Datos Avión

$m = 91370\ kg$

$V = 264\ m/s$

$m_p = 179,170\ kg$

Datos edificio

$h = 417\ m$ $\quad e = 40$

Núm. pisos = 110 $\quad E_{Concreto} = 25\ GPa$

$h_{impacto} = 350\ m$ $\quad C = h/2 = 417/2 \approx 208.5$

$A_{Torre} = 4000\ m^2$ $\quad \cdot A_{Tubo} = 1161\ m^2$

63.4 m

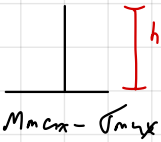
$\cdot\ I_T = I_{Concreto} + I_{Tubo}$

$I_T = \frac{1}{12}(4000)(63.4^2 + 63.4^2) + \frac{1}{12}(1161)(27^2 + 43^2)$

$I_T = 1679706 + 244421.5 \approx 3000000\ m^4$

$I_T = 3 \times 10^6\ m^4$

Calculo de la fuerza de impacto



Modelo → $\Rightarrow u_c = u_{flexión}$

$\Rightarrow \frac{1}{2} m V^2 = \int_0^L \frac{(-P_x)^2}{2EI}\,dx \Rightarrow \frac{1}{2} m V^2 = \frac{P^2}{2EI} \cdot \frac{x^3}{3}\Big|_0^L \Rightarrow \frac{1}{2} m V^2 = \frac{P^2 L^3}{6EI}$

$\Rightarrow \frac{1}{2} m v^2 = \frac{P^2 L^3}{6EI} + \%0 \frac{P^2 L^3}{6EI} \Rightarrow \frac{1}{2} m v^2 = \frac{P^2 L^3}{6EI}(1 + \%0)$

Factor de Error

$\Rightarrow P^2 = \frac{6 m v^2 EI}{2L^3 (1+\%0)} \Rightarrow$

$P = \sqrt{\frac{1}{1+\%0}} \cdot \sqrt{\frac{3 m v^2 EI}{L^3}} = \sqrt{\frac{1}{1+0.2}} \cdot \sqrt{\frac{3(91370 \times 10^3)(264)^2 (15 \times 10^6)(3 \times 10^6)}{(350)^3}}$

$\%0 \rightarrow 20\%$ $\quad L = h$

$P_{min} = 0.913 \cdot 5780893072 = 5277209175\ N \approx 528\ MN$

- $P_{mgk} = \sqrt{\frac{1}{1+0.2}} \cdot \sqrt{\frac{3mv^2 EI}{L^3}} = \sqrt{\frac{1}{1+0.2}} \cdot \sqrt{\frac{3(4179,130\times10^3)(764)^2(28\times10^6)(3.8\times10^6)}{(350)^3}}$

20% ↓ $L = h$

$P_{mgk} = 0.911 \cdot 805516138 = 736601185\ N \approx 736\ MN$

↓

Incluyendo la capacidad total del Avión

- $Av = b \cdot B = (417)(63.4) = 26437.8\ m^2$

$P = 5\ kN/m^2$

$P_V = (5kN/m^2)(26437.8\ m^2) = \boxed{132.2\ MN}$ → Viento

- $P_S = A \cdot N_{pisos} \cdot Peso\ por\ piso = (4019\ m^2)(110)(8kN/m^2)$

$P_S = 2210450000\ N \approx \boxed{2.21\ GN}$ → Sísmica

Sabiendo que $P = 528\ MN$ c $I = 3\cdot10^6\ m^4$ Peso edificio $= 440{,}000{,}000\ kg \cdot 9.8\ m/s^2 = 4.312\cdot10^9\ N$

$c = \frac{D}{4}$

$\sigma = \frac{PL \cdot c}{I} = \frac{(520\cdot10^6 N)(350\ m)\left(\frac{4.312\cdot10^9 N}{4000\ m^2}\right)}{3\cdot10^6\ m^4} = 65.4\ GPa$

$\delta = \frac{PL^3}{3EI} = \frac{(520\cdot10^6)(350\ m)^3}{3(25\cdot10^9)(3\cdot10^6\ m^4)} = 0.1\ m$