

Summary of alternative description of wheel loads in braking vehicle

1. Using sprung and unsprung weights and distance of CG from axle

$$W_{fb} = W_{usf} + \frac{W_s \times b}{L} + \frac{(W_s \times a_x \times H)}{L \times g} + \frac{(W_{us} \times a_x \times r)}{L \times g}$$

Unsprung weight both front wheels N

W_{usf}

Total unsprung weight N

W_{us}

Front sprung weight N

W_{sf}

Total sprung weight N

W_s

Height of CG of sprung mass m

H

Longitudinal acceleration m/s^2

a_x

Rolling radius of tyre m

r

Distance of CG from rear axle m

b

Wheelbase m

L

Summary of alternative description of wheel loads in braking vehicle

2. Using sprung and unsprung masses and distance of CG from axle

$$W_{fb} = M_{usf} \times g + \frac{M_s \times g \times b}{L} + \frac{(M_s \times a_x \times H)}{L} + \frac{(M_{us} \times a_x \times r)}{L}$$

Front sprung mass kg

Total sprung mass kg

Unsprung mass both front wheels kg

Total unsprung mass kg

Height of CG of sprung mass kg

Longitudinal acceleration m/s²

Rolling radius of tyre m

Distance of CG from rear axle m

Wheelbase m

M_{sf}

M_s

M_{usf}

M_{us}

H

a_x

r

b

L

Summary of alternative description of wheel loads in braking vehicle

3. Using corner weight scale reading and sprung and unsprung masses

$$W_{fb} = M_{usf} \times g + M_{sf} \times g + \frac{(M_s \times a_x \times H)}{L} + \frac{(M_{us} \times a_x \times r)}{L}$$

Front sprung mass both front wheels kg

Total sprung mass kg

Unsprung Mass both front wheels kg

Total Unsprung mass kg

Height of CG of sprung mass kg

Longitudinal acceleration m/s²

Rolling radius of tyre m

Wheelbase m

M_{sf}

M_s

M_{usf}

M_{us}

H

a_x

r

L

Example 4

Finding wheel loads from typical track test data

CG height for **sprung** mass above ground. 0.299m

Wheelbase 2.351m

Left front scale reading [kg] 110kg

Right front scale reading [kg] 120kg

Left rear scale reading [kg] 185kg

Right rear scale reading [kg] 195kg

Left front unsprung mass [kg] 38kg

Right front total unsprung mass [kg] 38kg

Left rear unsprung mass [kg] 44kg

Right rear unsprung mass [kg] 44kg

Rolling radius [m] 0.275 m

Longitudinal acceleration [m/s²] 0.68g

Example 4 Solution

$$M_{\text{usf}} = 76 \text{ kg}$$

$$M_{\text{us}} = 164 \text{ kg}$$

$$M_{\text{sf}} = 154 \text{ kg}$$

$$M_{\text{s}} = 446 \text{ kg}$$

$$W_{\text{fb}} = M_{\text{usf}} \times g + M_{\text{sf}} \times g + \frac{(M_{\text{s}} \times a_{\text{x}} \times H)}{L} + \frac{(M_{\text{us}} \times a_{\text{x}} \times r)}{L}$$

$$W_{\text{fb}} = 76 \times g + 154 \times g + \frac{(446 \times 0.68g \times 0.299)}{2.351} + \frac{(164 \times 0.68g \times 0.275)}{2.351}$$

$$\begin{aligned} \text{Giving } W_{\text{fb}} &= 745.6 + 1510.74 + 378.38 + 127.97 \\ &= 2762.69 \text{ N} \end{aligned}$$
