Tekanan akibat beban luar

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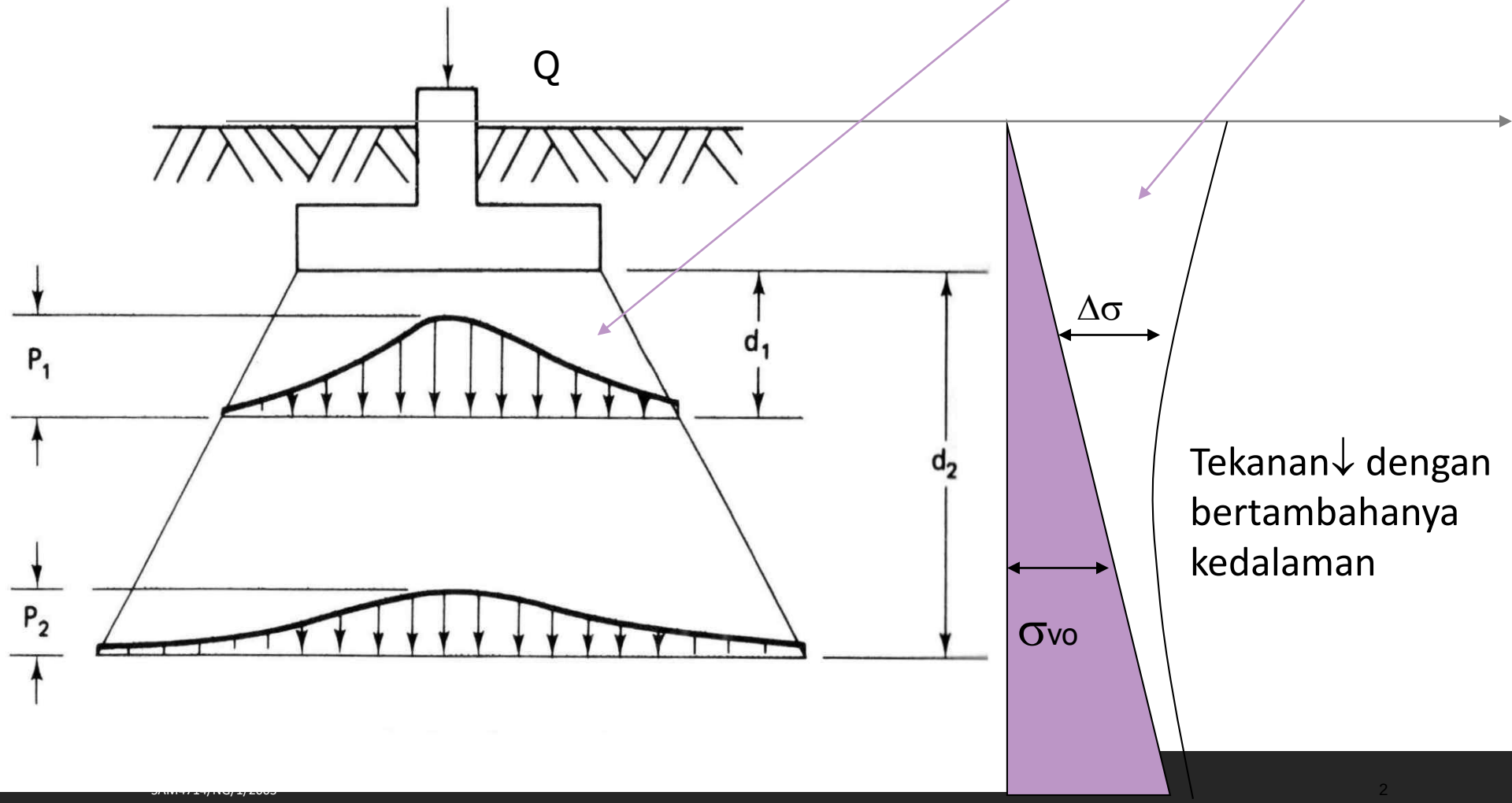
Tekanan akibat beban luar

Tekanan menyebar ke arah horizontal dan vertikal



Tekanan↓ dengan bertambahanya kedalaman

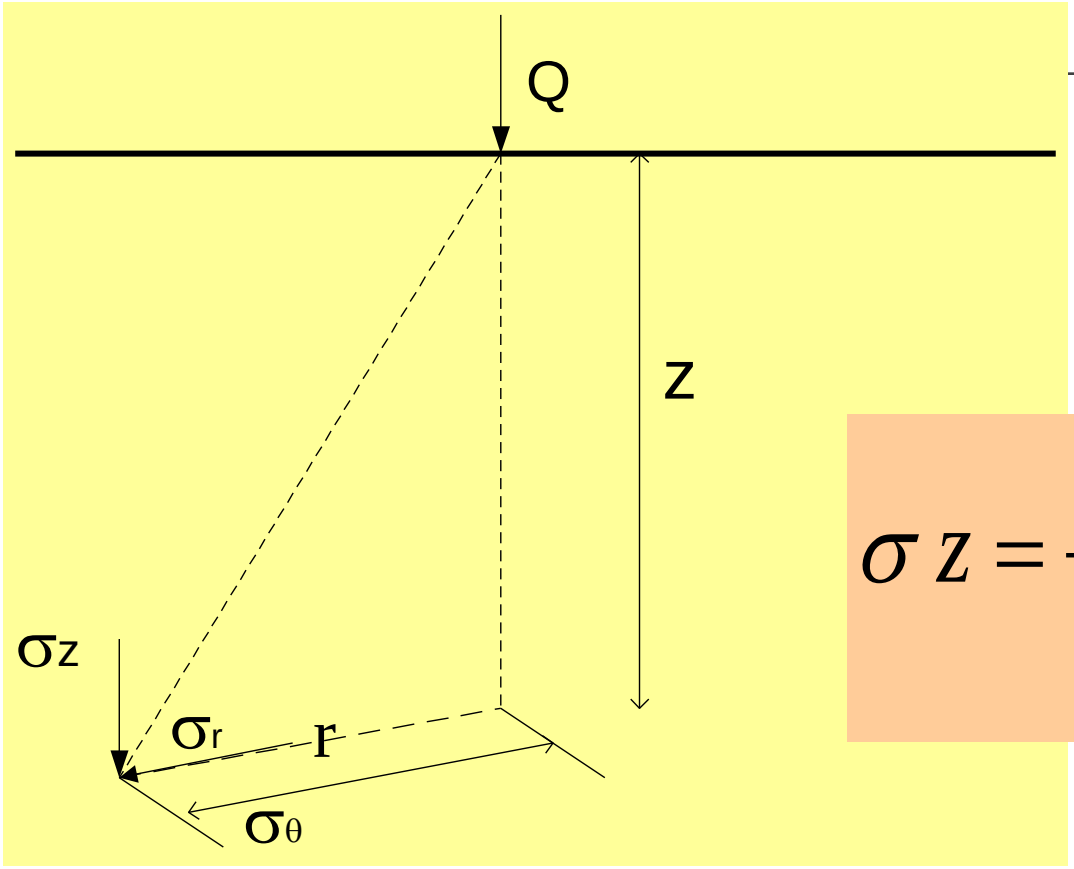
Metode memperkirakan penyebaran beban

Boussinesq (1885) based on assumption that the soil is a homogeneous, isotropic, semi-infinite medium

Westergaard Theory (1912) assume the soil contains of several thin layers

Explain comparison Westergaard & Bousinesq

Boussinesq Solution



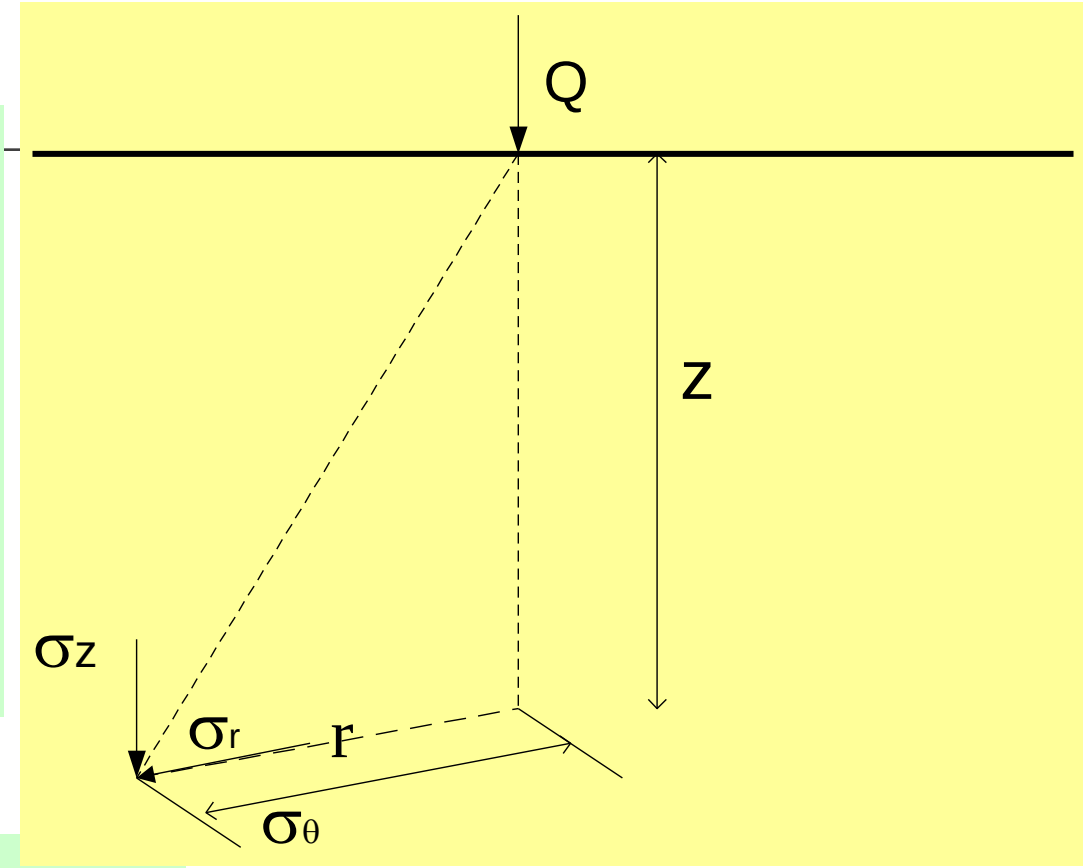
$$\sigma z = \frac{3Q}{2\pi z^2 \left(1+\left(\frac{r}{z}\right)^2\right)^{5/2}}$$

explain

Westergaard Solution

POINT LOAD

$$\sigma_z = \frac{Q\sqrt{\frac{(1-2\mu)}{(2-2\mu)}}}{2\pi z^2\left\{\frac{(1-2\mu)}{(2-2\mu)+\left(r/z\right)^2}\right\}^{3/2}}$$



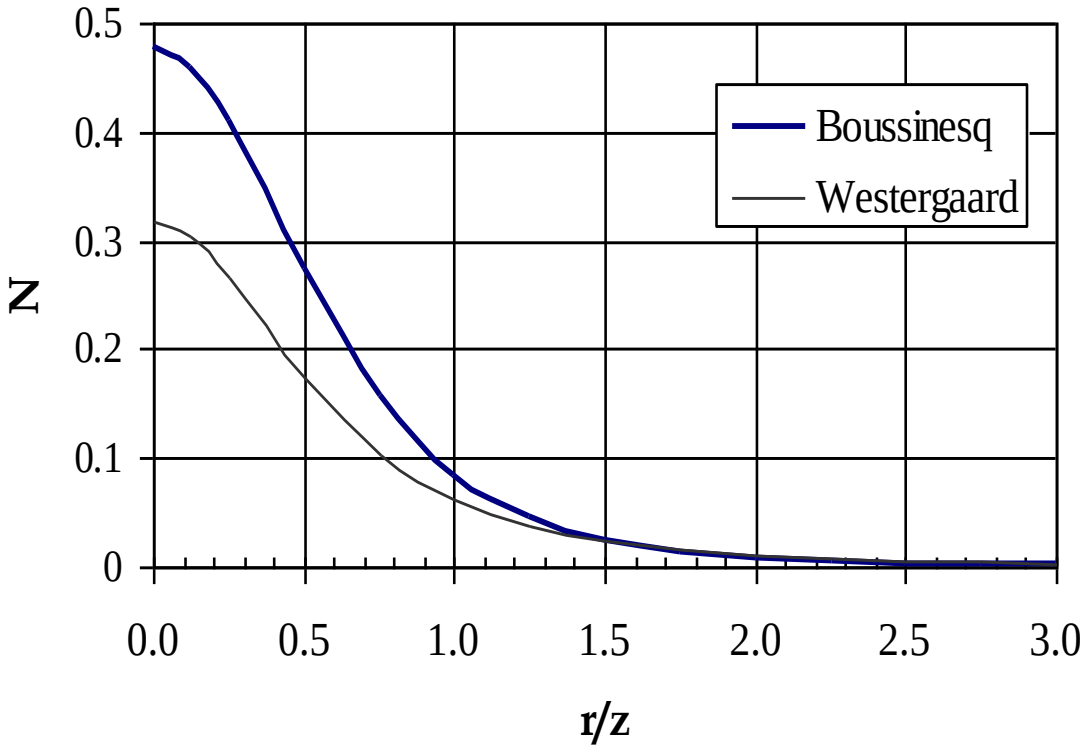
If $\mu = 0$

$$\sigma_z = \frac{Q}{\pi z^2\left[\left(1+2(r/z)^2\right)\right]^{3/2}}$$

Simplified solution

Simplified solution for Westergaard and Boussinesq equation is given in the form of chart by Taylor

$$\Delta\sigma_z = \frac{Q}{z^2} N$$



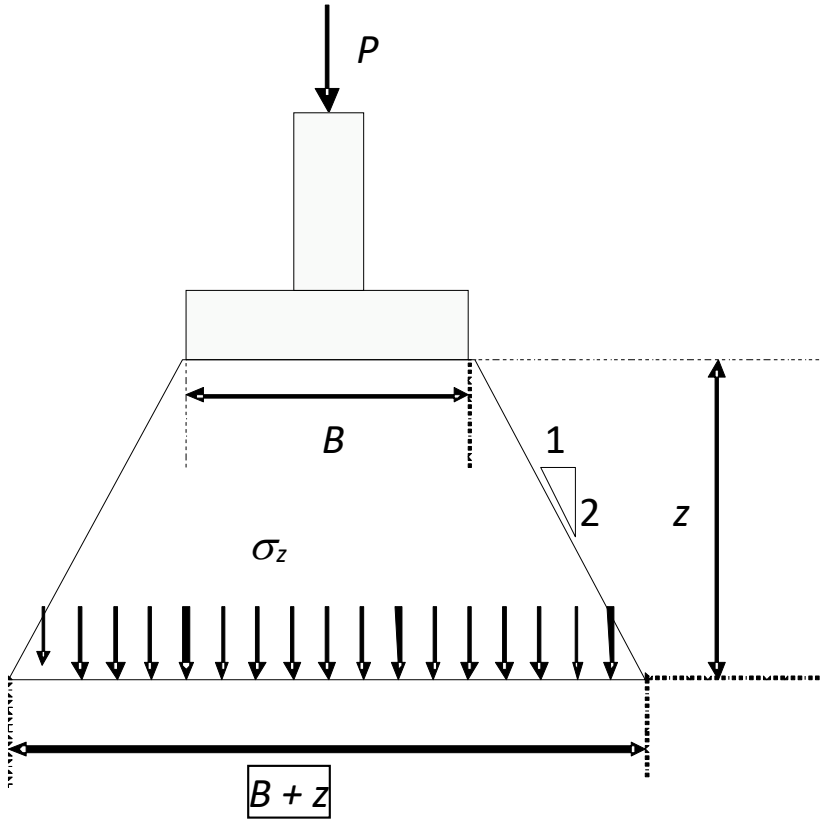
Very often concentrated/point loads are not applied directly onto soil

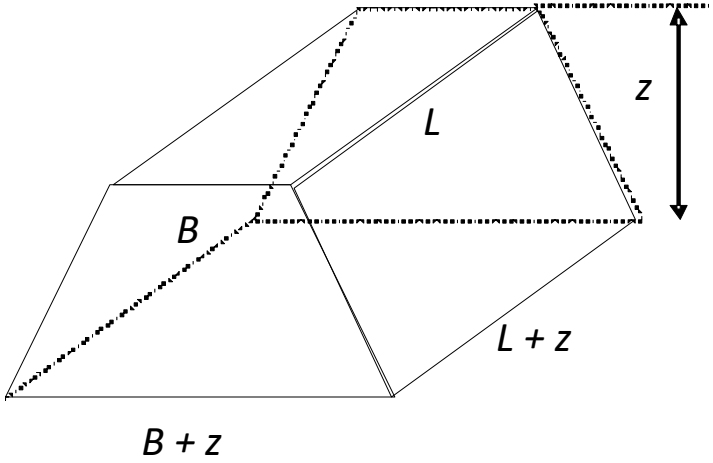
Instead, concentrated loads rest on footings, piers, etc & the load is applied in the form of uniform load

Two methods for computing vertical pressure below a loaded surface area

- Approximate method
- Integration from Elastic theory

Simple Method (2:1 distribution)





Example Problem: Whiteboard

Simple (2:1 method)

- Because *P*, *L* and *B* are constants, *p* ↓ as depth ↑
- This method is considered crude at best
- It may be useful for preliminary stability analysis of footings
- For settlement analysis, the approximate method may not be accurate enough

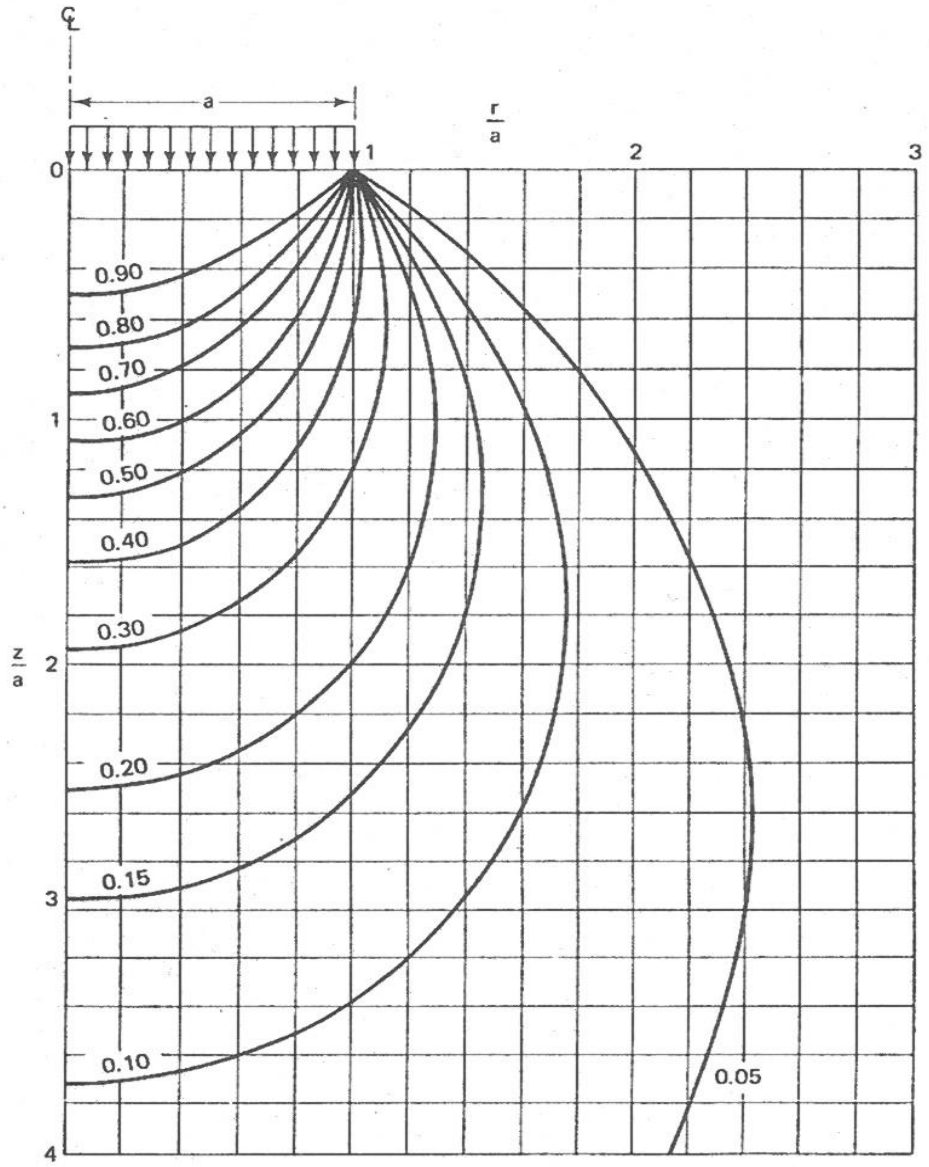
Integration from elastic theory

Charts & Graphs using influence factors I

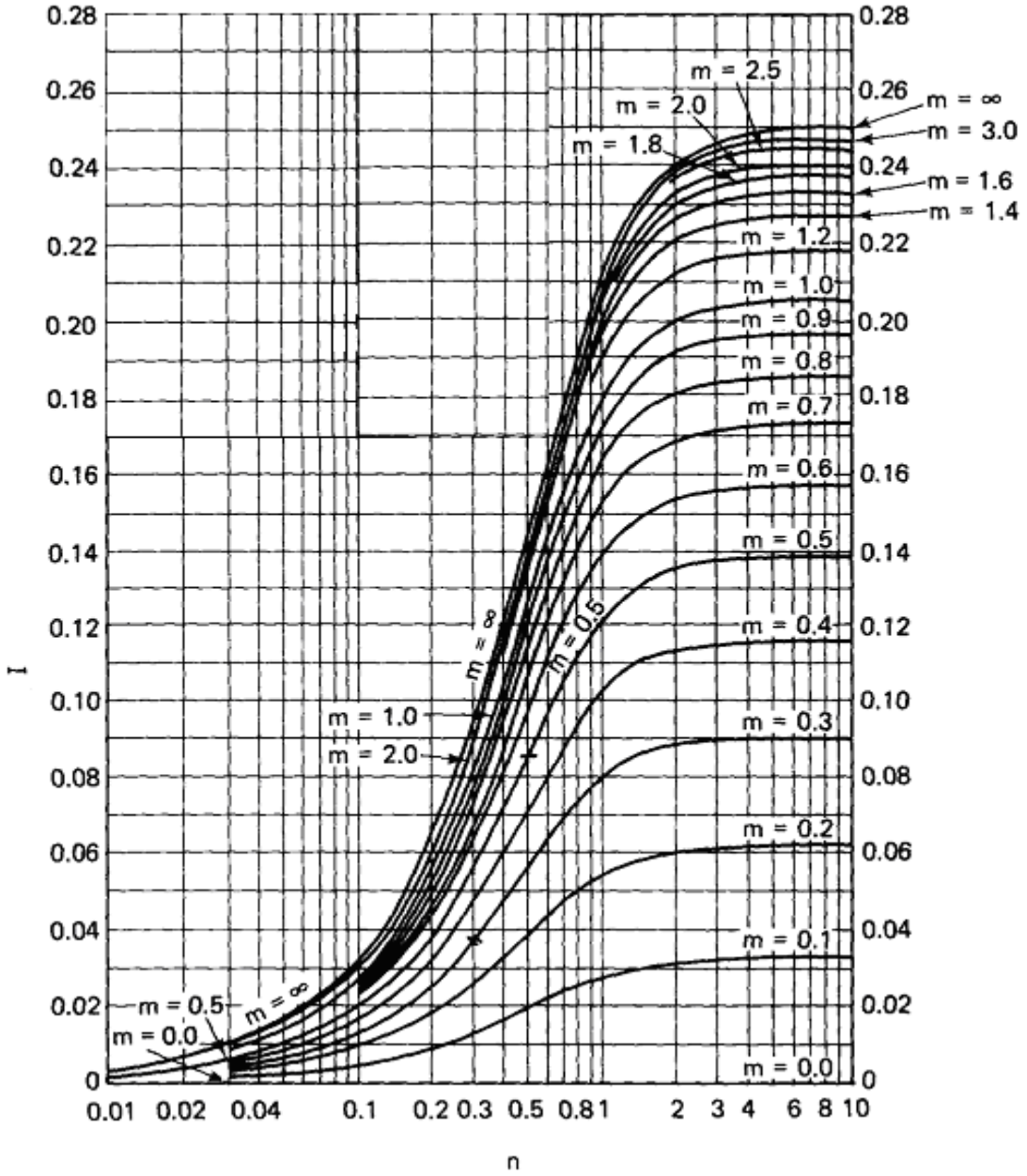
- Pressure Bulb
- Fadum
- Osterberg
- Newmark

Example Problem: Whiteboard

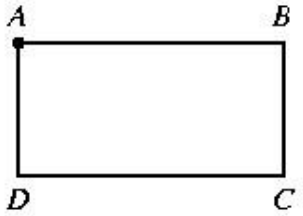
Pressure bulb Method based on Boussinesq formula



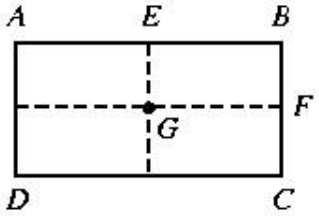
Fadum methods for rectangular footing



Explanation for Fadum Method
Uniform load on a rectangular area

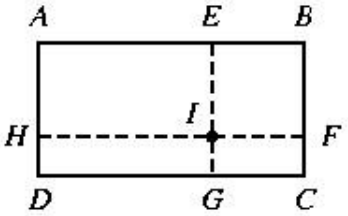


Case I



Case II

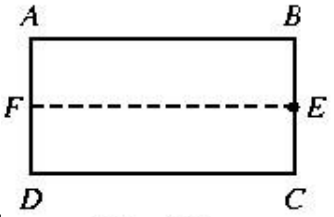
Load on *ABCD* =
4 × Load on *EBFG*



Case III

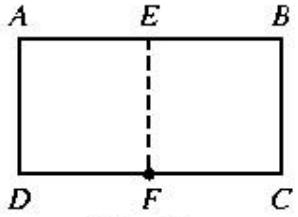
Load on *ABCD* = Load on
EBFI + *IFCG* + *IGDH* + *AEIH*

The dot
require



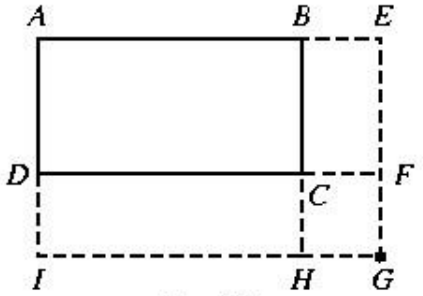
Case IV

Load on *ABCD* =
2 × Load on *ABEF*



Case V

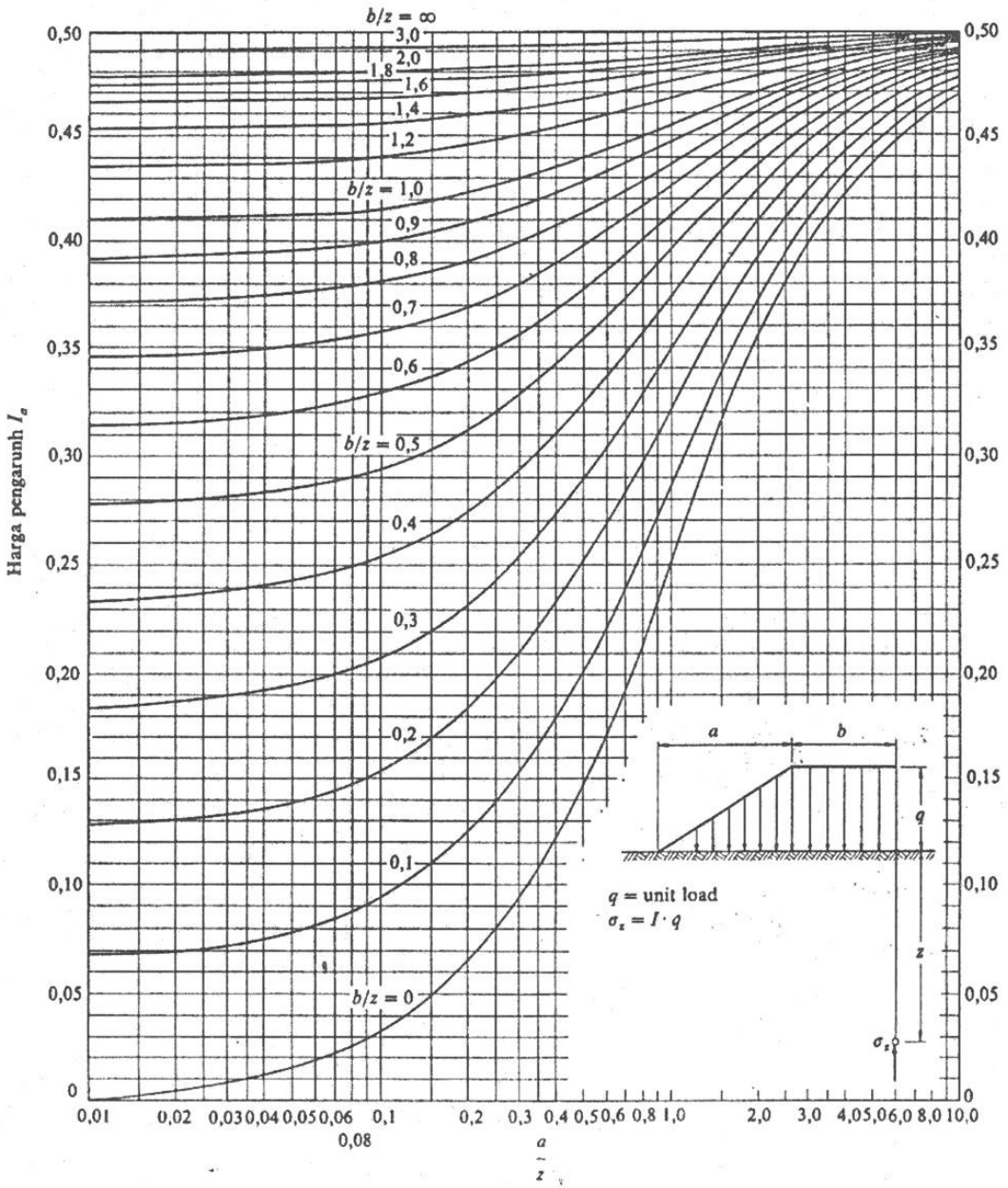
Load on *ABCD* =
2 × Load on *EBCF*



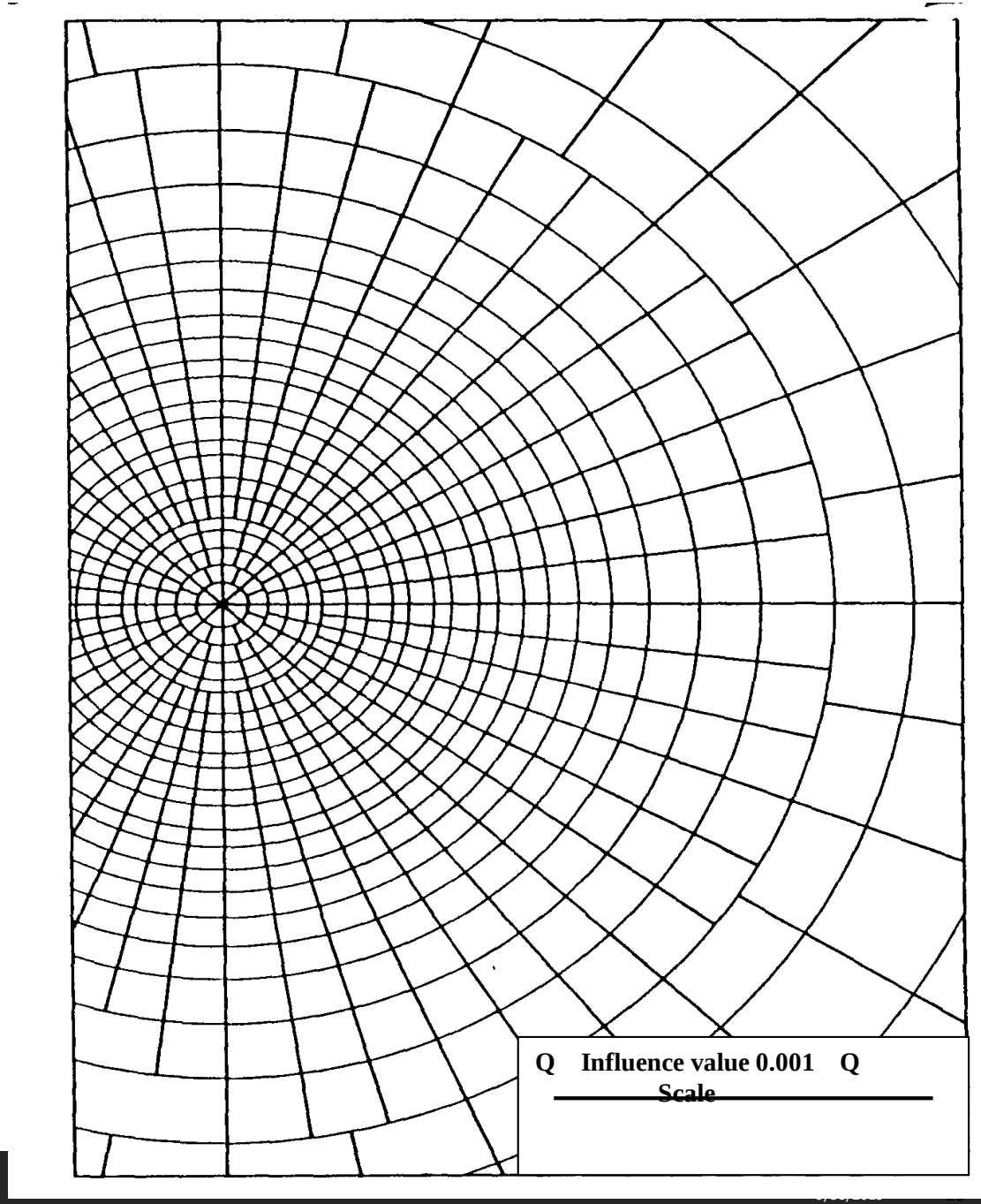
Case VI

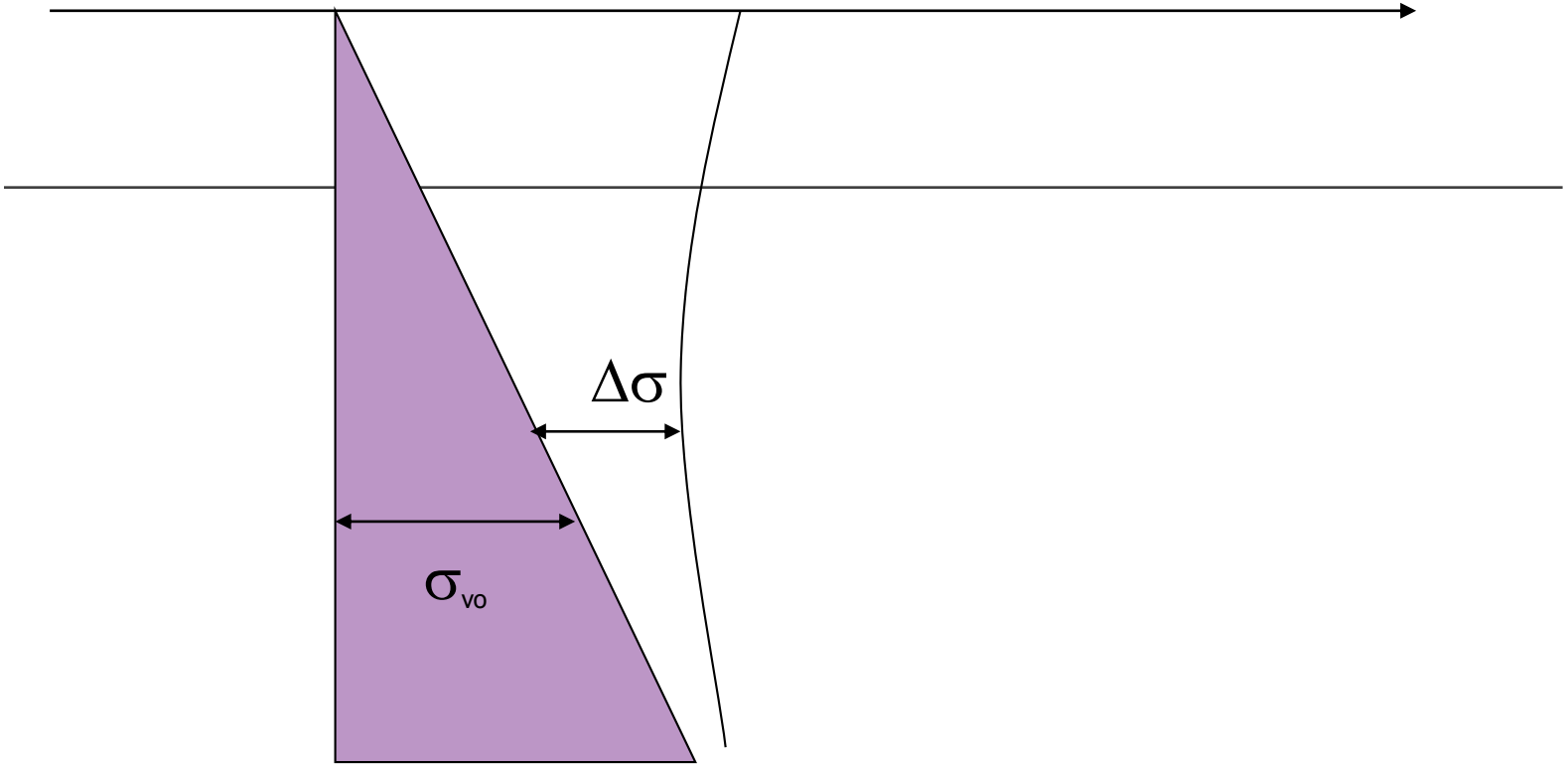
Load on *ABCD* = Load on
AEGI – *BEGH* – *DFGI* + *CFGH*

Osterberg method for trapezoidal load (generally refer to embankment)



Newmark methods





Note on the load distribution in soil:

It is an ADDITIONAL stress to the stress due own weight of the soil (overburden pressure)