

**Wheel Load Design Calculation Details**

|                                |
|--------------------------------|
| <b>Date:</b> 5/1/2014          |
| <b>Name:</b> Sample Project    |
| <b>Location:</b> Buffalo Grove |
| <b>Engineer:</b> Mike McPhee   |

|                               |         |                       |
|-------------------------------|---------|-----------------------|
| Poisson's Ratio               | $\mu =$ | 0.15                  |
| Section Width                 | $b =$   | 1 meter               |
| Slab Thickness                | $h =$   | 6.00 in               |
| Concrete Compressive Strength | $F_c =$ | 4,000.00 psi          |
| Modulus of Elasticity         | $E =$   | 3,602,728.70 psi      |
| Concrete Flexural Strength    | $F_r =$ | 600.00 psi            |
| Modulus of Subgrade Reaction  | $k =$   | 100.00 pci            |
| Axle Load                     | $P =$   | 10,400.00 lb          |
| Contact Area                  | $C_a =$ | 52.00 in <sup>2</sup> |
| Wheel Spacing                 | $S =$   | 30.00 in              |
|                               | $S_w =$ | 0.00 in               |
|                               | $S_d =$ | 0.00 in               |

**Radius of Relative Stiffness**

$$l = \left| \frac{E * h^3}{12(1 - \mu^2) * k} \right|^{0.25} \quad l = \mathbf{28.51 \text{ in}}$$

(724.05 mm)

**Load Percentage**

Wheel Configuration = **Single Axle**

Main Axle

|                       |   |       |
|-----------------------|---|-------|
| Wheel                 | = | 50.0% |
| Wheel <sub>S</sub>    | = | 5.6%  |
| Wheel <sub>Sw</sub>   | = | 0.0%  |
| Wheel <sub>S+Sw</sub> | = | 0.0%  |

Adjacent Axle

|                           |   |      |
|---------------------------|---|------|
| Wheel <sub>Sd</sub>       | = | 0.0% |
| Wheel <sub>Sd(S)</sub>    | = | 0.0% |
| Wheel <sub>Sd(Sw)</sub>   | = | 0.0% |
| Wheel <sub>Sd(S+Sw)</sub> | = | 0.0% |

**A = 5,780.39 lb**  
(2.58 tonne)

**Load Contact Radius**

Single Concentrated Load

$$a = \left| \frac{C_a}{\Pi} \right|^{0.5} \quad a = \mathbf{4.07 \text{ in}}$$

(0.10 m)

**If contact radius(a) < (1.72 \* h) then**

$$b = \sqrt{1.6 * a^2 + h^2} - (0.675 * h)$$

**else**

$$b = a$$

$$b = \mathbf{3.85 \text{ in}}$$

(0.10 m)

**Slab Stress - Interior Loading**

$$f_b = 2.70 * (1 + \mu) * (P / h^2) * (4.0 * \log(R / b) + 1.069) * 10^6$$

$$f_b = \mathbf{227.40 \text{ psi}}$$

(1,567.89 kN/m<sup>2</sup>)

**Interior Safety Factor**

$$FS = \frac{f_r}{f_b}$$

Corner = 2.10  
Edge = 1.92

$$FS = \mathbf{2.64}$$



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