

CIVL 4901  
Fall 2009  
Homework 6

1. Calculate the maximum allowable joint spacing for a concrete pavement 12 feet wide and 8 inches thick resting on an unstabilized gravel base course with a modulus of subgrade reaction of 200 psi/in. Assume the lowest mean monthly temperature is 60°F less than the temperature at placement and assume you will use dowels to transfer loads across the joints. Clearly state any assumptions.
2. Repeat the previous problem assuming you will rely on aggregate interlock alone to transfer loads across the joints. Clearly state any assumptions.
3. We've decided to use a slab length of 40 ft. Calculate the maximum daytime curling stresses in the slab based on a typical temperature gradient of 3°F per inch of slab thickness. Remember that there are longitudinal and transverse curling stresses in the slab interior, but only longitudinal stresses at the slab edge. Clearly state any assumptions.
4. Determine the welded wire fabric required for the slabs above if they are part of a two-lane-wide concrete pavement. Clearly state any assumptions.
5. Determine the length, diameter, and spacing of tie bars needed between the two adjacent pavement lanes. Clearly state all of the assumptions you've made.
6. Because we are using a 40-ft slab length, we will have to use dowels to transfer load from one slab to the next in the direction of travel. Assume the dowels will be placed at 1-ft intervals with the outermost dowels 6" from the edge of the slab. The design axle load is 18,000 lb with the outside wheel centered over the dowel closest to the edge of the slab and the inside wheel centered over the dowel 7' to the left. Assume the concrete has a compressive strength ( $f'_c$ ) of 5000 psi. Based on recent research, assume that zero shear stress occurs at a distance of  $1.0 \ell$  from the point of application of the wheel load.