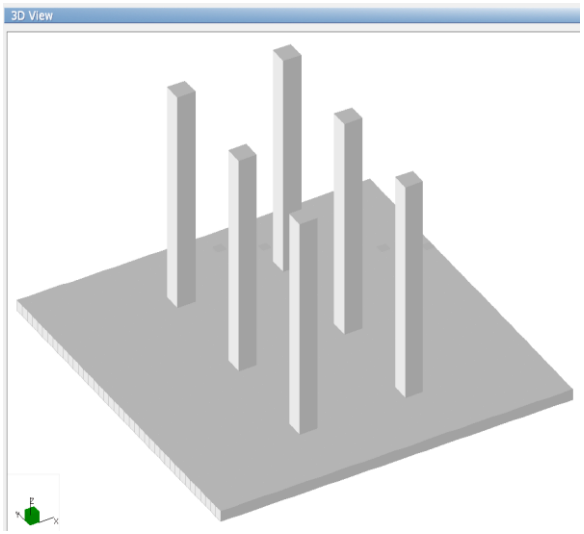
PLAIN UNREINFORCED CONCRETE SLABS ON GRADE

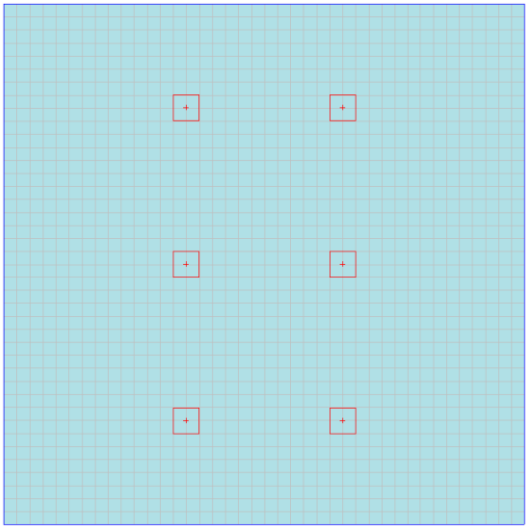
Ground supported slabs with light loading are frequently designed without reinforcing (unreinforced). Such slabs are referred to as membrane slabs, floating slabs, or filler slabs and range in thickness from as little as 4" to 8" depending on the supported loads. In warehouses and storage facilities such slabs are subjected to concentrated point loads from storage rack posts or forklift wheel loads.

Example Model with Sample Input:

In this example, a concrete warehouse floor with joints spacing 20' o.c. a slab is subject to modular racking posts loads of 1,750 lbs each in a grid of 6'x6'. The 6" slabs on grade is unreinforced and supported on soil with a subgrade modulus of 100 kcf. Concrete strength is 2,500 psi. Investigate whether the slab has adequate flexural capacity.



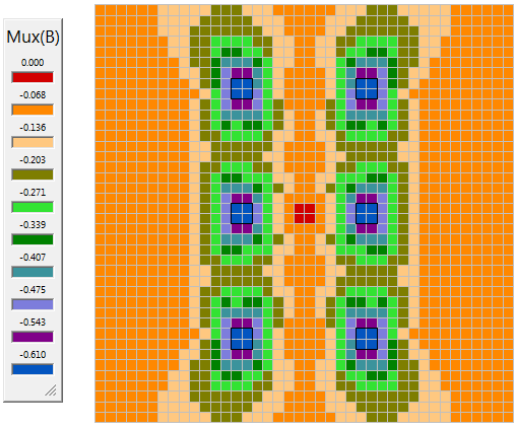
3D View



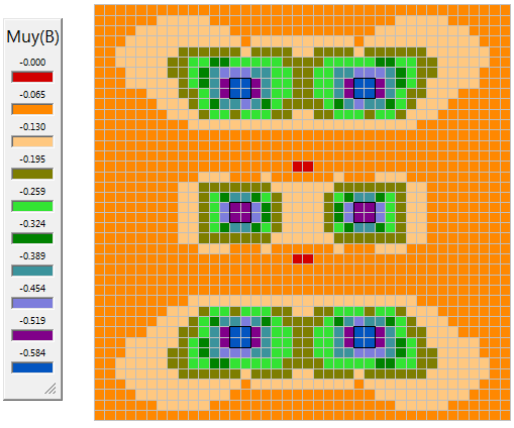
Plan View

Interpretation of Design Moment Output:

spMats displays the top and bottom design moment envelopes as a contour view as well as a text output for each element. The contour view of bottom (governing) design moment envelopes in the X and Y-Directions are shown below.



From spMats, the design moment, M_{ux} = 0.610 ft-kips



From spMats, the design moment, M_{uy} = 0.584 ft-kips

The combined effects of the design moments in X and Y-Directions are calculated by SRSS Method as follows:
The combined design moment effect, $M_u = \sqrt{(M_{ux}^2 + M_{uy}^2)} = \sqrt{(0.610^2 + 0.584^2)} = 0.84$ ft-kips

The design flexural strength per ACI 318-14, 14.5 is:

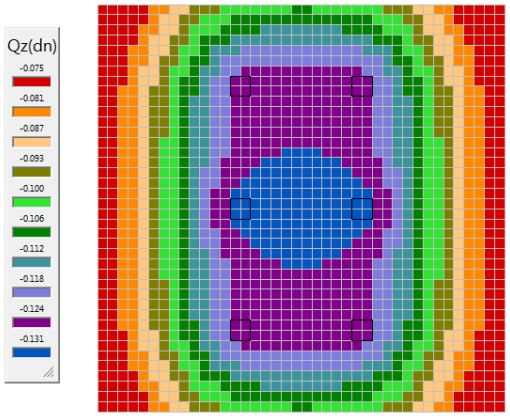
$\phi M_n = \phi\ 5\ \lambda\ \text{sqrt}(f'_c)\ S_m$

where S_m is the corresponding elastic section modulus.

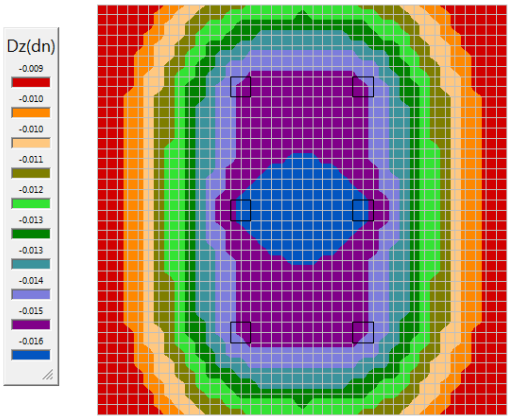
ϕM_n = 0.60 (5) (1.0) sqrt(2,500) [(12) (6)^2/6]

ϕM_n = 10,800 in-lb = 0.9 ft-kips > M_u = 0.84 ft-kips

Therefore, the 6" unreinforced concrete slabs on grade has higher flexural capacity than the combined effect of the applied moments in the X and Y-Directions.



From spMats, the soil bearing pressure envelope, Q_z (down) = 131 psf



From spMats, the soil settlement (displacement down), D_z (down) = 0.016 in.