Design of One-Way Slabs

- Check if it is one-way slab system
  - If clear span in one direction, L1, is greater than or equal to two times the clear span in other direction, L2, then it is.
    - \( L1 \geq 2 \times L2 \), okay
- Design principal flexural reinforcement for short span, perpendicular to that direction place temperature and shrinkage reinforcement.
- Choose slab height, \( h \), to limit deflections \( h \)-min (table 9.5a)
  - Simply supported, \( l/20 \) (\( l = \) clear span)
  - One end continuous, \( l/24 \)
  - Both ends continuous, \( l/28 \)
  - Cantilever, \( l/10 \)
- Determine dead load
- Find \( \text{Mn}_{\text{req}} = (\text{Mu}/\phi) \) using factored loads [use moment modification factors if dealing with an indeterminate multiple span system]
- Determine effective depth, \( d \), based on cover requirements and assumed bar size
- Design section \( \text{Mn}_{\text{req}} = A_s f_y (d-A_s f_y/1.7 f_c') \)
- Find \( A_s_{\text{req}} \)
- Check that the flexural reinforcement is less than \( 0.75 \rho_{\text{balanced}} \)
- Check that the flexural reinforcement is greater than
  \[
  \max \left\{ \frac{200}{f_y} \text{ and } \frac{3\sqrt{f_c'}}{f_y} \right\}
  \]
  \( \text{and} \) greater than temperature and shrinkage reinforcement requirements
- Choose bars and spacing for flexural reinforcement
- Check spacing
  - Spacing of the flexural steel should be less than 3 x slab thickness and less than 18"
- Determine temp and shrinkage reinforcement in perpendicular direction to flexural reinforcement.
  - ACI 7.12.2.1
  \[
  \rho = \begin{cases} 
  \text{Grade 40 or 50 deformed bars, 0.0020} \\
  \text{Grade 60 deformed bars or welded wire mesh, 0.0018} \\
  \text{Reinforcement greater than 60,000 psi, } \frac{0.0018 \times 60,000}{f_y} \end{cases} \quad \text{and } \geq 0.0014
  \]
- Choose bars and spacing for temperature and shrinkage reinforcement
- Spacing shall be less than the min(5h, 18")
- Draw cross-sections