MSC IN ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES (ADERS)

Course: **Geotechnical Engineering in the Design of Structures**

PROJECT: SETTLEMENT CALCULATIONS FOR THE LEANING TOWER OF PISA

The leaning Tower of Pisa was designed as a circular bell tower of 19.06m in diameter. The tilt of the Tower (before the period of strengthening 1990-2001) is shown in Fig. 1.

The first stage of construction took place in the period 1173-1178 and the load applied by three floors to the foundation was 92904kN. Settlement was introduced during this stage.

The second stage of construction took place in the period 1272-1278 and the total load applied to the foundation was 134534kN.

The third stage of construction in the period 1360-1370 resulted in total load of 141640kN.

Calculate the settlement of the Tower until 1990 when a multinational task force of engineers started work on its stabilization. The soil profile and the parameters required for settlement calculations are given in Figs 2,3 and 4.

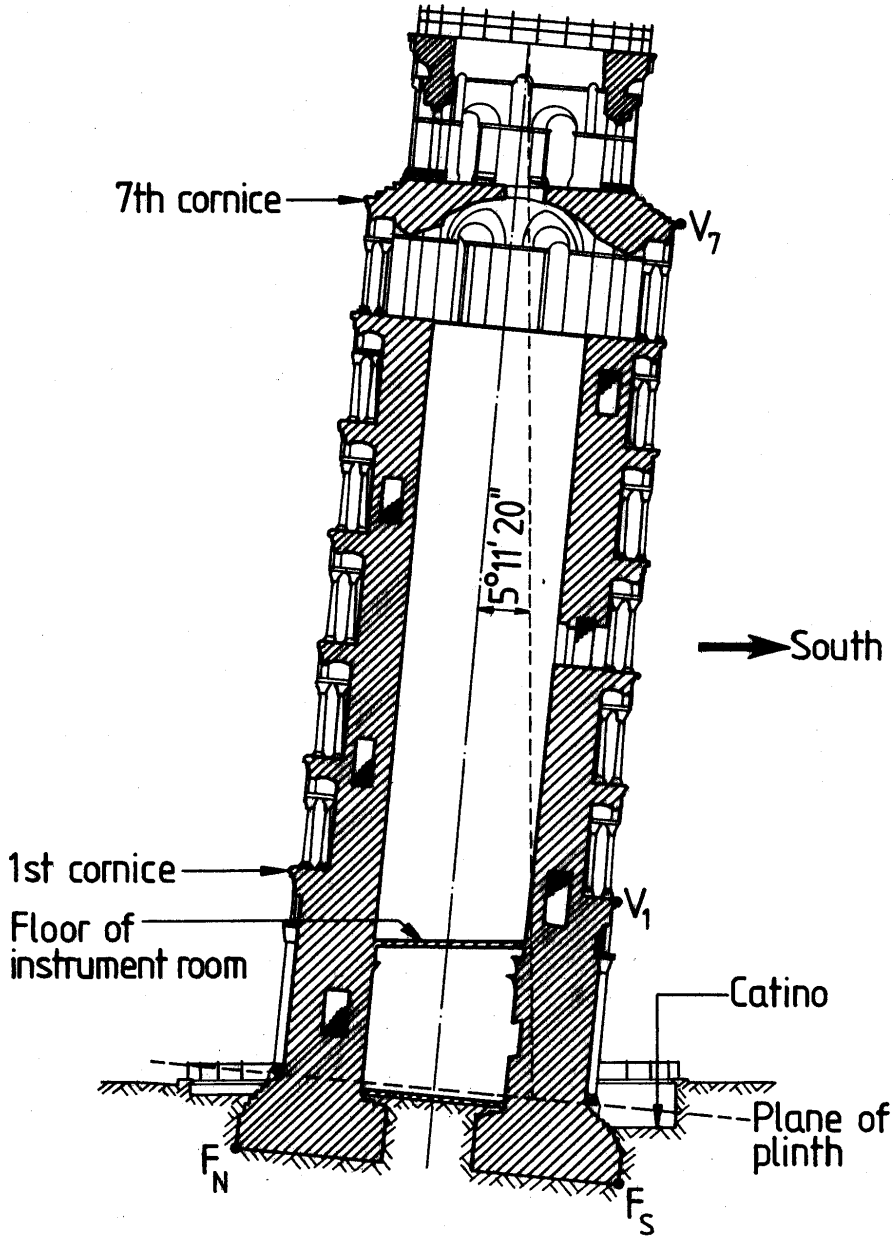

Fig. 1 Tilt of the Tower of Pisa

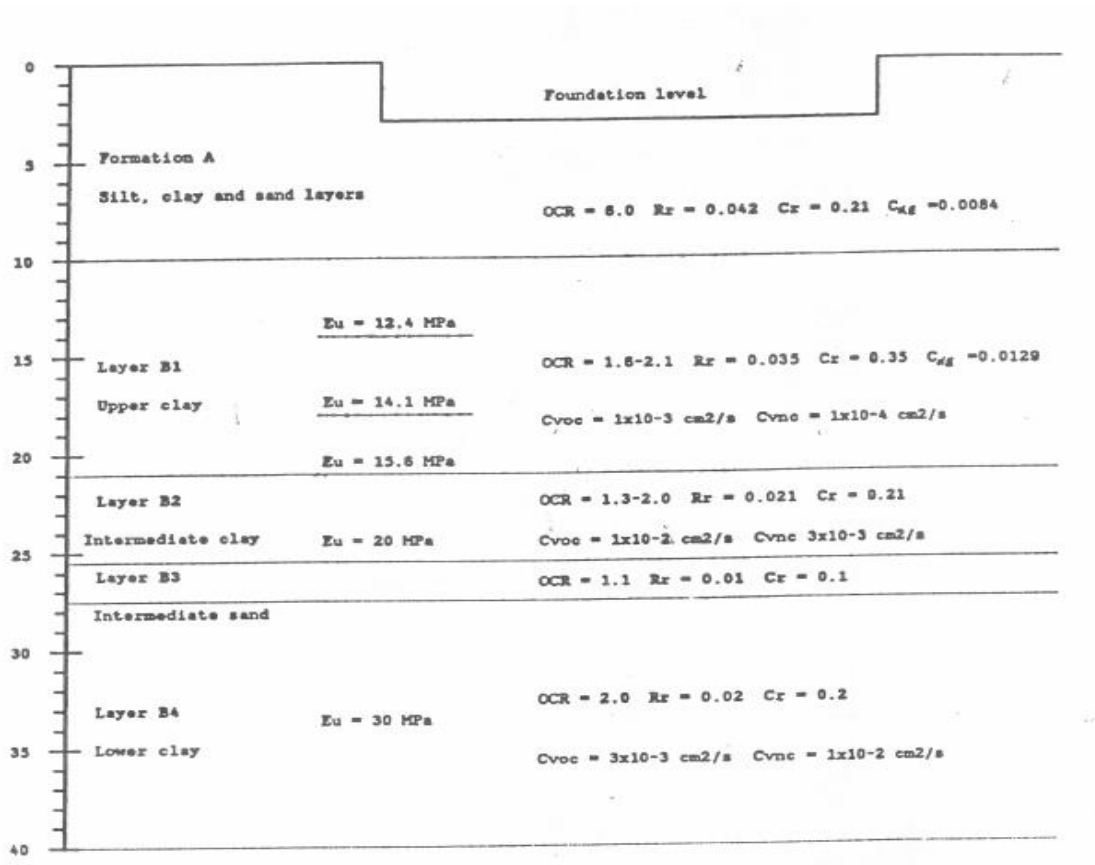

Fig. 2 Soil profile and compression parameters

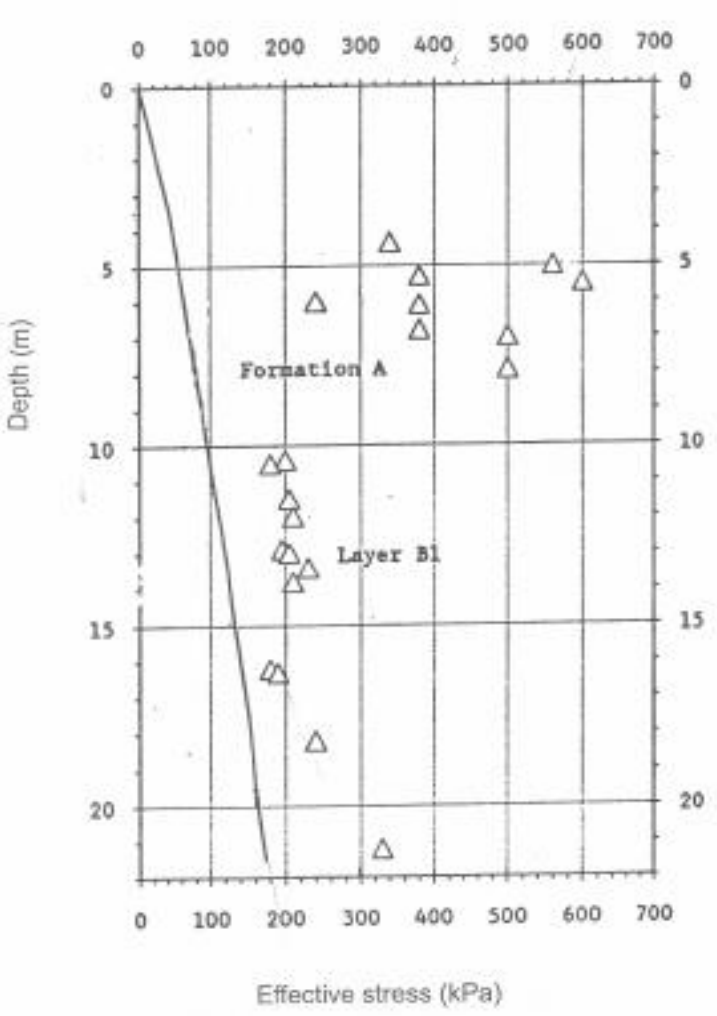

Fig. 3 Effective stress (solid line) and preconsolidation pressure variation with depth

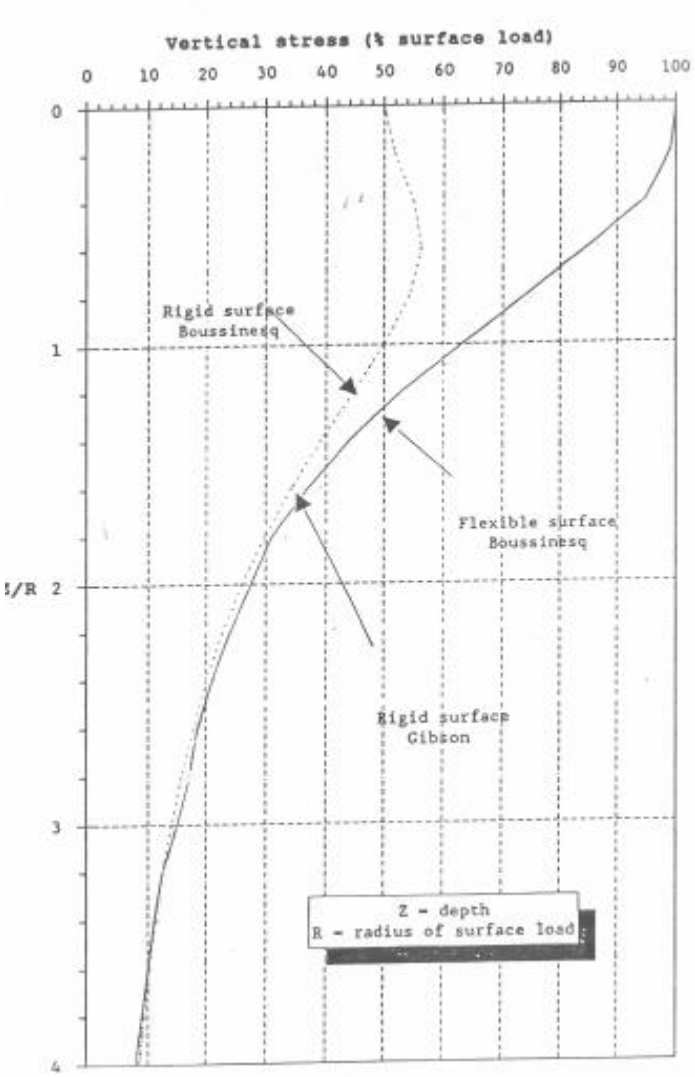

Fig. 4 Vertical stress distribution with depth under circular foundation