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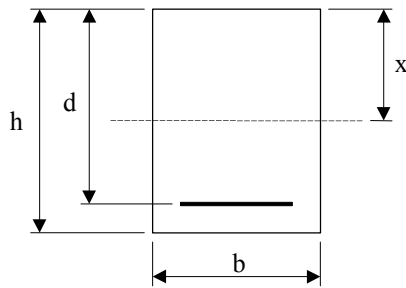
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Anejo I

Relaciones adimensionales para sección rectangular

En este Anejo se desarrollan expresiones de Wd/I y W/bd^2 en función de d/h y $n\rho$, para sección rectangular, según se ha indicado en el Capítulo 4.



$$n = \frac{E_s}{E_c}$$

Sección no fisurada (Estado I)

$$x = \frac{b \frac{h^2}{2} + (n-1)A_s d}{bh + (n-1)A_s} \Rightarrow \frac{x}{d} = \frac{\left(\frac{h}{d}\right)^2 + 2(n-1)\rho}{2\left(\frac{h}{d}\right) + 2(n-1)\rho} \quad (\text{A1.1})$$

despreciando el valor 1 frente a n , se obtiene

$$\frac{x}{d} \approx \frac{\left(\frac{h}{d}\right)^2 + 2n\rho}{2\left(\frac{h}{d}\right) + 2n\rho} \quad (\text{A1.2})$$

$$W = \frac{I_1}{h-x} \Rightarrow \frac{Wd}{I_1} = \frac{1}{\frac{n}{d} - \frac{x}{d}} \approx \frac{2\left(\frac{h}{d}\right) + 2n\rho}{\left(\frac{h}{d}\right)^2 - 2n\rho\left(1 - \frac{h}{d}\right)} \quad (\text{A1.3})$$

teniendo en cuenta

$$I_1 = \frac{1}{12}bh^3 + bh\left(x - \frac{h}{2}\right)^2 + (n-1)A_s(d-x)^2 \quad (\text{A1.4})$$

y despreciando el valor 1 frente a n , se obtiene

$$\frac{W}{bd^2} \approx \frac{\frac{1}{12}\left(\frac{h}{d}\right)^3 + \left(\frac{h}{d}\right)\left[\frac{x}{d} - \frac{1}{2}\left(\frac{h}{d}\right)\right]^2 + n\rho\left(1 - \frac{x}{d}\right)^2}{\frac{h}{d} - \frac{x}{d}} \quad (\text{A1.5})$$

Sección fisurada (Estado II₀)

$$\frac{bx^2}{2} - A_s n(d-x) = 0 \Rightarrow \frac{x}{d} = n\rho\left(-1 + \sqrt{1 + \frac{2n}{\rho}}\right) \quad (\text{A1.6})$$

$$\frac{Wd}{I_2} = d \frac{I_1}{h-x} \frac{1}{I_2} \quad (\text{A1.7})$$

teniendo en cuenta

$$I_2 = \frac{1}{3}bx^3 + nA_s(d-x)^2 \quad (\text{A1.8})$$

se obtiene

$$\frac{Wd}{I_2} = \frac{\frac{1}{12}bh^3 + bh\left(x - \frac{h}{2}\right)^2 + (n-1)A_s(d-x)}{\left[\frac{1}{3}bx^3 + nA_s(d-x)^2\right](h-x)\frac{1}{d}} \quad (\text{A1.9})$$

despreciando el valor 1 frente a n

$$\frac{Wd}{I_2} = \frac{\frac{1}{12}\left(\frac{h}{d}\right)^3 + \left(\frac{h}{d}\right)\left(\frac{x}{d} - \frac{1}{2}\frac{h}{d}\right)^2 + n\rho\left(1 - \frac{x}{d}\right)^2}{\left[\frac{1}{3}\left(\frac{x}{d}\right)^3 + n\rho\left(1 - \frac{x}{d}\right)^2\right]\left(\frac{h}{d} - \frac{x}{d}\right)} \quad (\text{A1.10})$$

Anejo II

Tabla de valores coeficiente α_2

De acuerdo con lo indicado en 4.5.4, se ha generado la tabla de valores que se indica a continuación para sección rectangular en flexión simple.

$n\rho$	d/h	α_2	$n\rho$	d/h	α_2	$n\rho$	d/h	α_2
0.0170	0.98	22.50	0.0330	0.88	17.80	0.0450	0.90	14.60
0.0170	1.00	21.00	0.0330	0.90	16.90	0.0450	0.92	13.90
0.0210	0.88	26.00	0.0330	0.92	16.00	0.0450	0.94	13.30
0.0210	0.90	23.70	0.0330	0.94	15.30	0.0450	0.96	12.70
0.0210	0.92	22.20	0.0330	0.96	14.50	0.0450	0.98	12.20
0.0210	0.94	20.80	0.0330	0.98	13.90	0.0450	1.00	11.70
0.0210	0.96	19.50	0.0330	1.00	13.30	0.0490	0.80	18.20
0.0210	0.98	18.20	0.0370	0.80	21.20	0.0490	0.82	17.20
0.0210	1.00	17.10	0.0370	0.82	19.90	0.0490	0.84	16.30
0.0250	0.82	27.00	0.0370	0.84	18.70	0.0490	0.86	15.50
0.0250	0.84	24.80	0.0370	0.86	17.70	0.0490	0.88	14.80
0.0250	0.86	23.00	0.0370	0.88	16.80	0.0490	0.90	14.10
0.0250	0.88	21.40	0.0370	0.90	15.90	0.0490	0.92	13.40
0.0250	0.90	20.00	0.0370	0.92	15.20	0.0490	0.94	12.80
0.0250	0.92	19.00	0.0370	0.94	14.50	0.0490	0.96	12.30
0.0250	0.94	17.90	0.0370	0.96	13.80	0.0490	0.98	11.70
0.0250	0.96	16.90	0.0370	0.98	13.20	0.0490	1.00	11.20
0.0250	0.98	16.10	0.0370	1.00	12.70	0.0530	0.80	17.60
0.0250	1.00	15.30	0.0410	0.80	19.90	0.0530	0.82	16.70
0.0290	0.80	25.25	0.0410	0.82	18.80	0.0530	0.84	15.80
0.0290	0.82	23.20	0.0410	0.84	17.70	0.0530	0.86	15.00
0.0290	0.84	21.50	0.0410	0.86	16.80	0.0530	0.88	14.30
0.0290	0.86	20.20	0.0410	0.88	16.00	0.0530	0.90	13.60
0.0290	0.88	18.90	0.0410	0.90	15.20	0.0530	0.92	13.00
0.0290	0.90	17.70	0.0410	0.92	14.50	0.0530	0.94	12.40
0.0290	0.92	16.90	0.0410	0.94	13.80	0.0530	0.96	11.80
0.0290	0.94	16.10	0.0410	0.96	13.30	0.0530	0.98	11.30
0.0290	0.96	15.25	0.0410	0.98	12.70	0.0530	1.00	10.80
0.0290	0.98	14.40	0.0410	1.00	12.20	0.0570	0.80	17.00
0.0290	1.00	13.90	0.0450	0.80	19.00	0.0570	0.82	16.20
0.0330	0.80	23.00	0.0450	0.82	17.90	0.0570	0.84	15.30
0.0330	0.82	21.40	0.0450	0.84	17.00	0.0570	0.86	14.50
0.0330	0.84	20.00	0.0450	0.86	16.10	0.0570	0.88	13.80
0.0330	0.86	18.90	0.0450	0.88	15.30	0.0570	0.90	13.00

$n\rho$	d/h	α_2	$n\rho$	d/h	α_2	$n\rho$	d/h	α_2
0.0570	0.92	12.60	0.0770	0.84	13.30	0.0930	0.98	8.60
0.0570	0.94	12.00	0.0770	0.86	12.70	0.0930	1.00	8.20
0.0570	0.96	11.40	0.0770	0.88	12.00	0.0970	0.80	13.40
0.0570	0.98	10.90	0.0770	0.90	11.40	0.0970	0.82	12.60
0.0570	1.00	10.20	0.0770	0.92	10.90	0.0970	0.84	11.90
0.0610	0.80	16.60	0.0770	0.94	10.30	0.0970	0.86	11.30
0.0610	0.82	15.70	0.0770	0.96	9.90	0.0970	0.88	10.70
0.0610	0.84	14.90	0.0770	0.98	9.40	0.0970	0.90	10.20
0.0610	0.86	14.10	0.0770	1.00	9.00	0.0970	0.92	9.70
0.0610	0.88	13.40	0.0810	0.80	14.60	0.0970	0.94	9.20
0.0610	0.90	12.80	0.0810	0.82	13.80	0.0970	0.96	8.80
0.0610	0.92	12.20	0.0810	0.84	13.00	0.0970	0.98	8.40
0.0610	0.94	11.60	0.0810	0.86	12.30	0.0970	1.00	8.00
0.0610	0.96	11.10	0.0810	0.88	11.70	0.1010	0.80	13.10
0.0610	0.98	10.60	0.0810	0.90	11.10	0.1010	0.82	12.40
0.0610	1.00	9.80	0.0810	0.92	10.60	0.1010	0.84	11.70
0.0650	0.80	16.10	0.0810	0.94	10.10	0.1010	0.86	11.10
0.0650	0.82	15.30	0.0810	0.96	9.60	0.1010	0.88	10.50
0.0650	0.84	14.50	0.0810	0.98	9.20	0.1010	0.90	10.00
0.0650	0.86	13.70	0.0810	1.00	8.80	0.1010	0.92	9.50
0.0650	0.88	13.00	0.0850	0.80	14.20	0.1010	0.94	9.00
0.0650	0.90	12.40	0.0850	0.82	13.50	0.1010	0.96	8.60
0.0650	0.92	11.80	0.0850	0.84	12.70	0.1010	0.98	8.20
0.0650	0.94	11.20	0.0850	0.86	12.10	0.1010	1.00	7.90
0.0650	0.96	10.70	0.0850	0.88	11.40	0.1050	0.80	12.90
0.0650	0.98	10.20	0.0850	0.90	10.90	0.1050	0.82	12.10
0.0650	1.00	9.70	0.0850	0.92	10.30	0.1050	0.84	11.50
0.0690	0.80	15.70	0.0850	0.94	9.80	0.1050	0.86	10.80
0.0690	0.82	14.90	0.0850	0.96	9.40	0.1050	0.88	10.30
0.0690	0.84	14.10	0.0850	0.98	9.00	0.1050	0.90	9.80
0.0690	0.86	13.30	0.0850	1.00	8.60	0.1050	0.92	9.30
0.0690	0.88	12.70	0.0890	0.80	13.70	0.1050	0.94	8.80
0.0690	0.90	12.00	0.0890	0.82	13.10	0.1050	0.96	8.40
0.0690	0.92	11.50	0.0890	0.84	12.40	0.1050	0.98	8.10
0.0690	0.94	10.90	0.0890	0.86	11.80	0.1050	1.00	7.70
0.0690	0.96	10.40	0.0890	0.88	11.20	0.1090	0.80	12.60
0.0690	0.98	9.90	0.0890	0.90	10.50	0.1090	0.82	11.90
0.0690	1.00	9.50	0.0890	0.92	10.10	0.1090	0.84	11.20
0.0730	0.80	15.30	0.0890	0.94	9.60	0.1090	0.86	10.60
0.0730	0.82	14.50	0.0890	0.96	9.20	0.1090	0.88	10.10
0.0730	0.84	13.70	0.0890	0.98	8.80	0.1090	0.90	9.60
0.0730	0.86	13.00	0.0890	1.00	8.30	0.1090	0.92	9.10
0.0730	0.88	12.30	0.0930	0.80	13.60	0.1090	0.94	8.70
0.0730	0.90	11.70	0.0930	0.82	12.90	0.1090	0.96	8.30
0.0730	0.92	11.10	0.0930	0.84	12.20	0.1090	0.98	7.90
0.0730	0.94	10.60	0.0930	0.86	11.50	0.1090	1.00	7.60
0.0730	0.96	10.10	0.0930	0.88	10.90	0.1130	0.80	12.40
0.0730	0.98	9.70	0.0930	0.90	10.40	0.1130	0.82	11.70
0.0730	1.00	9.20	0.0930	0.92	9.90	0.1130	0.84	11.00
0.0770	0.80	14.90	0.0930	0.94	9.40	0.1130	0.86	10.40
0.0770	0.82	14.10	0.0930	0.96	9.00	0.1130	0.88	9.90

$n\rho$	d/h	α_2	$n\rho$	d/h	α_2	$n\rho$	d/h	α_2
0.1130	0.90	9.40	0.1170	0.94	8.40	0.1210	0.98	7.50
0.1130	0.92	8.90	0.1170	0.96	8.00	0.1210	1.00	7.20
0.1130	0.94	8.50	0.1170	0.98	7.70	0.1250	0.80	11.80
0.1130	0.96	8.10	0.1170	1.00	7.30	0.1250	0.82	11.10
0.1130	0.98	7.80	0.1210	0.80	12.00	0.1250	0.84	10.50
0.1130	1.00	7.50	0.1210	0.82	11.30	0.1250	0.86	9.90
0.1170	0.80	12.20	0.1210	0.84	10.70	0.1250	0.88	9.40
0.1170	0.82	11.50	0.1210	0.86	10.10	0.1250	0.90	8.90
0.1170	0.84	10.80	0.1210	0.88	9.60	0.1250	0.92	8.50
0.1170	0.86	10.30	0.1210	0.90	9.10	0.1250	0.94	8.10
0.1170	0.88	9.70	0.1210	0.92	8.60	0.1250	0.96	7.70
0.1170	0.90	9.20	0.1210	0.94	8.20	0.1250	0.98	7.40
0.1170	0.92	8.80	0.1210	0.96	7.90	0.1250	1.00	7.10

Tabla A2.1 - Valores del coeficiente α_2