Análisis Dinámico Modal Espectral

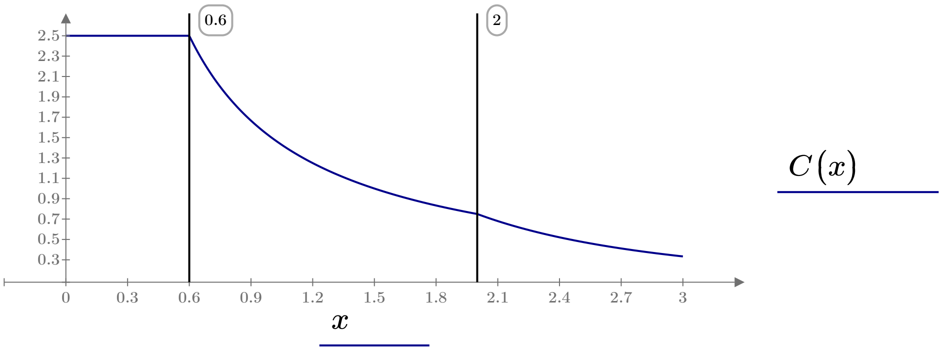
Ingeniería Sismorresistente y Prevención de Desastres ES831 H R.C.

PARÁMETROS SÍSMICOS E030

Ubicación: Zona 4	$Z:=0.45$
Uso: Centro de Salud	$U:=1.5$
Tipo de suelo: S2	$S:=1.05$
Periodo corto	$T_P:=0.6$
Periodo largo	$T_L:=2.0$
Sistema Estructural: C.A. Dual	$R_0:=7$
Regular en planta	$I_p:=1$
Regular en altura	$I_a:=1$
Coeficiente de reducción	$R:=R_0 \cdot I_p \cdot I_a=7$

COEFICIENTE DE AMPLIFICACIÓN SÍSMICA E030

$$C(x):=\text{if}\left(x<T_P, 2.5, \text{if}\left(T_P<x \wedge x<T_L, 2.5 \cdot \frac{T_P}{x}, 2.5 \cdot \left(\frac{T_P \cdot T_L}{x^2}\right)\right)\right)$$



DEFINICIÓN DE MASAS Y RIGIDECES

Nota: Dirección Larga (más desfavorable)

Peso sísmico

$w6:=829.458\ tonnef$ $\quad m6:=\frac{w6}{g}=0.846\ tonnef \cdot \frac{s^2}{cm}$ $\quad k6:=11657.01\ \frac{tonnef}{cm}$

$w5:=1054.794\ tonnef$ $\quad m5:=\frac{w5}{g}=1.076\ tonnef \cdot \frac{s^2}{cm}$ $\quad k5:=11657.01\ \frac{tonnef}{cm}$

$w4:=1054.794\ tonnef$ $\quad m4:=\frac{w4}{g}=1.076\ tonnef \cdot \frac{s^2}{cm}$ $\quad k4:=11657.01\ \frac{tonnef}{cm}$

$w3:=1054.794\ tonnef$ $\quad m3:=\frac{w3}{g}=1.076\ tonnef \cdot \frac{s^2}{cm}$ $\quad k3:=11657.01\ \frac{tonnef}{cm}$

$w2:=1054.794\ tonnef$ $\quad m2:=\frac{w2}{g}=1.076\ tonnef \cdot \frac{s^2}{cm}$ $\quad k2:=11657.01\ \frac{tonnef}{cm}$

$w1:=1031.994\ tonnef$ $\quad m1:=\frac{w1}{g}=1.052\ tonnef \cdot \frac{s^2}{cm}$ $\quad k1:=11735.81\ \frac{tonnef}{cm}$

$$mM:=\begin{bmatrix} m6 & 0 & 0 & 0 & 0 & 0 \\ 0 & m5 & 0 & 0 & 0 & 0 \\ 0 & 0 & m4 & 0 & 0 & 0 \\ 0 & 0 & 0 & m3 & 0 & 0 \\ 0 & 0 & 0 & 0 & m2 & 0 \\ 0 & 0 & 0 & 0 & 0 & m1 \end{bmatrix} \qquad mK:=\begin{bmatrix} k6 & -k6 & 0 & 0 & 0 & 0 \\ -k6 & k5+k6 & -k5 & 0 & 0 & 0 \\ 0 & -k5 & k4+k5 & -k4 & 0 & 0 \\ 0 & 0 & -k4 & k3+k4 & -k3 & 0 \\ 0 & 0 & 0 & -k3 & k2+k3 & -k2 \\ 0 & 0 & 0 & 0 & -k2 & k1+k2 \end{bmatrix}$$

OBTENCIÓN DE FRECUENCIAS Y PERIODOS

$$\det\left(mK - a \cdot mM\right) = 0 \qquad\qquad A = \frac{mI}{a} = mK^{-1} \cdot mM$$

$$matrizA := mK^{-1} \cdot mM = \begin{bmatrix} 0.0004 & 0.0005 & 0.0004 & 0.0003 & 0.0002 & 0.0001 \\ 0.0004 & 0.0005 & 0.0004 & 0.0003 & 0.0002 & 0.0001 \\ 0.0003 & 0.0004 & 0.0004 & 0.0003 & 0.0002 & 0.0001 \\ 0.0002 & 0.0003 & 0.0003 & 0.0003 & 0.0002 & 0.0001 \\ 0.0001 & 0.0002 & 0.0002 & 0.0002 & 0.0002 & 0.0001 \\ 0.0001 & 0.0001 & 0.0001 & 0.0001 & 0.0001 & 0.0001 \end{bmatrix} s^2$$

Las frecuencias se denominan de menor a mayor

$$\omega_i := \operatorname{csort}\left(\frac{1}{\operatorname{eigenvals}\left(matrizA\right)}, 0\right) = \begin{bmatrix} 674.64509 \\ 5822.84657 \\ 14828.49649 \\ 25379.11332 \\ 34841.93522 \\ 41166.52912 \end{bmatrix} \frac{1}{s^2}$$

Periodos

$$\omega_1 := \left\| \sqrt{\omega_i^{\langle 0 \rangle}} \right\| = 25.9739 \ \frac{1}{s} \qquad \omega_2 := \left\| \sqrt{\omega_i^{\langle 1 \rangle}} \right\| = 76.3076 \ \frac{1}{s} \qquad \omega_3 := \left\| \sqrt{\omega_i^{\langle 2 \rangle}} \right\| = 121.7723 \ \frac{1}{s}$$

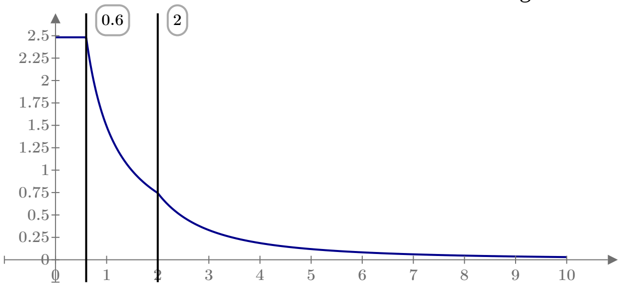
$$T_1 := \frac{2 \cdot \pi}{\omega_1} = 0.242 \ s \qquad T_2 := \frac{2 \cdot \pi}{\omega_2} = 0.082 \ s \qquad T_3 := \frac{2 \cdot \pi}{\omega_3} = 0.052 \ s$$

$$\omega_4 := \left\| \sqrt{\omega_i^{\langle 3 \rangle}} \right\| = 159.3082 \ \frac{1}{s} \qquad \omega_5 := \left\| \sqrt{\omega_i^{\langle 4 \rangle}} \right\| = 186.6599 \ \frac{1}{s} \qquad \omega_6 := \left\| \sqrt{\omega_i^{\langle 5 \rangle}} \right\| = 202.8954 \ \frac{1}{s}$$

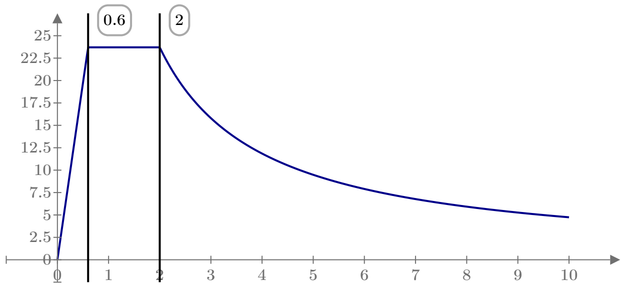
$$T_4 := \frac{2 \cdot \pi}{\omega_4} = 0.039 \ s \qquad T_5 := \frac{2 \cdot \pi}{\omega_5} = 0.034 \ s \qquad T_6 := \frac{2 \cdot \pi}{\omega_6} = 0.031 \ s$$

ESPECTROS DE DISEÑO E030

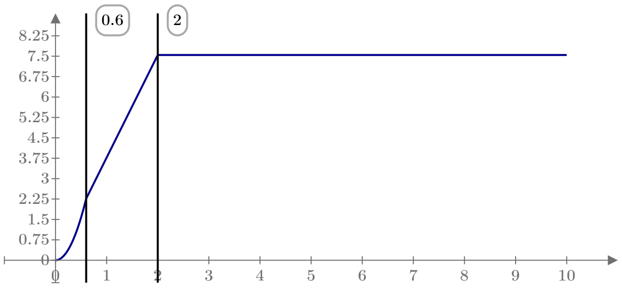
ESPECTRO DE ACELERACIONES $\frac{m}{s^2}$



ESPECTRO DE VELOCIDADES $\frac{cm}{s}$



ESPECTRO DE DESPLAZAMIENTOS cm



$$S_a = \begin{bmatrix} 2.482 \\ 2.482 \\ 2.482 \\ 2.482 \\ 2.482 \\ 2.482 \end{bmatrix} \frac{m}{s^2} \quad S_v = \begin{bmatrix} 9.557 \\ 3.253 \\ 2.038 \\ 1.558 \\ 1.33 \\ 1.223 \end{bmatrix} \frac{cm}{s} \quad S_d = \begin{bmatrix} 0.368 \\ 0.043 \\ 0.017 \\ 0.01 \\ 0.007 \\ 0.006 \end{bmatrix} cm$$

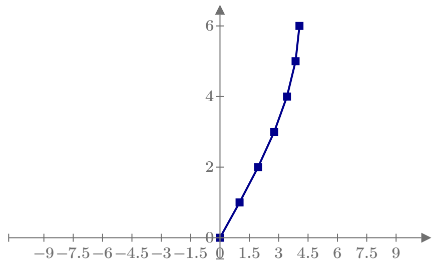
OBTENCIÓN DE MODOS DE VIBRACIÓN

$$i := \begin{bmatrix} 6 & 5 & 4 & 3 & 2 & 1 \end{bmatrix}^{\mathrm{T}}$$

PRIMER MODO

$$Mod1 := mK - {\omega_1}^2 \cdot mM = \begin{bmatrix} 11086.39 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & 22588.38 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & 22588.38 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & 22588.38 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & 22588.38 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & 22682.86 \end{bmatrix} \frac{tonnef}{cm}$$

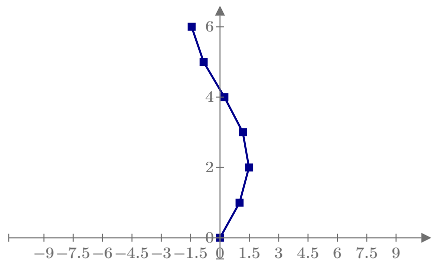
$$\phi_{mod1} = \begin{bmatrix} 4.061 \\ 3.862 \\ 3.423 \\ 2.771 \\ 1.946 \\ 1 \end{bmatrix}$$



SEGUNDO MODO

$$Mod2 := mK - {\omega_2}^2 \cdot mM = \begin{bmatrix} 6731.98 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & 17051.02 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & 17051.02 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & 17051.02 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & 17051.02 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & 17265.2 \end{bmatrix} \frac{tonnef}{cm}$$

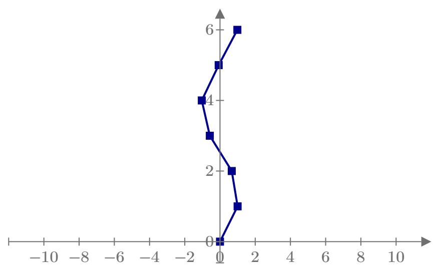
$$\phi_{mod2} = \begin{bmatrix} -1.45 \\ -0.837 \\ 0.225 \\ 1.166 \\ 1.481 \\ 1 \end{bmatrix}$$



TERCER MODO

$$Mod3 := mK - {\omega_3}^2 \cdot mM = \begin{bmatrix} -885.11 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & 7364.63 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & 7364.63 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & 7364.63 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & 7364.63 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & 7788.18 \end{bmatrix} \frac{tonnef}{cm}$$

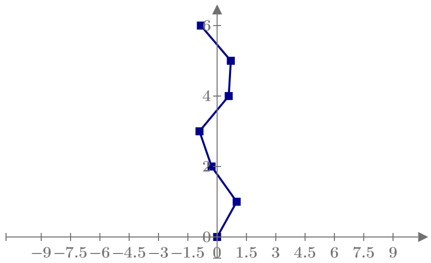
$$\phi_{mod3} = \begin{bmatrix} 0.986 \\ -0.075 \\ -1.033 \\ -0.578 \\ 0.668 \\ 1 \end{bmatrix}$$



CUARTO MODO

$$Mod4 := mK - \omega_4{}^2 \cdot mM = \begin{bmatrix} -9808.94 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & -3983.51 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & -3983.51 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & -3983.51 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & -3983.51 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & -3314.66 \end{bmatrix} \frac{tonnef}{cm}$$

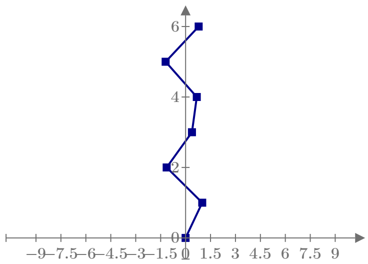
$$\phi_{mod4} = \begin{bmatrix} -0.832 \\ 0.7 \\ 0.593 \\ -0.903 \\ -0.284 \\ 1 \end{bmatrix}$$



QUINTO MODO

$$Mod5 := mK - \omega_5{}^2 \cdot mM = \begin{bmatrix} -17812.71 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & -14161.64 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & -14161.64 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & -14161.64 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & -14161.64 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & -13272.78 \end{bmatrix} \frac{tonnef}{cm}$$

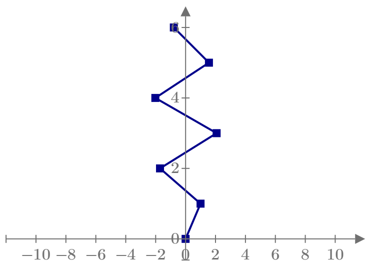
$$\phi_{mod5} = \begin{bmatrix} 0.786 \\ -1.201 \\ 0.673 \\ 0.383 \\ -1.139 \\ 1 \end{bmatrix}$$



SEXTO MODO

$$Mod6 := mK - \omega_6{}^2 \cdot mM = \begin{bmatrix} -23162.12 & -11657.01 & 0 & 0 & 0 & 0 \\ -11657.01 & -20964.31 & -11657.01 & 0 & 0 & 0 \\ 0 & -11657.01 & -20964.31 & -11657.01 & 0 & 0 \\ 0 & 0 & -11657.01 & -20964.31 & -11657.01 & 0 \\ 0 & 0 & 0 & -11657.01 & -20964.31 & -11657.01 \\ 0 & 0 & 0 & 0 & -11657.01 & -19928.41 \end{bmatrix} \frac{tonnef}{cm}$$

$$\phi_{mod6} = \begin{bmatrix} -0.785 \\ 1.561 \\ -2.021 \\ 2.075 \\ -1.71 \\ 1 \end{bmatrix}$$



MATRIZ MODAL

$$\phi_{mod} := \text{augment}\left(\phi_{mod1}, \phi_{mod2}, \phi_{mod3}, \phi_{mod4}, \phi_{mod5}, \phi_{mod6}\right)$$

$$\phi_{mod} = \begin{bmatrix} 4.061 & -1.45 & 0.986 & -0.832 & 0.786 & -0.785 \\ 3.862 & -0.837 & -0.075 & 0.7 & -1.201 & 1.561 \\ 3.423 & 0.225 & -1.033 & 0.593 & 0.673 & -2.021 \\ 2.771 & 1.166 & -0.578 & -0.903 & 0.383 & 2.075 \\ 1.946 & 1.481 & 0.668 & -0.284 & -1.139 & -1.71 \\ 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

FACTORES DE PARTICIPACIÓN

PRECÁLCULOS

$$B := \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}^{T}$$

$$\phi_{mod}^{T} \cdot mM \cdot B = \begin{bmatrix} 1739.553 \\ 201.548 \\ 79.144 \\ 46.242 \\ 33.683 \\ 28.508 \end{bmatrix} \frac{s^2}{m} \cdot tonnef \qquad \phi_{mod}^{T} \cdot mM \cdot \phi_{mod} \cdot B = \begin{bmatrix} 5597.315 \\ 746.119 \\ 386.81 \\ 350.719 \\ 516.54 \\ 1636.121 \end{bmatrix} \frac{s^2}{m} \cdot tonnef$$

FACTOR DE PARTICIPACIÓN DE MASA (FPM)

$$FPM := \frac{\phi_{mod}^{T} \cdot mM \cdot B}{\phi_{mod}^{T} \cdot mM \cdot \phi_{mod} \cdot B} = \begin{bmatrix} 0.311 \\ 0.27 \\ 0.205 \\ 0.132 \\ 0.065 \\ 0.017 \end{bmatrix} \begin{matrix} \text{Modo 1} \\ \text{Modo 2} \\ \text{Modo 3} \\ \text{Modo 4} \\ \text{Modo 5} \\ \text{Modo 6} \end{matrix}$$

MASA EFECTIVA MODAL - PORCENTAJE DE PARTICIPACIÓN DE MASA

$$\varphi := \frac{\left(\phi_{mod}^{T} \cdot mM \cdot B\right)^2}{\phi_{mod}^{T} \cdot mM \cdot \phi_{mod} \cdot B} = \begin{bmatrix} 540.624 \\ 54.444 \\ 16.193 \\ 6.097 \\ 2.196 \\ 0.497 \end{bmatrix} \frac{s^2}{m} \cdot tonnef$$

$$\sum \varphi = 620.051 \, \frac{s^2}{m} \cdot tonnef \qquad ppm := \frac{\varphi}{\sum \varphi} = \begin{bmatrix} 0.872 \\ 0.088 \\ 0.026 \\ 0.01 \\ 0.004 \\ 0.001 \end{bmatrix}$$

Mayor al 90% (E.030)

$$\left(ppm_0 + ppm_1\right) = 0.96$$

El 90% de participación de masa se alcanza con el segundo modo; de acuerdo con la norma E.030, se debe trabajar al menos con los tres primeros modos o hasta que se alcance el 90% de participación con modos superiores. Con fines académicos, se seguirá analizando considerando los 6 modos obtenidos de los cálculos matriciales.

DESPLAZAMIENTOS

DESPLAZAMIENTOS n MÁXIMOS

$$n_{max} := \overrightarrow{FPM \cdot S_d} = \begin{bmatrix} 0.114 \\ 0.012 \\ 0.003 \\ 0.001 \\ 0 \\ 0 \end{bmatrix} cm$$

MATRIZ R MODAL

$$R_{mod} := \text{diag}\left(n_{max}\right) = \begin{bmatrix} 0.114 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0.012 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.003 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.001 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} cm$$

DESPLAZAMIENTOS MODALES

$$U_{mod} := \phi_{mod} \cdot R_{mod} = \begin{array}{cc} \begin{bmatrix} 0.4644 & -0.0167 & 0.0034 & -0.0011 & 0.0004 & -0.0001 \\ 0.4416 & -0.0096 & -0.0003 & 0.0009 & -0.0006 & 0.0002 \\ 0.3914 & 0.0026 & -0.0035 & 0.0008 & 0.0003 & -0.0002 \\ 0.3168 & 0.0134 & -0.002 & -0.0012 & 0.0002 & 0.0002 \\ 0.2225 & 0.0171 & 0.0023 & -0.0004 & -0.0005 & -0.0002 \\ 0.1144 & 0.0115 & 0.0034 & 0.0013 & 0.0005 & 0.0001 \end{bmatrix} cm & \begin{array}{l} \text{Piso 6} \\ \text{Piso 5} \\ \text{Piso 4} \\ \text{Piso 3} \\ \text{Piso 2} \\ \text{Piso 1} \end{array} \end{array}$$

COMBINACIÓN DE RESPUESTAS

De acuerdo con Art. 29.3.4. (E.030)

DESPLAZAMIENTOS

$$U_{E030\_1} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \begin{array}{l} U^{\langle i \rangle} \leftarrow 0\ cm \\ \text{for } j \in 0..5 \\ \quad \left\| U^{\langle i \rangle} \leftarrow U^{\langle i \rangle} + \left\| \left(0.75 \cdot R \cdot U_{mod}{}^{\langle j \rangle} \right)^{\langle i \rangle} \right\| \right. \end{array} \right. \\ U \end{array} \right. \qquad U_{E030\_1} = \begin{bmatrix} 2.5512 \\ 2.379 \\ 2.0938 \\ 1.7524 \\ 1.2754 \\ 0.6885 \end{bmatrix} cm$$

$$U_{E030\_2} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \begin{array}{l} U^{\langle i \rangle} \leftarrow 0\ cm^2 \\ \text{for } j \in 0..5 \\ \quad \left\| U^{\langle i \rangle} \leftarrow U^{\langle i \rangle} + \left\| \left(0.75 \cdot R \cdot U_{mod}{}^{\langle j \rangle} \right)^{2\,\langle i \rangle} \right\| \right. \end{array} \right. \\ \sqrt{U} \end{array} \right. \qquad U_{E030\_2} = \begin{bmatrix} 2.4395 \\ 2.3191 \\ 2.055 \\ 1.6648 \\ 1.1717 \\ 0.6037 \end{bmatrix} cm$$

$$U_{E030} := 0.25 \cdot U_{E030\_1} + 0.75 \cdot U_{E030\_2} = \begin{bmatrix} 2.46745 \\ 2.33408 \\ 2.06471 \\ 1.68672 \\ 1.1976 \\ 0.6249 \end{bmatrix} cm$$

DERIVAS

$$\Delta_{mod} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \begin{array}{l} \text{for } j \in 0..5 \\ \quad \left\| \begin{array}{l} \text{if } i<5 \\ \quad \left\| \Delta_{i,j} \leftarrow U_{mod_{i,j}} - U_{mod_{i+1,j}} \right. \\ \text{else} \\ \quad \left\| \Delta_{i,j} \leftarrow U_{mod_{i,j}} \right. \end{array} \right. \end{array} \right. \\ \Delta \end{array} \right.$$

$$H := \begin{bmatrix} 310 \\ 310 \\ 310 \\ 310 \\ 310 \\ 310 \end{bmatrix} cm$$

$$\Delta_{mod} = \begin{bmatrix} 0.023 & -0.007 & 0.004 & -0.002 & 0.001 & 0 \\ 0.05 & -0.012 & 0.003 & 0 & -0.001 & 0 \\ 0.075 & -0.011 & -0.002 & 0.002 & 0 & 0 \\ 0.094 & -0.004 & -0.004 & -0.001 & 0.001 & 0 \\ 0.108 & 0.006 & -0.001 & -0.002 & -0.001 & 0 \\ 0.114 & 0.012 & 0.003 & 0.001 & 0 & 0 \end{bmatrix} cm$$

$$\delta_{mod} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \delta^{\langle i \rangle} \leftarrow \overrightarrow{\Delta_{mod}{}^{\langle i \rangle} \cdot H^{-1}} \right. \\ \delta \end{array} \right.$$

$$\delta_{mod} = \begin{bmatrix} 0.000073 & -0.000023 & 0.000012 & -0.000006 & 0.000003 & -0.000001 \\ 0.000162 & -0.000039 & 0.000011 & 0 & -0.000003 & 0.000001 \\ 0.000241 & -0.000035 & -0.000005 & 0.000006 & 0 & -0.000001 \\ 0.000304 & -0.000012 & -0.000014 & -0.000003 & 0.000002 & 0.000001 \\ 0.000349 & 0.000018 & -0.000004 & -0.000005 & -0.000003 & -0.000001 \\ 0.000369 & 0.000037 & 0.000011 & 0.000004 & 0.000001 & 0 \end{bmatrix}$$

$$\delta_{E030\_1} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \begin{array}{l} \delta^{\widehat{i}} \leftarrow 0 \\ \text{for } j \in 0..5 \\ \quad \left\| \delta^{\widehat{i}} \leftarrow \delta^{\widehat{i}} + \left| \left(0.75 \cdot R \cdot \delta_{mod}{}^{\langle j \rangle} \right)^{\widehat{i}} \right| \right. \end{array} \right. \\ \delta \end{array} \right.$$

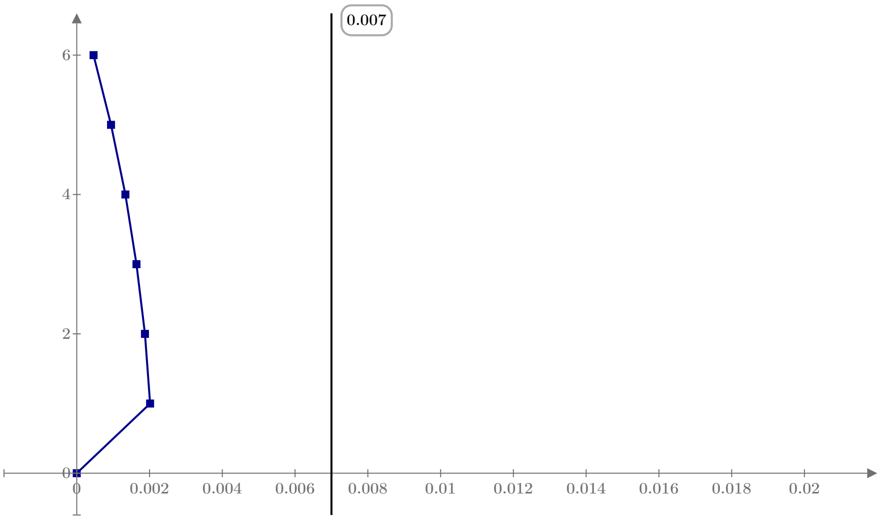
$$\delta_{E030\_1} = \begin{bmatrix} 0.0006 \\ 0.0011 \\ 0.0015 \\ 0.0018 \\ 0.002 \\ 0.0022 \end{bmatrix}$$

$$\delta_{E030\_2} := \left\| \begin{array}{l} \text{for } i \in 0..5 \\ \quad \left\| \begin{array}{l} \delta^{\widehat{i}} \leftarrow 0 \\ \text{for } j \in 0..5 \\ \quad \left\| \delta^{\widehat{i}} \leftarrow \delta^{\widehat{i}} + \left(0.75 \cdot R \cdot \delta_{mod}{}^{\langle j \rangle} \right)^{2\,\widehat{i}} \right. \end{array} \right. \\ \sqrt{\delta} \end{array} \right.$$

$$\delta_{E030\_2} = \begin{bmatrix} 0.0004 \\ 0.0009 \\ 0.0013 \\ 0.0016 \\ 0.0018 \\ 0.0019 \end{bmatrix}$$

$$\delta_{E030} := 0.25 \cdot \delta_{E030\_1} + 0.75 \cdot \delta_{E030\_2} = \begin{bmatrix} 0.00046 \\ 0.00094 \\ 0.00134 \\ 0.00164 \\ 0.00187 \\ 0.00202 \end{bmatrix}$$

GRÁFICA Y COMPARACIÓN CON LÍMITE No debe exceder 0.007 (E.030)



$$\delta_{E030}=\begin{bmatrix}0.0005\\0.0009\\0.0013\\0.0016\\0.0019\\0.002\end{bmatrix}$$

Piso 6 $\text{if}\left(\delta_{E030_0}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Piso 5 $\text{if}\left(\delta_{E030_1}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Piso 4 $\text{if}\left(\delta_{E030_2}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Piso 3 $\text{if}\left(\delta_{E030_3}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Piso 2 $\text{if}\left(\delta_{E030_4}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Piso 1 $\text{if}\left(\delta_{E030_5}\le 0.007, \text{“Cumple”}, \text{“No cumple”}\right)=\text{“Cumple”}$

Como se observa en la comparación, las derivas no superan los límites de la norma E.030. **La edificación cumple las especificaciones de la norma.**