

iSPEED



Mass	Duration	Length of the carriage	Max height	Minimum height	Max speed	Inclination
2000 kg	1 minute	6 m	55 m	1,95 m	110 km/h	90°

Method:

Kinetic Energy = $K = 0.5 \cdot m \cdot v^2$

Potential Energy = $U = m \cdot g \cdot h$

Mechanical Energy = $E_m = U + K$

$E_m = U + K = 0.5 \cdot 2000 \text{ kg} \cdot 13,89 \text{ m/s}^2 + 9,81 \text{ m/s}^2 \cdot 2000 \text{ kg} \cdot 55 \text{ m} = 1,3 \cdot 10^6 \text{ J}$

$v = (110 \text{ km/h} : 3,6) \text{ m/s} = 30,56 \text{ m/s}$

$a_1 = \Delta v / \Delta t = 30,56 \text{ m/s} : 2,2 \text{ s} = 13,89 \text{ m/s}^2$

$r_1 = 8,33 \text{ m}$

$r_2 = 32,5 \text{ m}$

$v_{\text{curve1}} = (50 \text{ km/h} : 3,6) \text{ m/s} = 13,89 \text{ m/s}$

$a_{c1} = v_{\text{curve1}}^2 : r_1 = (13,89 \text{ m/s})^2 : 8,33 \text{ m} = 23,16 \text{ m/s}^2$

$v_{\text{curve2}} = (110 \text{ km/h} : 3,6) \text{ m/s} = 30,56 \text{ m/s}$

$a_{c2} = v_{\text{curve2}}^2 : r_2 = (30,56 \text{ m/s})^2 : 32,5 \text{ m} = 28,73 \text{ m/s}^2$

During the first 2,2 seconds:

$F = ma_1 = 2000 \text{ kg} \cdot 13,89 \text{ m/s}^2 = 2,778 \cdot 10^4 \text{ N}$

During the first climb:

$F_{c2} = ma_{c2} = 2000 \text{ kg} \cdot 28,73 \text{ m/s}^2 = 5,746 \cdot 10^4 \text{ N}$

In the top height:

$F_{c1} = ma_{c1} = 2000 \text{ kg} \cdot 23,16 \text{ m/s}^2 = 1,668 \cdot 10^4 \text{ N}$

All the informations that have been used have been esteemed by us because of lack of certain directions.