

Vehicle 1 (Chevrolet S-10)

- $A = 293.2 \text{ lb/in}$
- $B = 72.8 \text{ lb/in}^2$
- $G = 590.8 \text{ lbs}$

Average values from StiffCalcs (See below adjustment).

- $x_1 = C_1 + 2C_2 + 2C_3 + 2C_4 + 2C_5 + C_6$

$$x_1 = 16.8 + 2(13.8) + 2(18.2) + 2(14.4) + 2(4.5) + 0.2$$

$$x_1 = 118.8$$

- $x_2 = C_1^2 + 2C_2^2 + 2C_3^2 + 2C_4^2 + 2C_5^2 + C_6^2$

$$x_2 = 16.8^2 + 2(13.8)^2 + 2(18.2)^2 + 2(14.4)^2 + 2(4.5)^2 + 0.2^2$$

$$x_2 = 282.24 + 380.88 + 662.48 + 414.72 + 40.5 + .04$$

$$x_2 = 1780.86$$

- $x_3 = C_1C_2 + C_2C_3 + C_3C_4 + C_4C_5 + C_5C_6$

$$x_3 = (16.8)(13.8) + (13.8)(18.2) + (18.2)(14.4) + (14.4)(4.5) + (4.5)(0.2)$$

$$x_3 = 810.78$$

- $E = \frac{L}{5} \left(5G + \frac{Ax_1}{2} + \frac{B(x_2 + x_3)}{6} \right) (1 + \tan^2 \alpha)$

$$E_1 = \frac{58.1}{5} \left(5(590.8) + \frac{(293.2)(118.8)}{2} + \frac{72.8(1780.86 + 810.78)}{6} \right) (1 + \tan^2(0))$$

$$E_1 = 11.62(2954 + 17416.08 + 31445.32)(1)$$

$$E_1 = 602093.92 \text{ in/lbs} \div 12 = 50174.49 \text{ ft/lbs}$$

- $$\Delta V_1 = \sqrt{\frac{30\gamma_1(E_1 + E_2)}{W_1\left(1 + \frac{\gamma_1 W_1}{\gamma_2 W_2}\right)}}$$

$$\Delta V_1 = \sqrt{\frac{30(1)(50174.49 + 45223.17)}{3400\left(1 + \frac{(1)(3400)}{(1)(3675)}\right)}}$$

$$\Delta V_1 = \sqrt{\frac{30(1)(95397.66)}{6528}} = \sqrt{\frac{2861929.8}{6528}} = \sqrt{438.4} = \underline{\underline{20.93 \text{ mph}}}$$

- $\gamma = .99$; See Gamma values which take into account rotation

$$\Delta V_1 = \sqrt{\frac{30(.99)(50174.49 + 45223.17)}{3400\left(1 + \frac{(.99)(3400)}{(.99)(3675)}\right)}}$$

$$\Delta V_1 = \sqrt{\frac{30(.99)(95397.66)}{3400\left(1 + \frac{(.99)(3400)}{(.99)(3675)}\right)}} = \sqrt{\frac{2833310.5}{3400\left(1 + \frac{3366}{3638.25}\right)}} = \sqrt{\frac{2833310.5}{6528}} = \sqrt{434.02}$$

$$\Delta V_1 = \underline{\underline{20.83 \text{ mph}}}$$

Adjustment: It should be noted that if the maximum stiffness values ($A = 328.6$, $B = 89.8$, $G = 601.2$) are used the closing speed is 51 mph.