IDEAL CUSHION

Free falling body

$$v^2 = u^2 + 2as$$

v = final velocity (impact velocity)

u = initial velocity = 0

a = gravity acceleration g

s = distance (drop height)

$$v^2 = 0^2 + 2gh$$

$$v = \sqrt{2gh}$$

Impact on Cushion

$$v^2 = u^2 + 2as$$

v = Final Velocity = 0, body comes to rest

u = Initial Vel = impact velocity

a = impact acceleration

~~Cushion~~ Fragility $\times g$

Gg

s = Distance = cushion thickness

$$u = \sqrt{2gh}$$

$$v^2 = u^2 + 2Ggt$$

$$0 = (\sqrt{2gh})^2 + 2Ggt$$

$$0 = 2gh + 2Ggt$$

$$-2gh = 2Ggt$$

$$-h = Gt$$

$$t = \frac{-h}{G}$$

A phone weighs 0.1 Kg can withstand 100G shock

The pack should survive a drop of 2m. How much cushioning is required

PU cushion Density 64 Kg m^{-3} Cushion factor 3

Static Stress 1.8 KPa

Cushion thickness

$$t = \frac{Ch}{G}$$

$$t = \frac{3 \times 2}{100}$$

$$t = 0.06 \text{ m}$$

or 60 mm.

Area

$$\text{Stress} = \frac{F}{A}$$

$$1800 = \frac{m \times g}{A}$$

$$1800 = \frac{0.1 \times 10}{A}$$

$$A = \frac{0.1 \times 10}{1800}$$

$$A = 0.00055 \text{ m}^2$$

$$= 5.5 \text{ cm}^2$$