

CIVL 7132 Advanced Soil Mechanics
Spring 2019 - Homework 4

1. A steel-framed building is being designed with column loads of 32 kips supported on 4-ft-square spread footings. Boring logs show 3 feet of medium-dense sand underlain by 6 feet of normally consolidated clay. The clay sits on a layer of dense sand and gravel. The water table is at the top of the clay layer. The medium-dense sand has a moist unit weight of 130 lb/ft^3 , a saturated unit weight of 134 lb/ft^3 , an undrained Young's modulus of 5000 psi and a Poisson's ratio of 0.35. The clay has a saturated unit weight of 105 lb/ft^3 and a modified compression index of 0.30. **For simplicity, assume that it, too, has a Young's modulus of 5000 psi and a Poisson's ratio of 0.35 even though it's saturated and probably not quite as stiff as the sand.**
 - a) Calculate the immediate settlement of the fill beneath the center of the concrete footings.
 - b) Calculate the consolidation settlement of the NC clay layer due to the load on each footing using three sublayers and mid-layer stresses. Use the Boussinesq solution to determine the footing stresses transmitted to the clay layer. Assume the building columns are far enough apart that the stresses from adjacent columns do not overlap.