CONCRETE SLAB ON GRADE ANALYSIS
For Slab Subjected to Interior Concentrated Post or Wheel Loading
Assuming ACI-360 "Type B" Design - Reinforced for Shrinkage and Temperature Only

Job Name: Sunset Farms, Inc. Feed Pad  Subject: Semi Tractor
Job Number: 14774000  Originator: JRH  Checker:

Input Data:
- Slab Thickness, t = 8.000 in.
- Concrete Strength, f’c = 4000 psi
- Conc. Unit Weight, wc = 150 pcf
- Reoiring Yield, fy = 60000 psi
- Subgrade Modulus, k = 200 pci
- Concentrated Load, P = 10000.00 lbs.
- Contact Area, Ac = 45.00 in.^2
- Factor of Safety, FS = 2.00
- Dowel Bar Dia., db = 1.000 in.
- Dowel Bar Spacing, s = 15.000 in.
- Const. Joint Width, z = 0.1250 in.
- Joint Spacing, L = 125.000 ft.
- Temperature Range, T = 80.00 deg.
- Increase for 2nd Wheel, i = 15 %

Results:

Check Slab Flexural Stress: (assuming unreinforced slab with interior load condition)
- Effective Load Radius, a = 3.785 in.
- Modulus of Elasticity, Ec = 3834254 psi
- Modulus of Rupture, MR = 569.21 psi
- Cracking Moment, Mr = 6.07 ft-k.
- Poisson's Ratio, µ = 0.15
- Radius of Stiffness, Lr = 30.245 in.
- Equivalent Radius, b = 3.923 in.
- Load: fb1(actual) = 228.07 psi
- 2 Loads: fb2(actual) = 262.29 psi
- Fb(allow) = 284.60 psi

Check Slab Bearing Stress: (assuming working stress)
- fp(actual) = 222.22 psi
- Fp(allow) = 2390.68 psi

Check Slab Punching Shear Stress: (assuming working stress)
- bo = 26.833 in.
- fv(actual) = 21.25 psi
- Fv(allow) = 153.69 psi

Shrinkage and Temperature Reinf.: (assuming subgrade drag method)
- Friction Factor, F = 1.50
- Slab Weight, W = 100.00 psf
- Reinf. Allow. Stress, fs = 45000 psi
- As = 0.208 in.^2/ft.

(continued)
Determine Estimated Crack Width: (assuming no use of stabilized or granular subbase)

Slab-base Fric. Adjust., C = 1.00
Thermal Expansion, \(\alpha = 0.0000055\) in./in./deg
Shrinkage Coefficient, \(\epsilon = 0.00035\) in./in.

Est. Crack Width, \(\Delta L = 1.1850\) in.

\[
\Delta L = C \times L \times 12 \times (\alpha \times \Delta T + \epsilon)
\]

Check Bearing Stress on Dowels at Construction Joints with Load Transfer:

Assumed Load Transfer Distribution for Dowels at Construction Joint

Effective Dowels, \(N_e = 2.02\) bars
Joint Load, \(P_t = 5000.00\) lbs.
Critical Dowel Load, \(P_c = 2469.97\) lbs.
Mod. of Dowel Suppt., \(k_c = 1500000\) psi
Mod. of Elasticity, \(E_b = 29000000\) psi
Inertia/Dowel Bar, \(I_b = 0.0491\) in.\(^4\)

Relative Bar Stiffness, \(\beta = 0.716\)

\[\text{fd(allow)} = 4000.00\] psi

\[\text{fd(allow)} >\text{fd(actual)}, \text{O.K.}\]

References:
1. "Load Testing of Instrumented Pavement Sections - Improved Techniques for Applying the Finite Element Method to Strain Prediction in PCC Pavement Structures" - by University of Minnesota, Department of Civil Engineering (submitted to MN/DOT, March 24, 2002)
2. "Dowel Bar Optimization: Phases I and II - Final Report" - by Max L. Porter (Iowa State University, 2001)
3. "Design of Slabs on Grade" - ACI 360R-92 - by American Concrete Institute (from ACI Manual of Concrete Practice, 1999)
4. "Slab Thickness Design for Industrial Concrete Floors on Grade" (IS195.01D) - by Robert G. Packard (Portland Cement Association, 1976)

Comments: