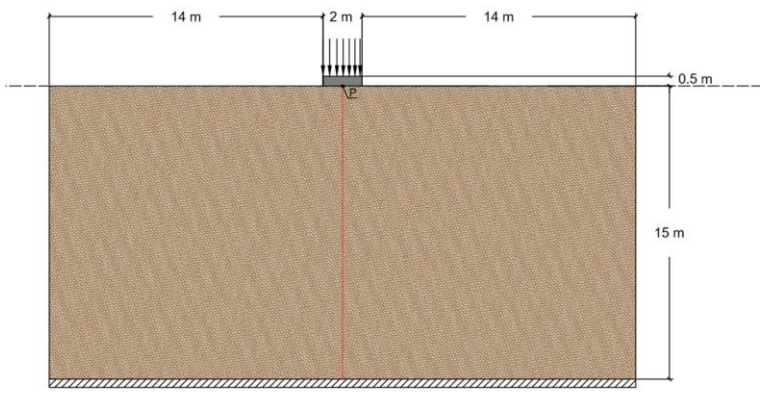


Geomechanics

HANDS-ON SESSION

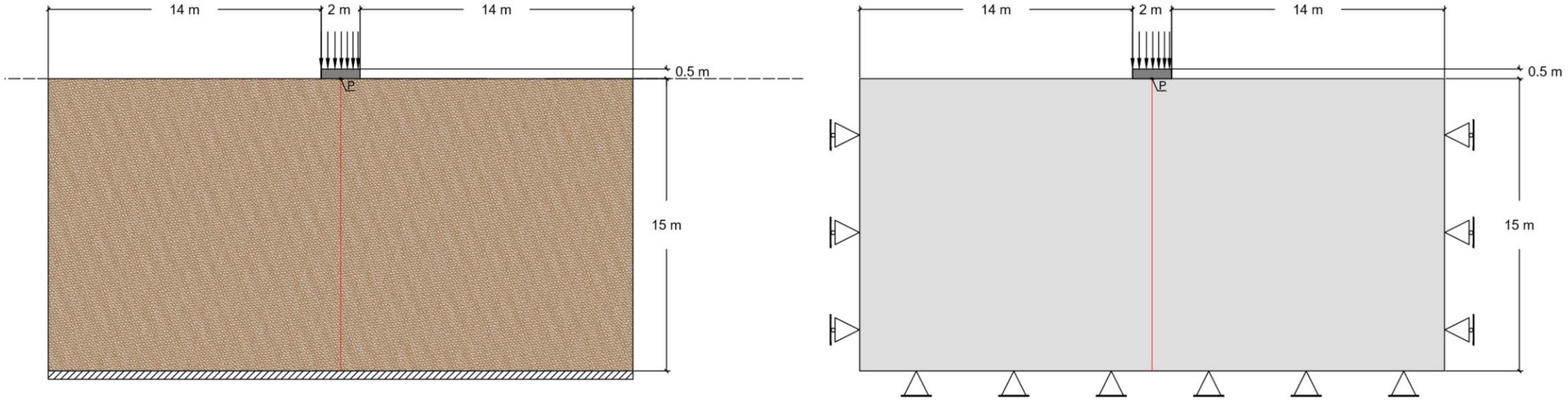
ANALYSIS OF FOUNDATION USING FEM

Laboratory of soil mechanics – Fall 2025

Assignment I - Description

- The aim of this exercise is to assess the effect of the relative stiffness foundation/soil on the distribution of the contact stresses on the foundation-soil interface.

- The problem can be outlined as shown in the figure below, where a simplified geometry is assumed, and kinematic boundary conditions are defined. The foundation is in concrete.



Assignment I - Description

The soil is dry. The analysis is conducted in terms of total stress ($\sigma = \sigma'$). Both materials are assumed to behave linearly elastic with the properties indicated in Table 1. Three values of the Young's modulus are considered for the soil. The coefficient of lateral pressure is here used to determine the initial stress state of the soil. The vertical load uniformly distributed on the foundation is 20 kPa. The weight of the foundation is neglected.

Table 1: Material parameters for the case 1

	Soil	**Foundation**
E, Young's Modulus	5 – 500 – 50000 MPa	30000 MPa
ν, Poisson's ratio	0.3	0.2
γ, Unit weight	16.0 kN/m^3	----
K_0, Coefficient of lateral pressure	0.5	----

Assignment I – Work to be done

1. For the initial state (before the load is applied) plot and comment the vertical and horizontal effective stress distributions within the domain.

2. After the load is applied, plot and comment:
   a. the vertical effective stress distribution within the domain;
   b. the vertical effective stress profile along the axis of symmetry;
   c. the vertical effective stress profile along the foundation-soil interface;
   d. the principal directions of stresses within the domain;
   e. the vertical strain distributions within the domain.

3. Compute the vertical settlement for point P in the figure and compare it with the settlement computed with a 1D (oedometric) analysis.