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Front Lateral Load Transfer for Race Cars Formulas

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List of 9 Front Lateral Load Transfer for Race Cars Formulas

Front Lateral Load Transfer for Race Cars

1) COG Position Distance from Rear Wheels given Front Lateral Load Transfer

$$fx \quad x = \frac{W_F - \frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}}}{\frac{Z_{RF}}{b}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$ex \quad 2.26802m = \frac{226kg - \frac{9.81m/s^2}{[g]} \cdot \frac{155kg}{1.5m} \cdot 0.335m \cdot \frac{94900Nm/rad}{94900Nm/rad + 67800Nm/rad}}{\frac{245m}{2.7m}}$$

2) Front Lateral Load Transfer

$$fx \quad W_F = \frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}} + \frac{x}{b} \cdot Z_{RF}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$ex \quad 228.9019kg = \frac{9.81m/s^2}{[g]} \cdot \frac{155kg}{1.5m} \cdot 0.335m \cdot \frac{94900Nm/rad}{94900Nm/rad + 67800Nm/rad} + \frac{2.3m}{2.7m} \cdot 245m$$


3) Front Roll Centre Height given Front Lateral Load Transfer

$$fx \quad Z_{RF} = \left(W_F - \frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}} \right) \cdot \frac{b}{x}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$ex \quad 241.5934m = \left(226kg - \frac{9.81m/s^2}{[g]} \cdot \frac{155kg}{1.5m} \cdot 0.335m \cdot \frac{94900Nm/rad}{94900Nm/rad + 67800Nm/rad} \right) \cdot \frac{2.7m}{2.3m}$$



4) Roll Rate given Front Lateral Load Transfer [Open Calculator](#) 

$$fx \quad K_{\Phi F} = \frac{K_{\Phi R}}{\left(\frac{\frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot H}{(W_F - \frac{x}{b} \cdot Z_{RF})} \right) - 1}$$

$$ex \quad 67659.57 \text{Nm/rad} = \frac{67800 \text{Nm/rad}}{\left(\frac{\frac{9.81 \text{m/s}^2}{[g]} \cdot \frac{155 \text{kg}}{1.5 \text{m}} \cdot 0.335 \text{m}}{(226 \text{kg} - \frac{2.3 \text{m}}{2.7 \text{m}} \cdot 245 \text{m})} \right) - 1}$$

5) Track Width given Front Lateral Load Transfer [Open Calculator](#) 

$$fx \quad t_F = \frac{\frac{A_y}{[g]} \cdot m \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}}}{W_F - \frac{x}{b} \cdot Z_{RF}}$$

$$ex \quad 1.751662 \text{m} = \frac{\frac{9.81 \text{m/s}^2}{[g]} \cdot 155 \text{kg} \cdot 0.335 \text{m} \cdot \frac{94900 \text{Nm/rad}}{94900 \text{Nm/rad} + 67800 \text{Nm/rad}}}{226 \text{kg} - \frac{2.3 \text{m}}{2.7 \text{m}} \cdot 245 \text{m}}$$

6) Height of Centre of Gravity from Roll Axis given Front Lateral Load Transfer [Open Calculator](#) 

$$fx \quad H = \frac{W_F - \frac{x}{b} \cdot Z_{RF}}{\frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}}}$$

$$ex \quad 0.28687 \text{m} = \frac{226 \text{kg} - \frac{2.3 \text{m}}{2.7 \text{m}} \cdot 245 \text{m}}{\frac{9.81 \text{m/s}^2}{[g]} \cdot \frac{155 \text{kg}}{1.5 \text{m}} \cdot \frac{94900 \text{Nm/rad}}{94900 \text{Nm/rad} + 67800 \text{Nm/rad}}}$$

7) Lateral Acceleration given Front Lateral Load Transfer [Open Calculator](#) 

$$fx \quad A_y = \frac{W_F - \frac{x}{b} \cdot Z_{RF}}{\frac{1}{[g]} \cdot \frac{m}{t_F} \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}}}$$

$$ex \quad 8.400592 \text{m/s}^2 = \frac{226 \text{kg} - \frac{2.3 \text{m}}{2.7 \text{m}} \cdot 245 \text{m}}{\frac{1}{[g]} \cdot \frac{155 \text{kg}}{1.5 \text{m}} \cdot 0.335 \text{m} \cdot \frac{94900 \text{Nm/rad}}{94900 \text{Nm/rad} + 67800 \text{Nm/rad}}}$$



8) Rear Roll Rate given Front Lateral Load Transfer Open Calculator 

$$fx \quad K_{\Phi R} = K_{\Phi F} \cdot \left(\frac{\frac{A_y}{[g]} \cdot \frac{m}{t_F} \cdot H}{W_F - \frac{x}{b} \cdot Z_{RF}} - 1 \right)$$

$$ex \quad 95096.97 \text{ Nm/rad} = 94900 \text{ Nm/rad} \cdot \left(\frac{\frac{9.81 \text{ m/s}^2}{[g]} \cdot \frac{155 \text{ kg}}{1.5 \text{ m}} \cdot 0.335 \text{ m}}{226 \text{ kg} - \frac{2.3 \text{ m}}{2.7 \text{ m}} \cdot 245 \text{ m}} - 1 \right)$$

9) Total Vehicle Mass given Front Lateral Load Transfer Open Calculator 

$$fx \quad m = \frac{W_F - \frac{x}{b} \cdot Z_{RF}}{\frac{A_y}{[g]} \cdot \frac{1}{t_F} \cdot H \cdot \frac{K_{\Phi F}}{K_{\Phi F} + K_{\Phi R}}}$$

$$ex \quad 132.7311 \text{ kg} = \frac{226 \text{ kg} - \frac{2.3 \text{ m}}{2.7 \text{ m}} \cdot 245 \text{ m}}{\frac{9.81 \text{ m/s}^2}{[g]} \cdot \frac{1}{1.5 \text{ m}} \cdot 0.335 \text{ m} \cdot \frac{94900 \text{ Nm/rad}}{94900 \text{ Nm/rad} + 67800 \text{ Nm/rad}}}$$







Variables Used

- A_y Lateral Acceleration (Meter per Square Second)
- b Wheelbase of Vehicle (Meter)
- H Centre of Gravity Distance to Roll Axis (Meter)
- $K_{\phi F}$ Front Roll Rate (Newton Meter per Radian)
- $K_{\phi R}$ Rear Roll Rate (Newton Meter per Radian)
- m Mass of Vehicle (Kilogram)
- t_F Front Track Width (Meter)
- W_F Front Lateral Load Transfer (Kilogram)
- x Horizontal Distance of C.G. from Rear Axle (Meter)
- Z_{RF} Front Roll Centre Height (Meter)



Constants, Functions, Measurements used

- **Constant:** **[g]**, 9.80665 Meter/Second²
Gravitational acceleration on Earth
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Weight** in Kilogram (kg)
Weight Unit Conversion 
- **Measurement:** **Acceleration** in Meter per Square Second (m/s²)
Acceleration Unit Conversion 
- **Measurement:** **Torsion Constant** in Newton Meter per Radian (Nm/rad)
Torsion Constant Unit Conversion 



Check other formula lists

- [Load on Wheels in Race Cars Formulas](#) 
- [Front Lateral Load Transfer for Race Cars Formulas](#) 

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