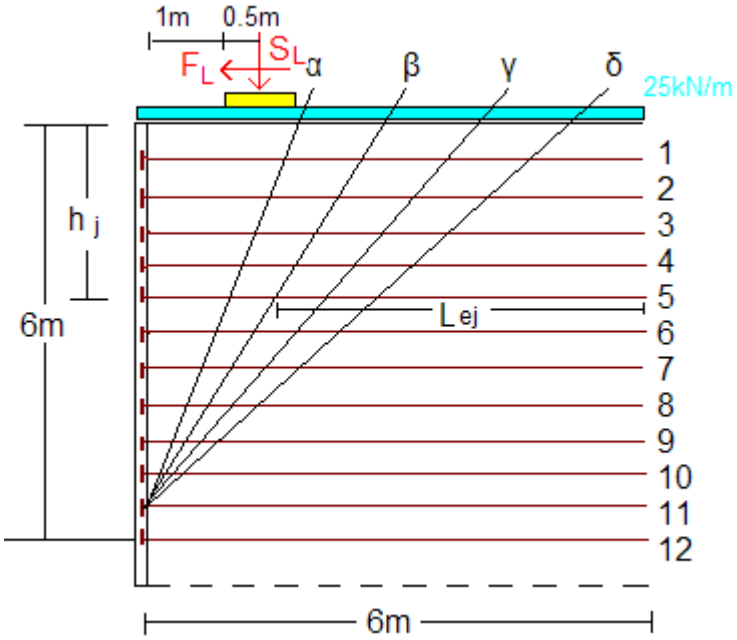
GEOTECHNICAL ENGINEERING IN THE DESIGN OF STRUCTURES:
NTUA Athens 16/12/2022

REINFORCED EARTH

A reinforced earthfill wall is to be constructed as shown in the Figure using 12 geogrid layers and compacted fill. Apart of its own weight the wall must support a uniform distributed load of 25kN/m at its surface and a strip load with vertical and horizontal components S_L=10kN and F_L=5kN respectively acting on a contact area of width b at the wall surface. The parameters of the compacted fill are γ=20kN/m^3, φ'=32^0, c'=0, Ka=0.307.

(1): Check the stability of the earthfill wall by considering 4 potential failure surfaces (α), (β), (γ) and (δ) starting at the face of layer 11 at angles 70, 61.5, 54 και 48^0 to the horizontal. Establish which of these is the most critical by constructing polygons of forces. Hence establish the force Tmax required for wedge stability.
(2): find the ultimate force carried at any level, Tj = Tpj + Tsj + Tfj, and compare with design strength
(3): using the most critical surface, check that the required total tensile strength is provided by the reinforcement $\sum_{j=1}^{m} P_j * L_{ej} * (c'+\sigma_{vj} * \mu) \geq T_{max}$, where Lej=length of reinforcement in the resistant zone. Take $\mu=\alpha*\tan\varphi'$ where α=0.5



Please note: the water table lies beneath formation level; omit factors of safety to loads and soil parameters to facilitate calculations; tabulate calculations; use ReActive to define critical failure mechanism and required T_{max}.