



FUNDACIONES SOBRE MEDIOS ELÁSTICOS

PARTE 2

MODELOS DE CÁLCULO

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MODELOS DE CÁLCULO

- 1. PLATEAS RÍGIDAS**
- 2. PLATEAS FEXIBLES**
 - a) Flexibles infinitas**
 - b) Flexibles finitas**



PLATEA RÍGIDA SECUENCIA DE DISEÑO

1. Determinar la capacidad de la fundación
2. Determinar el asentamiento de la fundación
3. Determinar el asentamiento diferencial
4. Determinar la distribución de tensiones debajo de la fundación, considerando los puntos 1 a 3.
5. Diseñar los componentes estructurales de la platea utilizando la distribución de tensiones obtenidos el 4



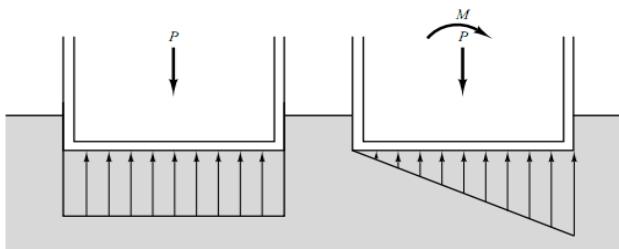
PLATEA RÍGIDA SECUENCIA DE DISEÑO

- **Capacidad Geotécnica** Se sigue la misma aproximación que para zapatas

$$q_{ult} = c'N_c s_c d_c + \sigma'_{zD} N_q s_q d_q + 0.5\gamma' B N_\gamma s_\gamma d_\gamma$$

- **Factor de seguridad (Das, 2004):**

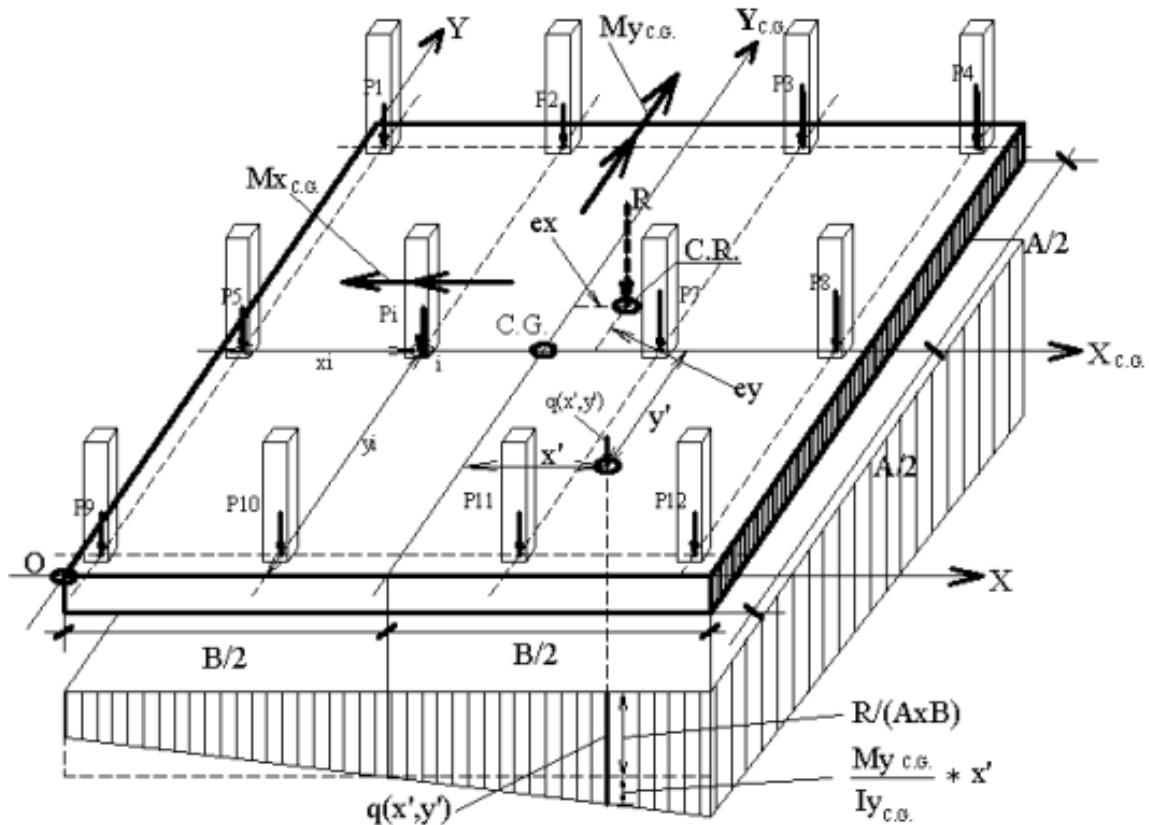
- Cargas permanentes normales = 3,00 (Min)
- Cargas extremas = 1,75-2,00 (Min)



Bearing pressure distribution for rigid method.

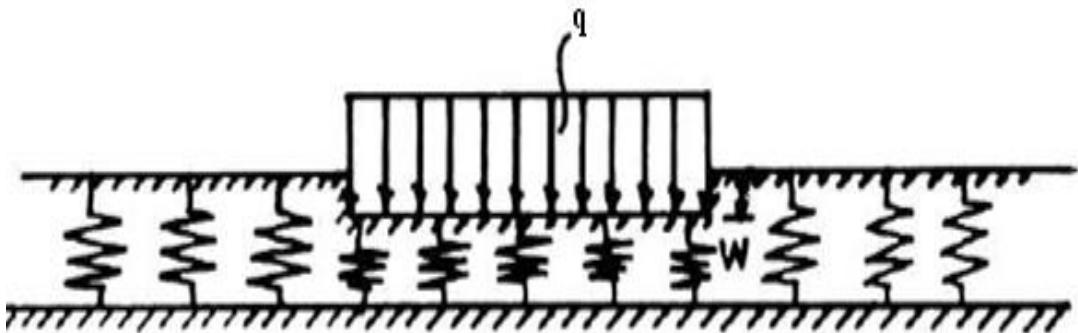
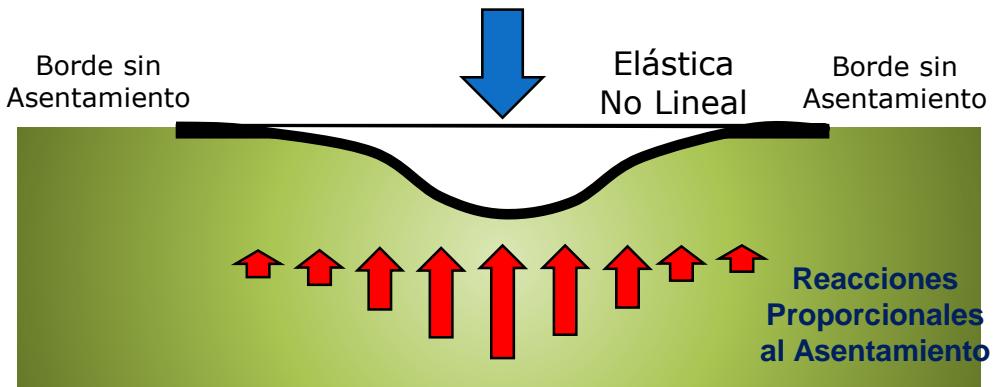


PLATEA RÍGIDA SECUENCIA DE DISEÑO





PLATEA FLEXIBLE

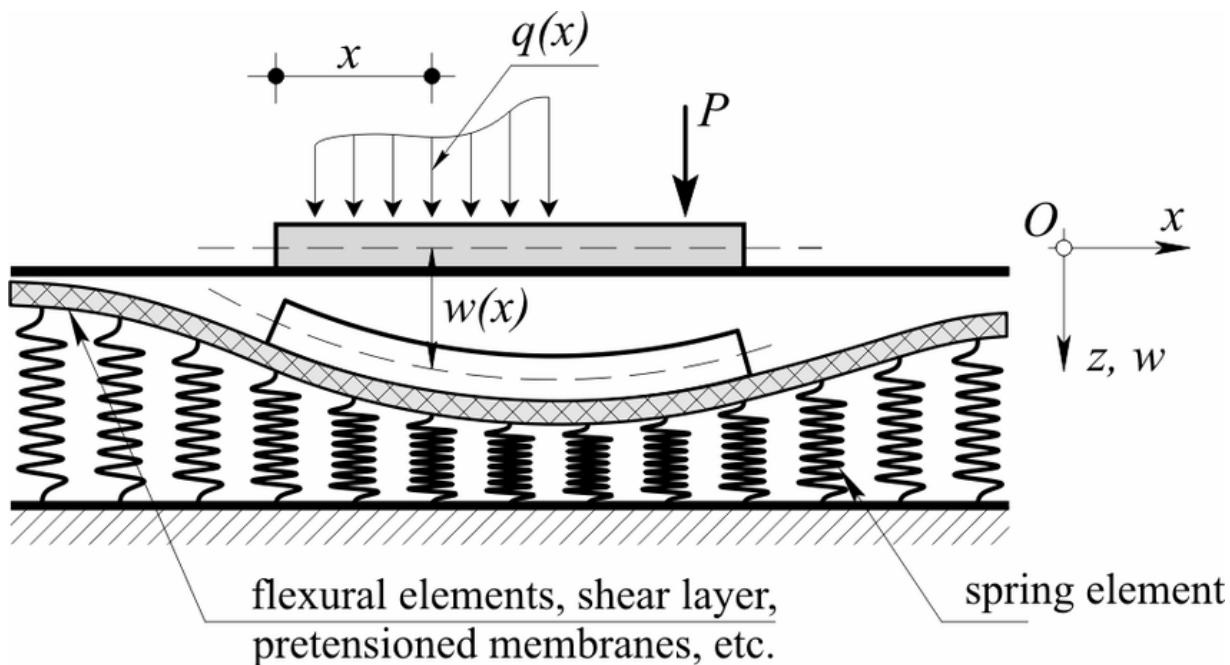


Fuente: Kerr A. D., "Elastic and visco-elastic foundation models." Journal of Applied Mechanics, ASCE, 31, 1964. p. 491-498



PLATEA FLEXIBLE MODELO TIMOSHENKO

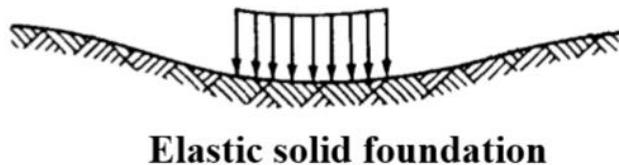
- Este modelo se basa en la teoría de la viga de Timoshenko





PLATEA FLEXIBLE MODELO TIMOSHENKO

- Este modelo se basa en la teoría de la viga de Timoshenko
- Secciones permanecen planas luego de la flexión pero no normal al eje longitudinal
- El modelo considera deformaciones por flexión y corte.

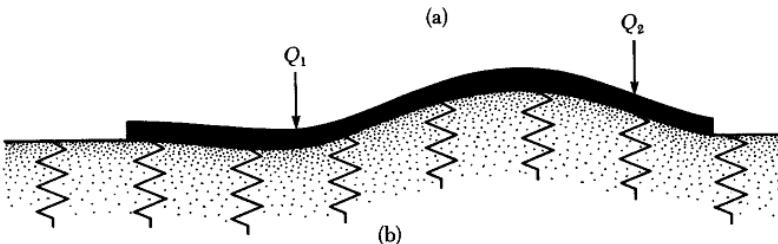




MODELO DE WINKLER

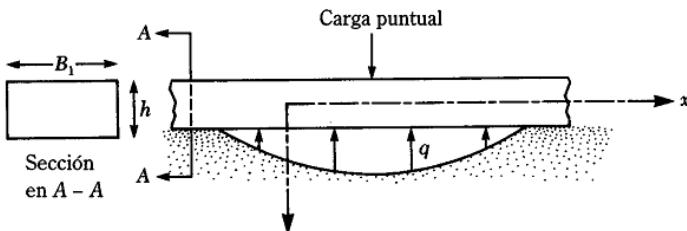
Equilibrio general

$$E_f I_f \frac{\delta^4 w}{dx^4} = q$$



Efecto carga ext

$$q = -wk$$



Objetivo: Conocer $w=f(x)$

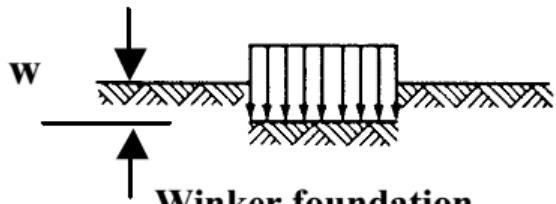
$$\frac{dw}{dx} = \varphi(x)$$

$$\frac{d^2 w}{dx^2} = -\frac{M}{EI}$$

$$\frac{d^3 w}{dx^3} = -\frac{Q}{EI}$$



MODELO DE WINKLER



Winkler foundation



Elastic solid foundation

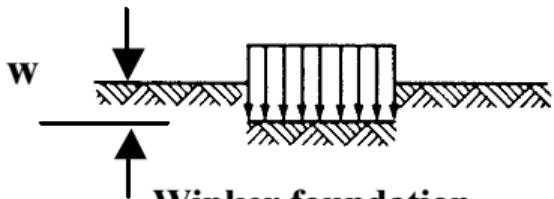
$$EI \frac{d^4 w}{dx^4} + kw = q$$

Modelo de Winkler limitaciones:

- No considera la interacción entre los resortes.
- La constante de los resortes depende de un número de factores tales como rigidez de la viga, geometría de la viga, perfil de suelo y comportamiento.



MODELO DE WINKLER



Winkler foundation



Elastic solid foundation

$$EI \frac{d^4 w}{dx^4} + kw = q$$

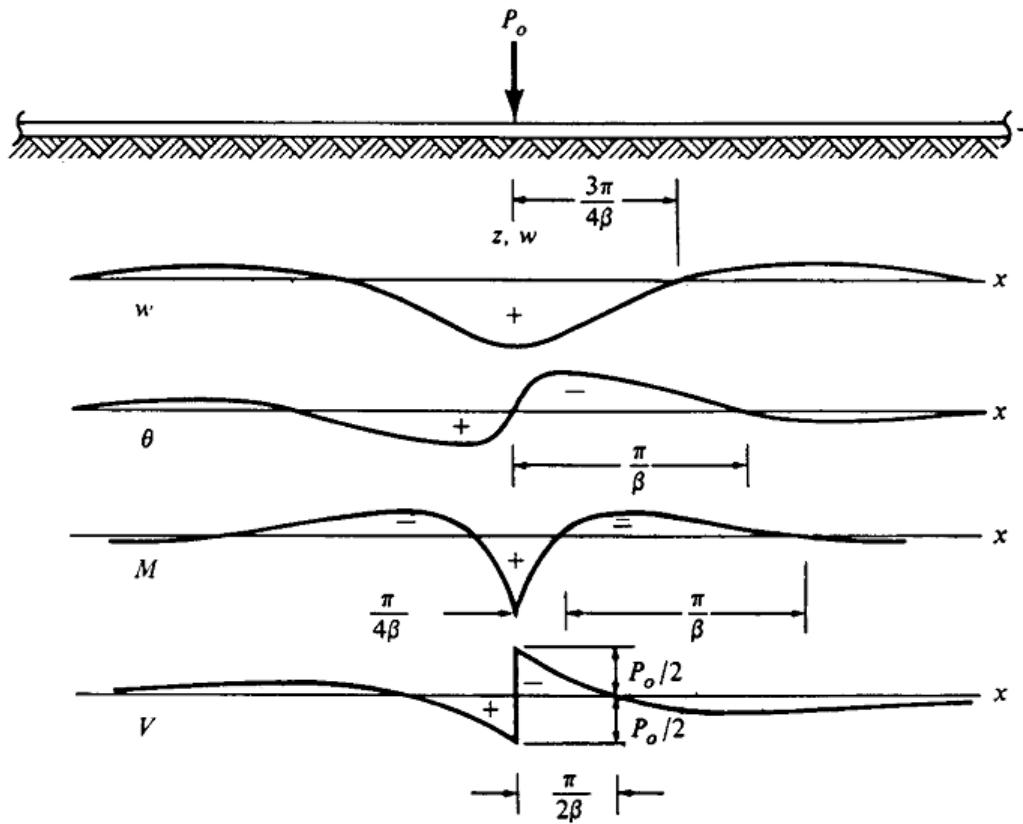
EXPRESION GENERICA

$$w = e^{\beta x} (C_1 \sin \beta x + C_2 \cos \beta x) + e^{-\beta x} (C_3 \sin \beta x + C_4 \cos \beta x) + w(q)$$

$$\beta = \left[\frac{k}{4EI} \right]^{\frac{1}{4}}$$



MODELO DE WINKLER



$$w = \frac{\beta P_o}{2k} A_{\beta x}$$

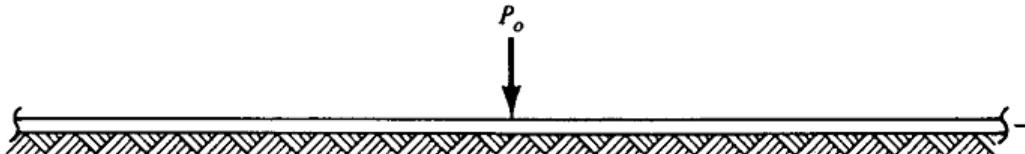
$$\theta = \frac{dw}{dx} = -\frac{\beta^2 P_o}{k} B_{\beta x}$$

$$M = \frac{P_o}{4\beta} C_{\beta x}$$

$$V = -\frac{P_o}{2} D_{\beta x}$$



MODELO DE WINKLER



$$w = \frac{\beta P_o}{2k} A_{\beta x} \quad A_{\beta x} = e^{-\beta x} (\cos \beta x + \sin \beta x)$$

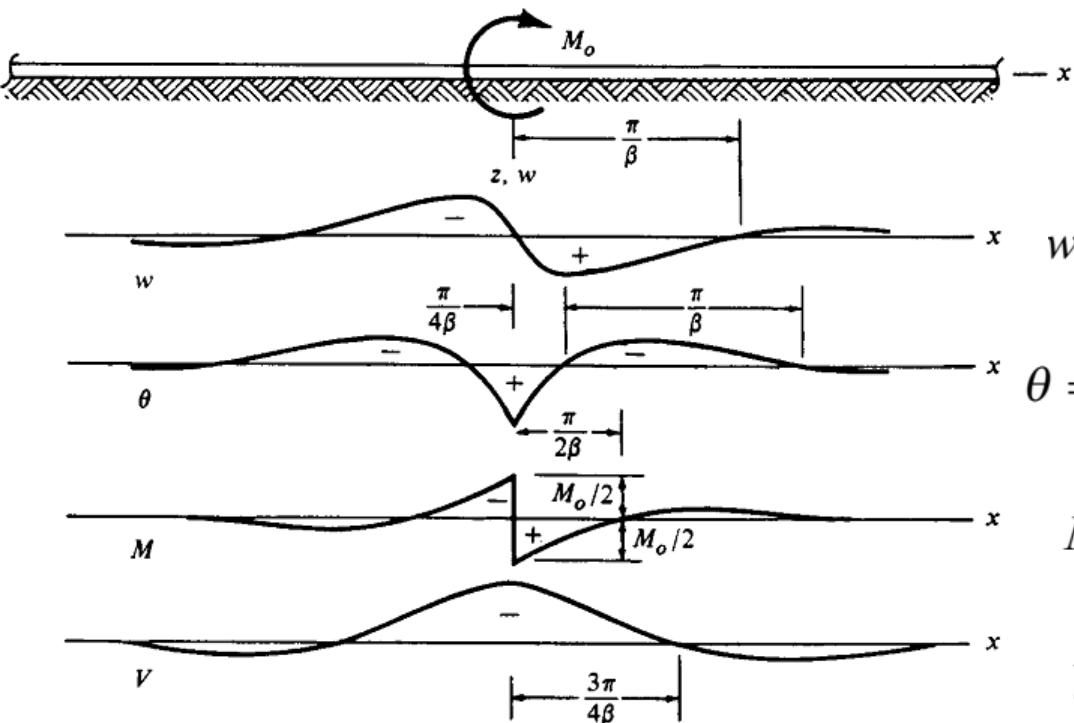
$$\theta = \frac{dw}{dx} = -\frac{\beta^2 P_o}{k} B_{\beta x} \quad B_{\beta x} = e^{-\beta x} \sin \beta x$$

$$M = \frac{P_o}{4\beta} C_{\beta x} \quad C_{\beta x} = e^{-\beta x} (\cos \beta x - \sin \beta x)$$

$$V = -\frac{P_o}{2} D_{\beta x} \quad D_{\beta x} = e^{-\beta x} \cos \beta x$$



MODELO DE WINKLER



$$w(x) = \frac{\beta^2 M_o}{k} B_{\beta x}$$

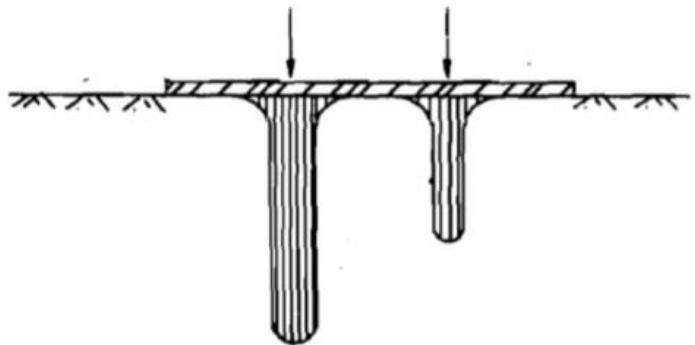
$$\theta = \frac{dw}{dx} = \frac{\beta^3 M_o}{k} C_{\beta x}$$

$$M(x) = \frac{M_o}{2} D_{\beta x}$$

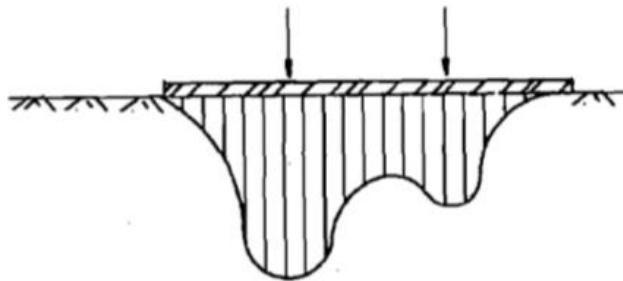
$$V = -\frac{\beta M_o}{2} A_{\beta x}$$



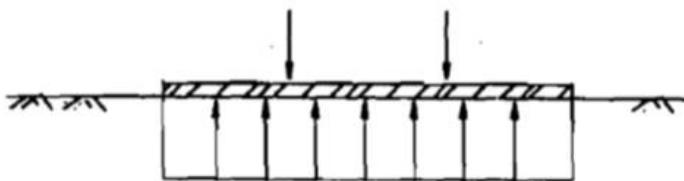
RESPUESTA SEGÚN RIGIDEZ RELATIVA



(a) ROCK



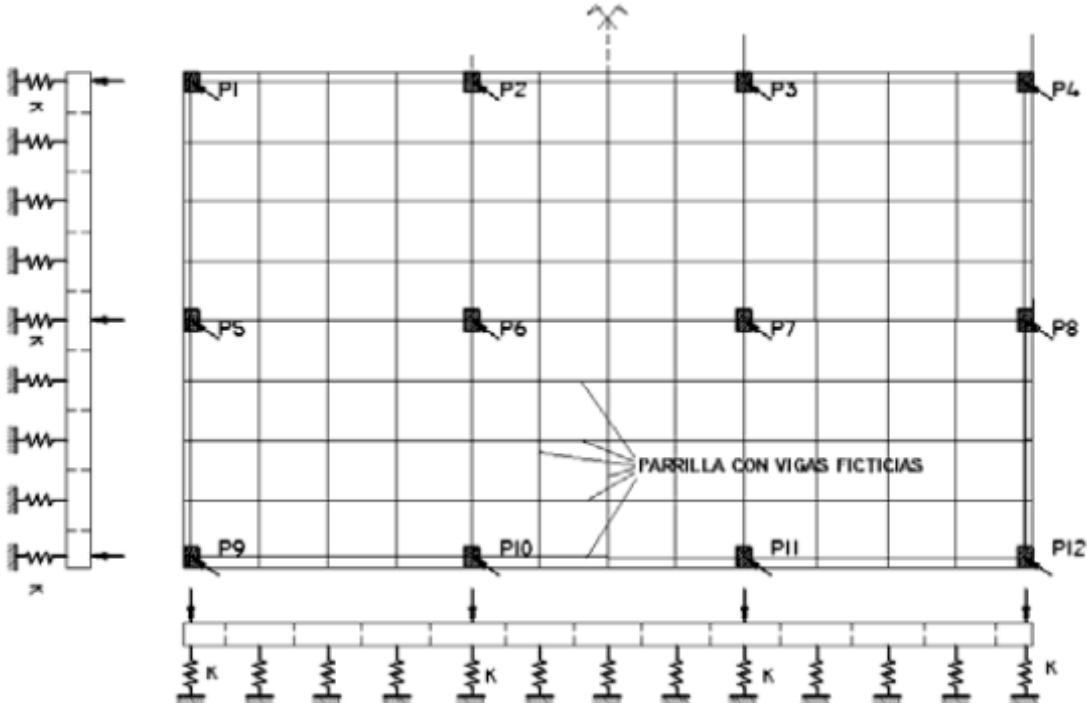
(b) STIFF SOIL



(c) SOFT SOIL



DISEÑO DE PLATEAS UTILIZANDO SOFTWARES ESQUEMA DE CIMENTACION

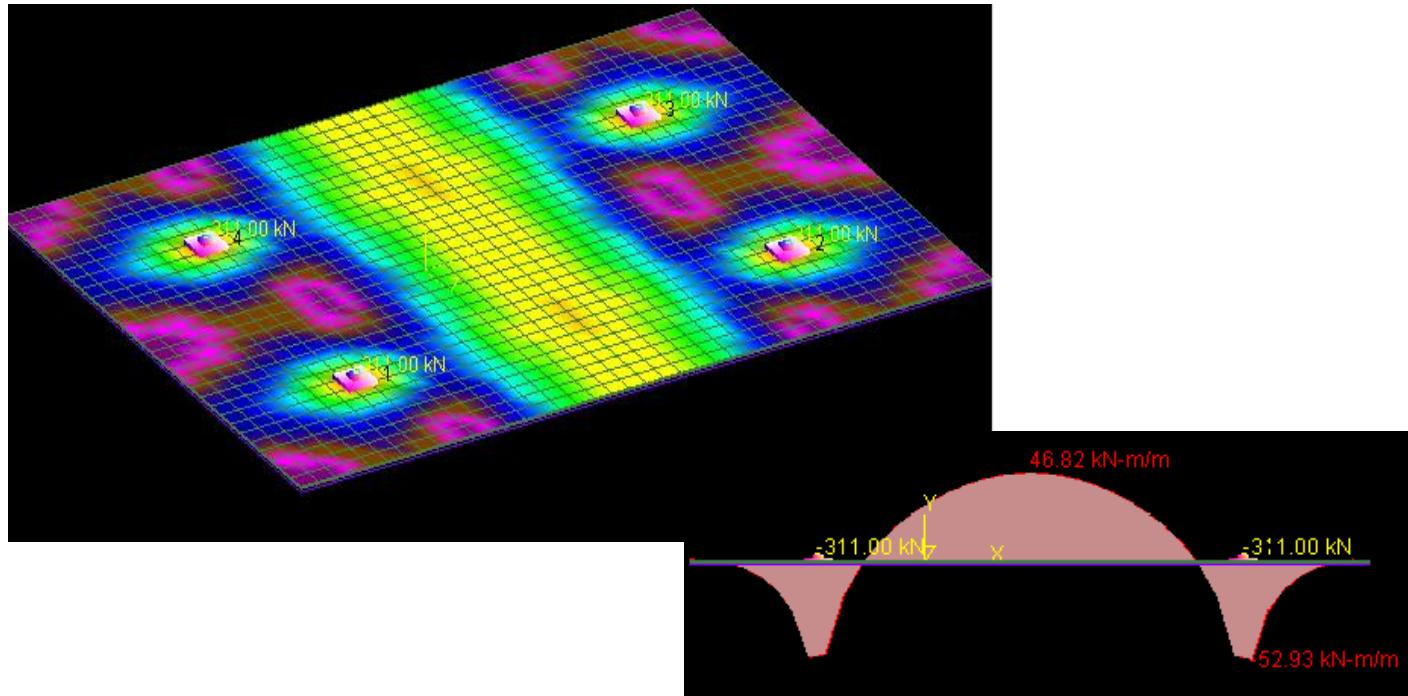


MODELO DE PLATEA COMO PLACA FLOTANTE



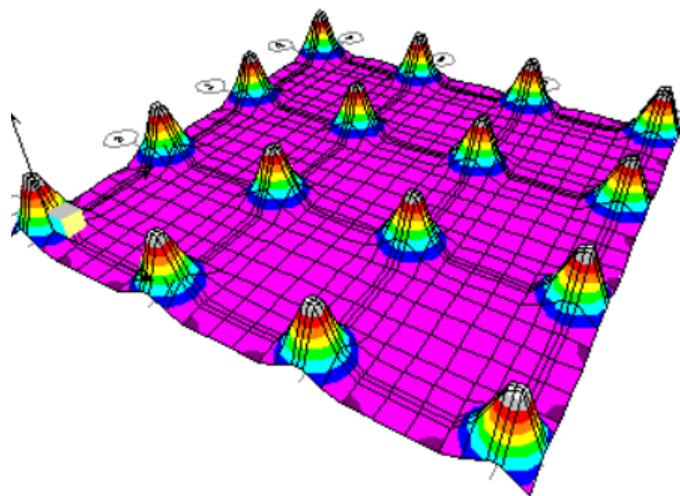
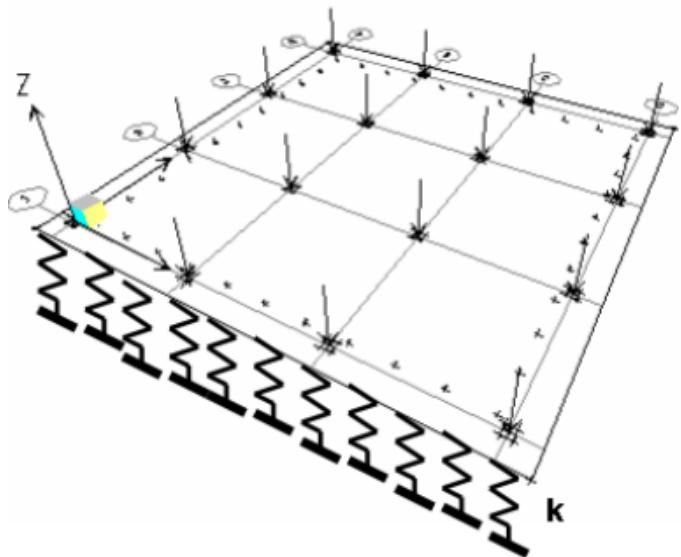
DISEÑO DE PLATEAS UTILIZANDO SOFTWARES

ABAQUS, STAAD FOUNDATION, RISA FOUNDATION, ANSYS, SAP, etc.



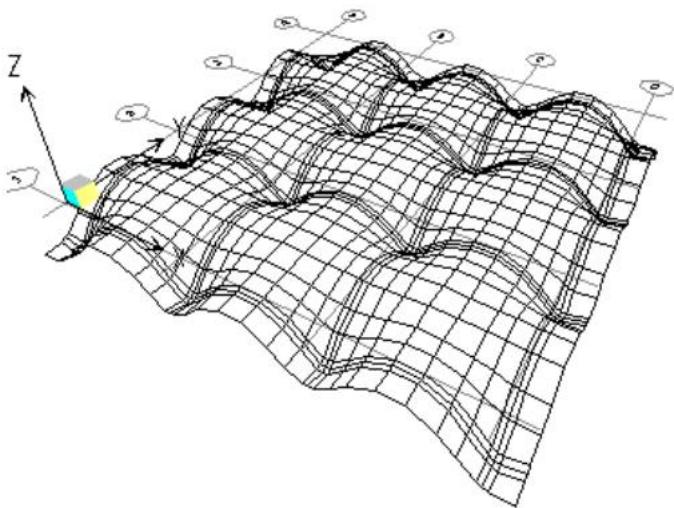
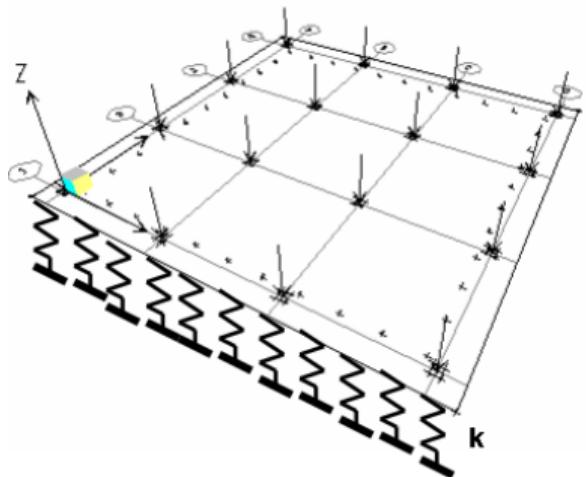


DISEÑO DE PLATEAS UTILIZANDO SOFTWARES





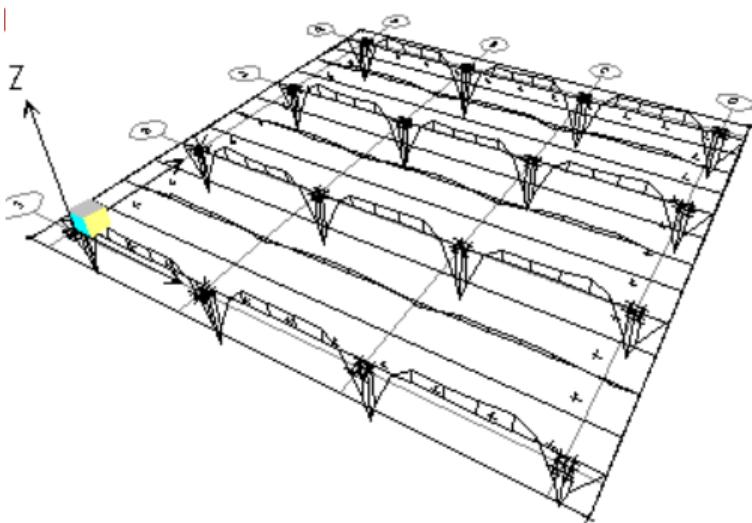
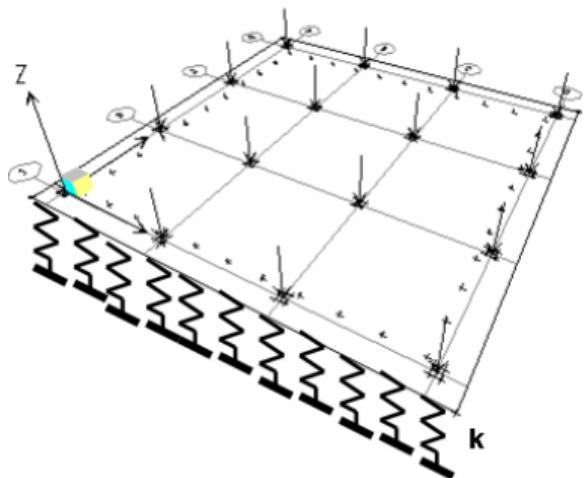
DISEÑO DE PLATEAS UTILIZANDO SOFTWARES



ASENTAMIENTOS



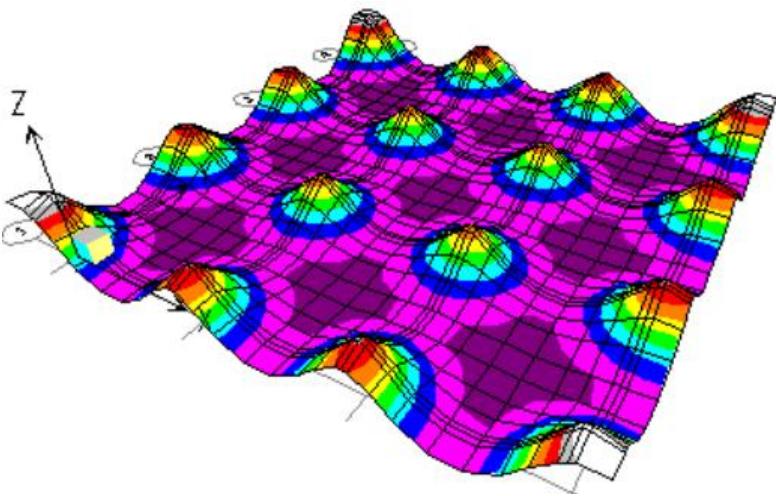
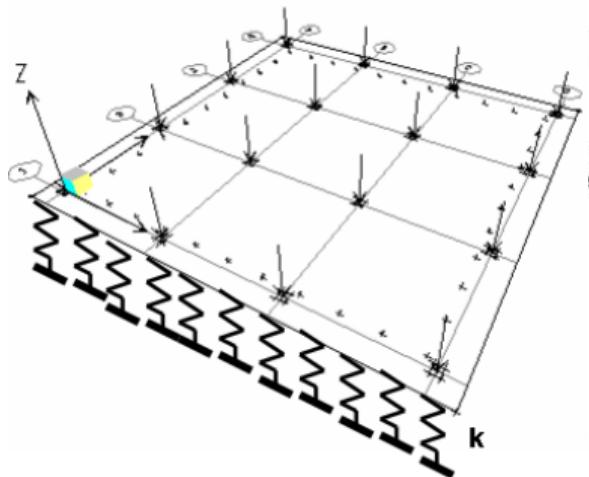
DISEÑO DE PLATEAS UTILIZANDO SOFTWARES



MOMENTOS



DISEÑO DE PLATEAS UTILIZANDO SOFTWARES



PRESION DE
CONTACTO



Asentamiento de la Fundación

Tipo De Fundación	Asentamiento máximo esperado, mm	Asentamiento diferencial esperado, mm
Base combinada	25	20
Platea	50	20



Cimentación Compensada

