable minimum.
b. Avoid excavation in rock.
c. In side-hill cut, carry roads partly on cut and partly on fill, if this is possible without using a retaining wall.
d. Avoid retaining walls wherever possible.

Planning Procedure

2918. Mark ruling points and their height on the map or plan.

2919. Calculate the length of road, at the ruling gradient between successive ruling points.

Example:

Ruling gradient	1 in 15
Height of ruling point B	1120 ft
Height of ruling point C	1564 ft
Difference in height	444 ft

Desirable length of road = $\frac{444}{1/15}$ =6660ft

2920. Measure the length of the obvious natural route between ruling points. If this is shorter than the desirable length, adjust the alignment by one of the following means:

a. Increase length to the desirable Figure, for which zig-zags may be necessary.

b. Increase the gradient in selected sections, up to the maximum permissible.

c. Make some increase in length, and use shorter lengths of the steeper gradient.

Example:
Length of natural route from B to C 5500 ft
Maximum permissible gradient 1 in 10
Solution (a) – Increase length of route to 6660 ft.
Solution (b) – Incorporate 2320 ft at 1 in 10. Rise 232 ft.
Incorporate 3180 ft at 1 in 15. Rise 212 ft.
Total length 5500 ft Total rise 444 ft.
Solution (c) – Compromise at, say, 800 ft at 1 in 10, and increase length by 760 ft (from 5500 to 6260), giving 5460 ft at 1 in 15.

Detailed Location

2921. Drainage (see Section 138). Final location is always influenced, and often governed, by drainage characteristics.

2922. **Curves.**

a. Use curves freely where they fit the ground to ease gradient, and to reduce earthwork.

b. Avoid zig-zags and hairpin bends where possible. They can only be sited where greatly increased road width is possible and where a reasonably level turning point can be provided. Retaining walls are often necessary.

2923. **Gradients.** Unless three traffic lanes can be provided either construct a separate climbing lane for slow vehicles or arrange for frequent lay-bys (see Section 113).