Ejemplo Asentamientos

Profesor: Ricardo Moffat

Journal of the
SOIL MECHANICS AND FOUNDATIONS DIVISION
Proceedings of the American Society of Civil Engineers

SETTLEMENT OF SPREAD FOOTINGS ON SAND

By David J. D'Appolonia,[1] A. M. ASCE, Elio D'Appolonia,[2] M. ASCE, and Richard F. Brissette,[3] A. M. ASCE

INTRODUCTION

Two requirements must be fulfilled in the design of footings: the load must be sufficiently less than the ultimate bearing capacity of the foundation to insure stability, and secondly, the differential settlement must not exceed an amount which will produce adverse behavior of the superstructure. The ultimate bearing capacity of footings on granular soils can be predicted using the bearing capacity factors developed by Terzaghi (27)[4] and modified by Meyerhof (17,18,19). However, except in cases where the footing width is less than about three-ft or four-ft, the allowable footing settlement is usually exceeded before bearing capacity considerations become important (20,28). Thus, the allowable bearing pressure is controlled by settlement considerations.

The total settlement of footings on sand is generally small; however, differential settlement between adjacent footings can approach the total settlement. Terzaghi and Peck (28) suggest that a differential settlement of 75% of the estimated total settlement should be used for design when adjacent footings vary significantly in size and depth ratio. For footings of approximately equal size and load, they suggest that differential settlement is unlikely to exceed 50% of the maximum settlement. From a study of structures on sand in Norway and elsewhere, Bjerrum (2) found that differential settlement was greater than 50% of the total settlement in a large number of cases. Skempton and MacDonald (25) have also shown from case studies that differential settlement is of the same order of magnitude as total settlement for buildings on sand.

The principle variables controlling settlement for a particular granular soil under a given static loading configuration are the initial density and the

Note.—Discussion open until October 1, 1968. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. This paper is part of the copyrighted Journal of the Soil Mechanics and Foundations Division, Proceedings of the American Society of Civil Engineers, Vol. 94, No. SM3, May, 1968. Manuscript was submitted for review for possible publication on July 17, 1967.

[1] Instructor, Massachusetts Institute of Technology, Cambridge, Mass.
[2] Pres., E. D'Appolonia Cons. Engrs., Inc., Pittsburgh, Pa.
[3] Engr., E. D'Appolonia Cons. Engrs., Inc., Pittsburgh, Pa.
[4] Numerals in parentheses refer to corresponding items in the Appendix.—References.

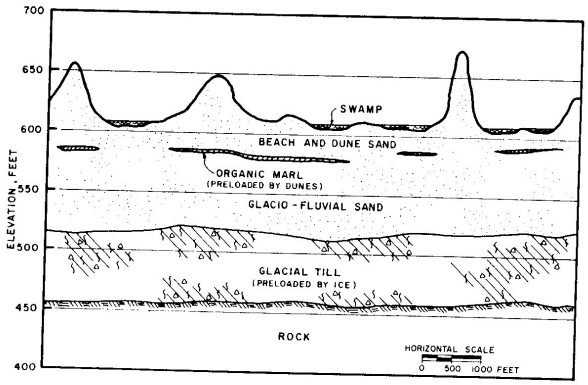
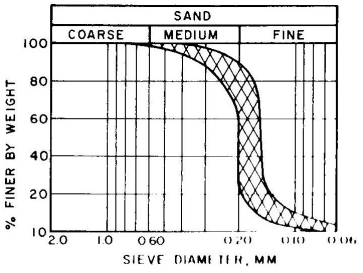
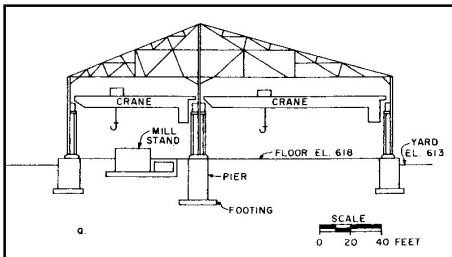
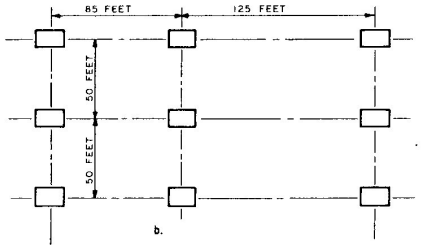


FIG. 2.—EAST-WEST SECTION THROUGH SITE PRIOR TO GRADING

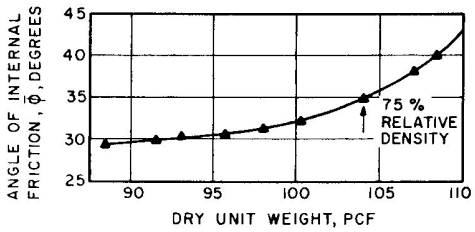


GRAIN SIZE DISTRIBUTION FOR DUNE SAND





Esquema de fundaciones



Angulo de fricción

- 300 fundaciones en 4 años de construcción
- Estimaciones del comportamiento del suelo a través del SPT, ensayo odométrico, Placas de carga y triaxiales
- Peso unitario arena:
  - 14.1 a 17.3 kN/m^3
- Fundaciones
  - L/B ~ 1.6
  - Area = 150 -450 ft^2
  - D_f/B ~ 0.5 (máximo 1.1)

Tensiones admisibles proyecto

- q_{adm} = 287.4 kPa = 2.9 kg/cm^2
- *Cargas excéntricas*
  - *Máximo 4.3 kg/cm^2*

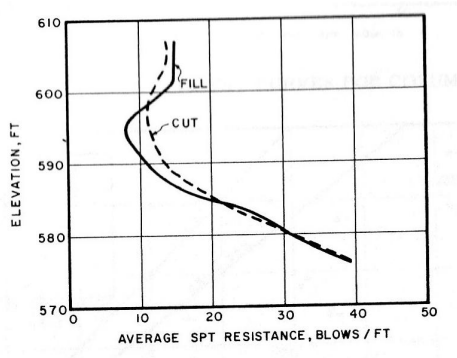
- ¿Cuál es el asentamiento esperado?

Nivel de terreno ~ 610 ft

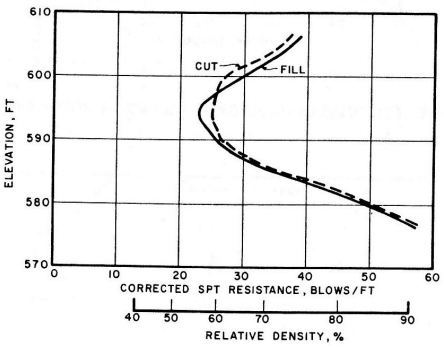
Nivel de sello de fundación ~ 595 – 607 ft

Carga entre 40 al 70 % de q_{adm}

Standard Penetration Tests (SPT)

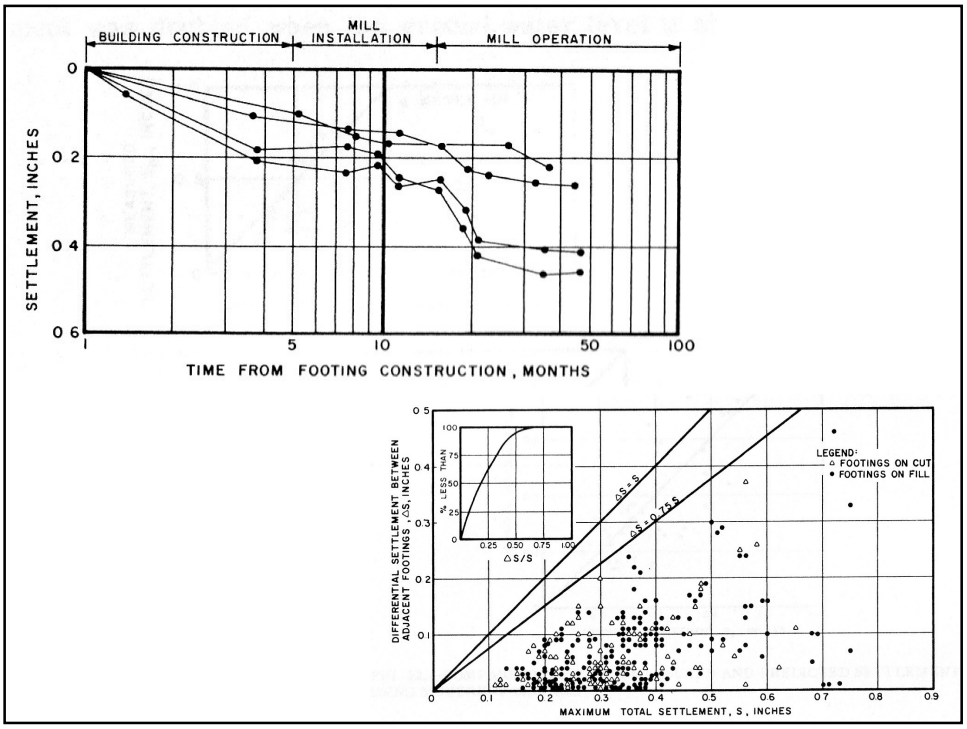


Valores de SPT medidos



Valores de SPT corregidos

Valores ajustado según Gibbs & Holtz (1957)



Predicción de asentamiento