Settlement of a large raft foundation

Author: Sofia Lefkaditi (2153297) - Supervisor: Dr. Bill Stewart

Introduction
The aim of the project is to predict the settlement beneath the large raft foundation at Dungeness B Power Station located in the south east coast of England, the largest area consisting of open flint shingle in Europe. The foundation is placed within a 9 – meter excavation on shingle overlain by multiple layers of sand (31 m) which extend down to the Hasting beds, a geological unit which consists of stiff silty clays and dense silts which serves as a rigid base. Figure 1 presents the problem geometry as well as the loads of the main structures during the period under consideration (Week 403 – 90% of superstructure constructed).

Settlement Measurements
- Excavation completion – Week 403: center point settled by 65mm at a depth of 4.27 m from foundation level.
- Raft completion – Week 403: maximum settlement of 63mm beneath WR.

Settlement Calculations
- Schmertmann’s method: average settlement of 63mm.
- The assumption of a constant secant modulus within each layer regardless the increase of vertical stress.
- The triangular strain profile diagram is not the best choice for the range of Poisson’s ratio of granular soils.
- No consideration of stress distribution – no detailed results.
- Burland – Burbidge’s method: maximum settlement of 142mm.

Settlements directly beneath the foundation: overestimated – Settlements at greater depths for center of foundation: underestimated (swelling)
- Boussinesq’s assumptions of elasticity and, especially, homogeneity do not represent accurately the real soil behaviour.
- The presence of the rigid base is not reflected in the results.
- Stiffness: raft – various soil layers not considered.
- Increase of vertical stresses only beneath the loaded area.
- Crude assumptions: behaviour of shingle – geometry of loads.

Conclusion
The discipline of foundation engineering is constantly adapting to any new methods or updates of the existing ones and during the last decades a great amount of methods, both analytical and numerical, have been and are still being developed. However, since the soil is a material the behaviour of which cannot be accurately predicted as many approaches as possible need to be developed in order to ensure that no aspects are neglected and the safety of the structure is secured.