Example *The altitudes of two proposed stations A and B, 100 km apart, are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are intervisible, and, if necessary, find by how much B should be raised so that the line of sight must nowhere be less than 3 m above the surface of the ground.*

Solution (Fig.

Let *aceb* be the visible horizon and a horizontal sight Ab_1 through A meet the horizon tangentially in e.

The distance Ae to the visible horizon from station A of an altitude 420 metres is given by

$$D = Ae = 3.8553\sqrt{h} = 3.8553\sqrt{420} = 79.01 \text{ km}$$

Now $AC = 70$ km and $AB = 100$ km

$\therefore$ $ec = Ae - AC = 79.01 - 70 = 9.01$ km

and $eb = AB - Ae = 100 - 79.01 = 20.99$ km

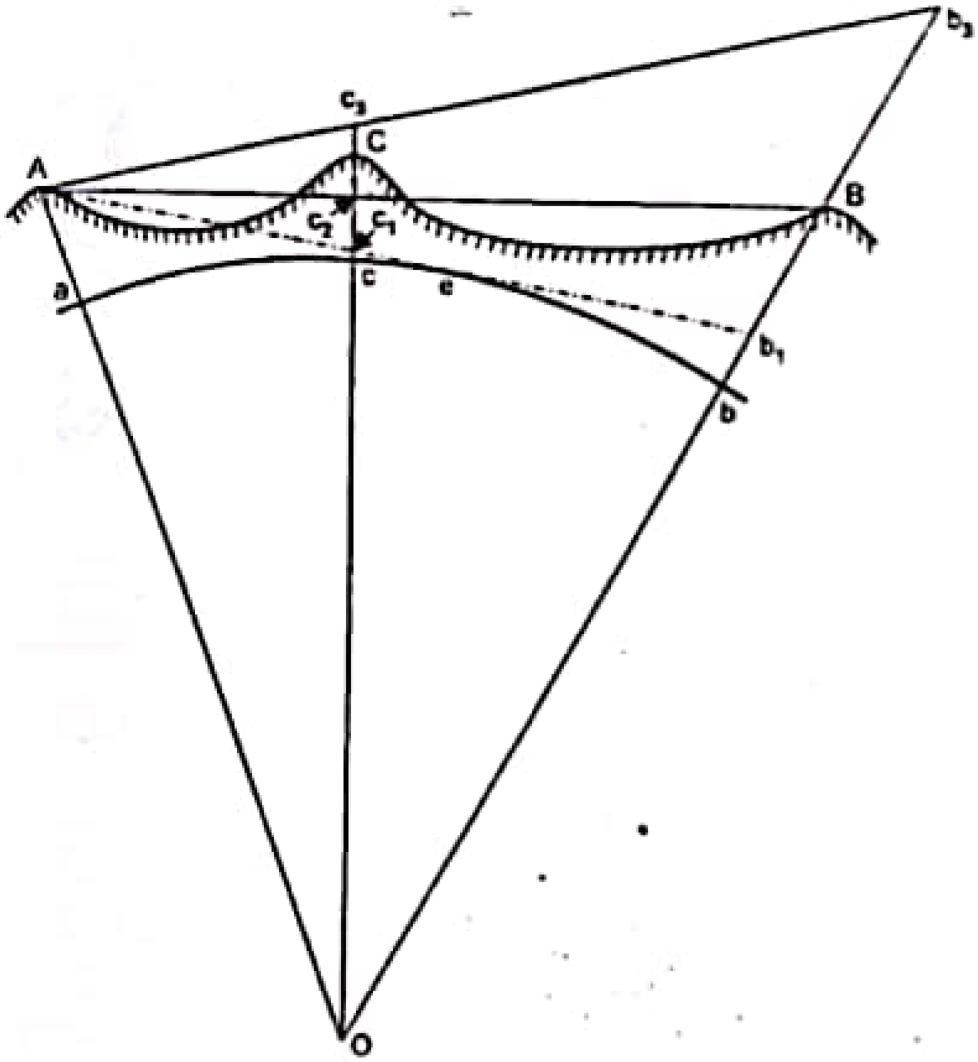

FIG.

The corresponding heights cc_1 and bb_1 are given by

$$cc_1 = 0.06728\,(ec)^2 = 0.06728\,(9.01)^2 = 5.46 \text{ m}$$

and $$bb_1 = 0.06728\,(eb)^2 = 0.06728\,(20.99)^2 = 29.64 \text{ m}$$

New $$Bb = \text{Elev. of } B = 700$$

$\therefore$ $$Bb_1 = Bb - bb_1 = 700 - 29.64 = 670.36 \text{ m}$$

Now, from similar triangles Ac_1c_2 and Ab_1B,

$$c_1c_2 = Bb_1 \frac{Ac_1}{Ab_1} = 670.36 \times \frac{70}{100} = 469.25 \text{ m}$$

$\therefore$ Elevation of line sight at C = elevation of c_2

$$= cc_1 + c_1c_2 = 5.46 + 469.25 = 474.71 \text{ m}$$

$\because$ Elevation of $C = 478$ m

Hence the line of sight fails to clear the peak by

$$c_2C = 478 - 474.71 = 3.29 \text{ m}$$

In order that the line of sight should at least be 3 m above the ground anywhere, the line of sight should be raised by $(3.29 + 3) = 6.29$ m.

That is. $c_2c_3 = 6.29$ m