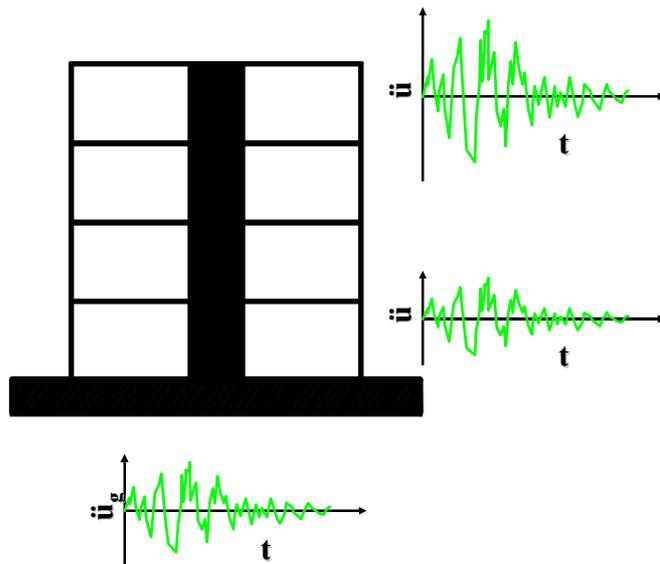


Diseño sísmico

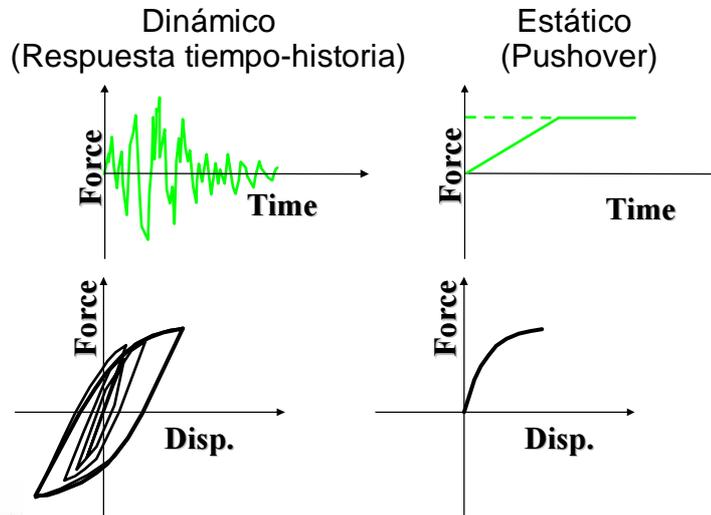
- Sistema estructural
- Estimación de cargas (muerta, viva, sismo, etc.)
- Modelación
 - SAP 2000
 - ETABS
 - RISA
 - STRUDL
 - etc.
- Diseño de elementos:
 - Diseño por capacidad
 - Detallamiento para garantizar ductilidad

} CI52I

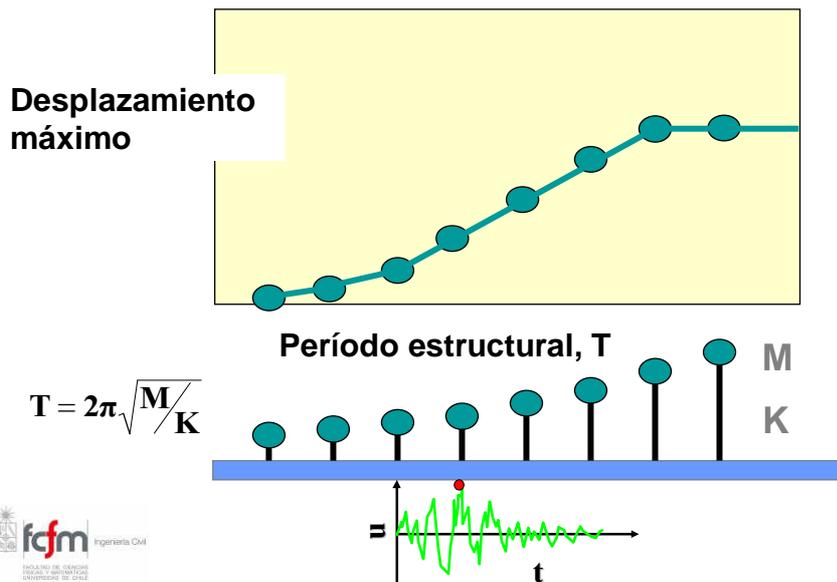
Respuesta Sísmica de Estructuras



Análisis de simulación de la respuesta

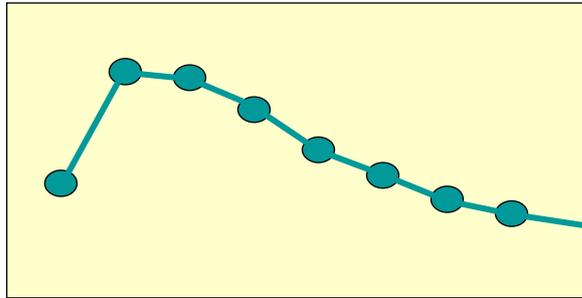


Espectro de Respuesta de Desplazamiento



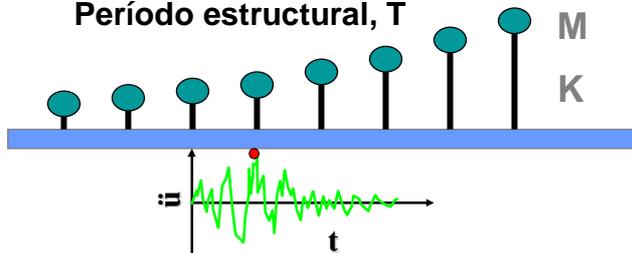
Espectro de Respuesta de Aceleración

Aceleración
Máxima
(tiene poca
aplicación
directa)

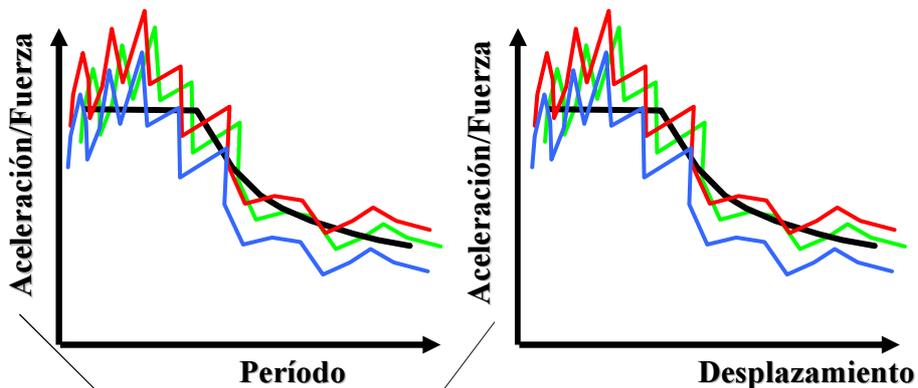


$$T = 2\pi\sqrt{\frac{M}{K}}$$

Período estructural, T

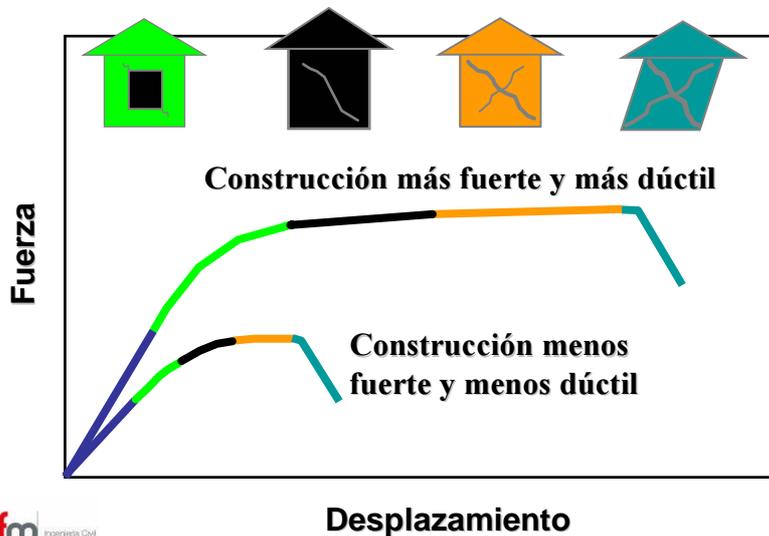


Representación de la acción sísmica

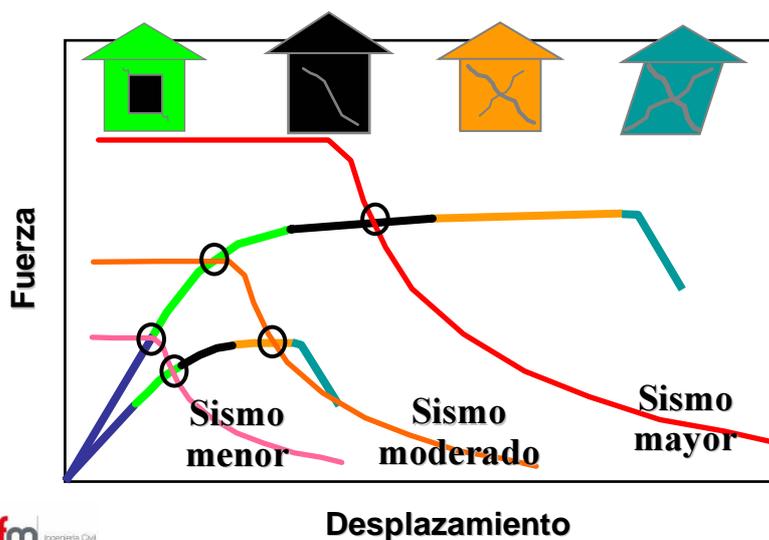


Comúnmente pseudo-aceleración
 $F = ku = mw_n^2 u = ma$, con $a = w_n^2 u$

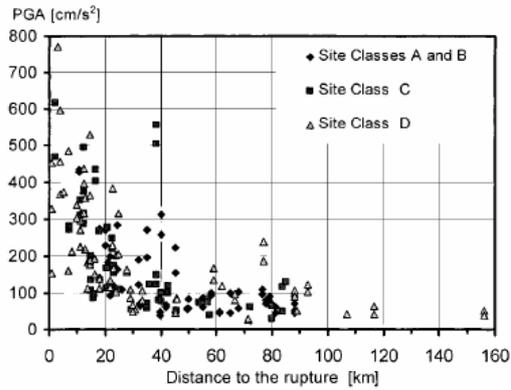
Comportamiento esquemático de estructuras



Comportamiento esquemático de estructuras



Respuesta no lineal de 1-GDL



$$C_{\mu} = \frac{\Delta_{inelastic}}{\Delta_{elastic}}$$

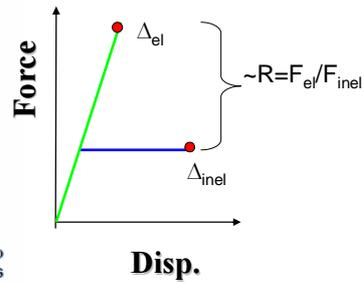
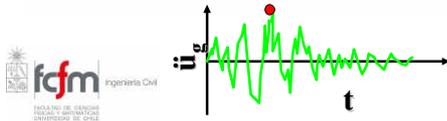


FIG. 2. Peak Ground Acceleration (PGA) versus Distance to Horizontal Projection of Rupture of Earthquake Ground Motions Considered



Miranda (2000), "Inelastic Displacement Ratios For Structures On Firm Sites"



Respuesta no lineal de 1-GDL

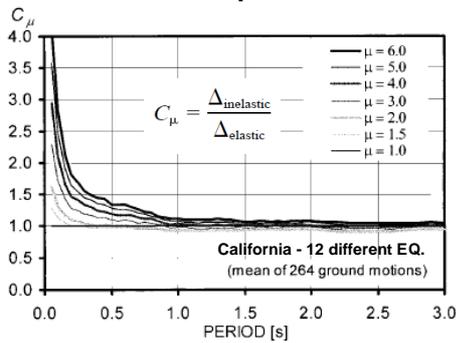


FIG. 3. Mean Inelastic Displacement Ratios from 264 Ground Motions from Site Classes A, B, C, and D (NEHRP site class)

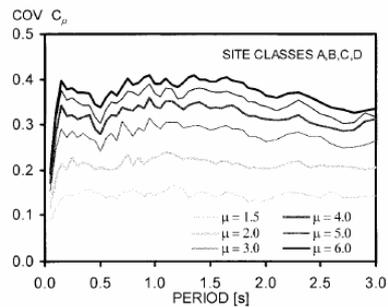
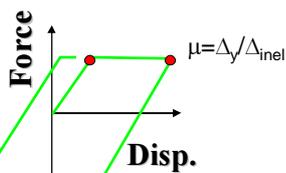


FIG. 4. COVs of Inelastic Displacement Ratios from 264 Ground Motions from Site Classes A, B, C, and D



Miranda (2000), "Inelastic Displacement Ratios For Structures On Firm Sites"

"...It is concluded that for sites with average shear-wave velocities higher than 180 m/s the influence of soil conditions is relatively small and can be neglected for design purposes..."



Respuesta no lineal de 1-GDL

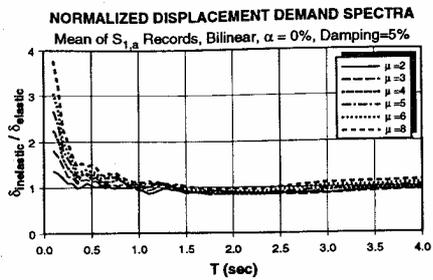


Figure 4 Normalized inelastic displacement demands for bilinear systems, S_{1,8} set of records 15 records

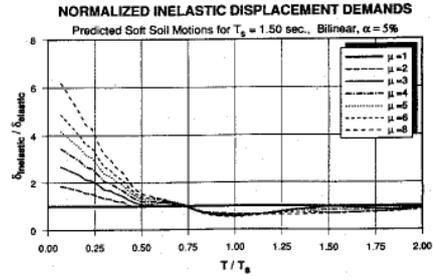
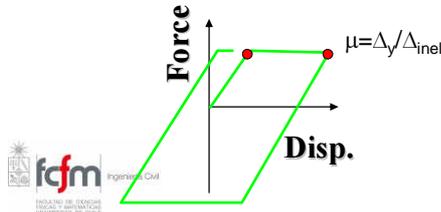
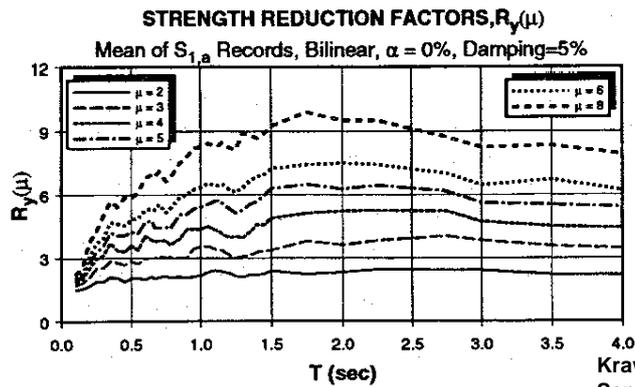


Figure 5 Normalized inelastic displacement demands for soft soil records 10 records

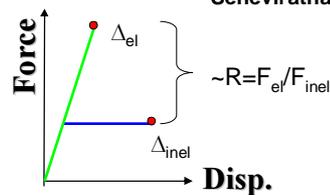
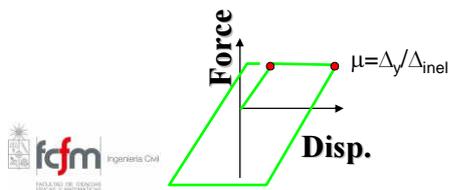


Krawinkler & Seneviratna (1998), "Pros and cons of a pushover analysis of seismic performance evaluation"

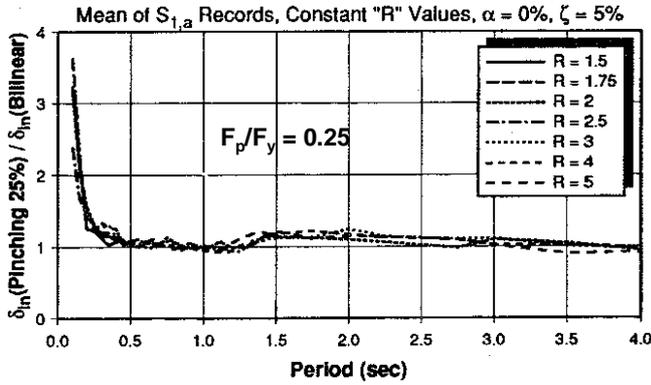
Respuesta no lineal de 1-GDL



Krawinkler & Seneviratna (1998)



Respuesta no lineal de 1-GDL



Krawinkler & Seneviratna (1998)

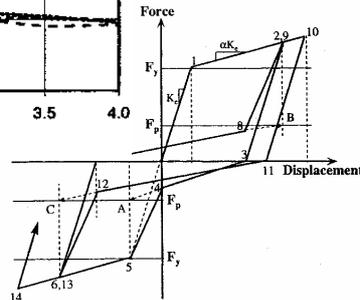
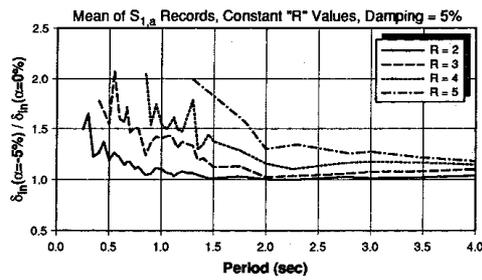
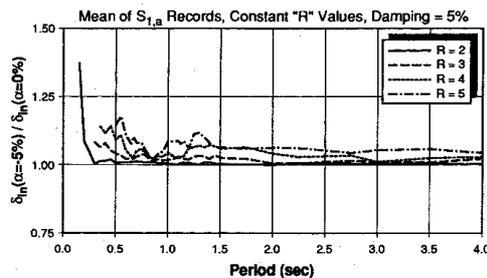


Figure 6 Pinched hysteresis model

Respuesta no lineal de 1-GDL

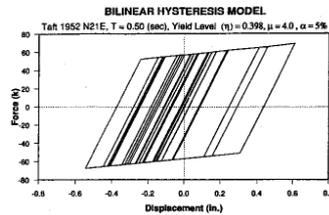


Bilinear Systems with 5% Negative Stiffness

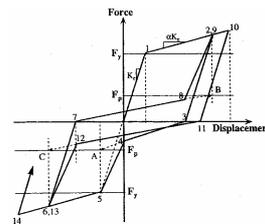


Modified Clough Systems with 5% Negative Stiffness

Bilinear system

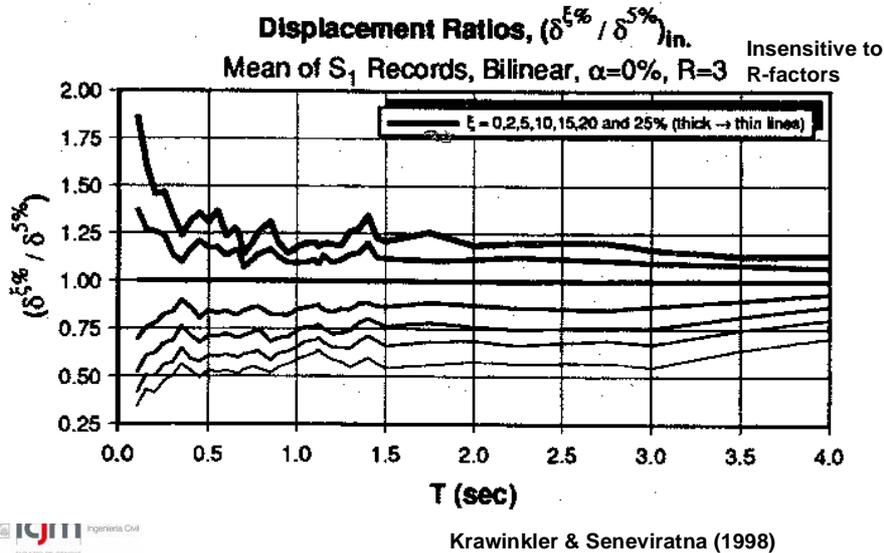


Peak-oriented stiffness degrading system



Krawinkler & Seneviratna (1998)

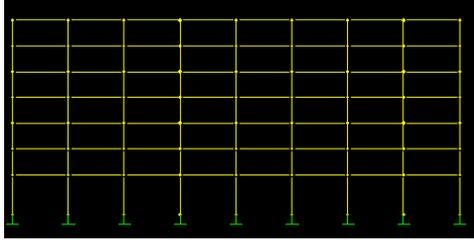
Respuesta no lineal de 1-GDL



Métodos de análisis

- | | |
|---|--|
| | Precisión |
| <ul style="list-style-type: none"> • Modelo Lineal <ul style="list-style-type: none"> – Análisis estático <ul style="list-style-type: none"> • Ej.: NCh 433Of96 – Análisis dinámico <ul style="list-style-type: none"> • Análisis modal espectral (espectro de respuesta) • Análisis tiempo-historia lineal • Modelo No-Lineal <ul style="list-style-type: none"> – Análisis estático <ul style="list-style-type: none"> • Análisis Pushover (ej.: FEMA 356 – “Target Displacement”, ATC-40 “Capacity Spectrum” & “Displacement coefficient method”) – Análisis dinámico <ul style="list-style-type: none"> • Análisis tiempo-historia no lineal (ej.: FEMA 356) | <div style="display: flex; align-items: center; justify-content: center; gap: 20px;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> |
| | Simpleza |
| | <ul style="list-style-type: none"> – Menor error humano – Simple interpretación |

Análisis Estructural



- Ej: método estático no lineal (pushover)
- Representación plana
- Deformaciones en el rango no lineal
 - Formación de rótulas plásticas (flexión, corte, etc.)
 - Concentración de deformaciones en rótulas plásticas

