

Datos

h (m)	5	w_{cp} (kgf/m)	800
L (m)	30	w_{cv} (kgf/m)	500

Calculo de g'

L_{arco} (m)	32.2	r	0.17	g (kgf/m)	800.00
		$\tan\theta$	0.67	g' (kgf/m)	161.48
		θ	33.6900675	p (kgf/m)	500.00

Resolución del arco

Caso I	Caso II	Caso V
R 12000.00	R 807.40	R 5250.00
H 18000.00	H 519.04	H 3573.00
	M_{apoyo} -692.1	M_{apoyo} -7785
	M_{centro} 259.5	M_{centro} -1170

Cargas de diseño

Cargas CP	CV
R 12807.40	R 5250
H 18519.04	H 3573.00
P_{cp} 22513.04	P_{cv} 5885.09
M_{emp} -692.06	M_{emp} -7785
M_c 259.52	M_c -1170

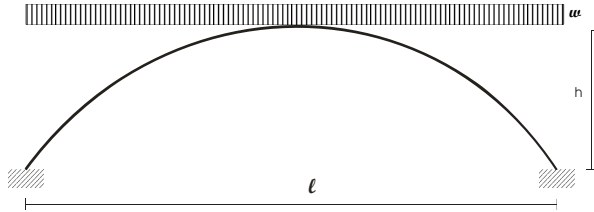
Cargas Mayoradas

U1	U2	U3
R 17930.4	R 17993.9	R 23768.88
H 25926.7	H 24009.4	H 27939.65
M_{emp} -968.9	M_{emp} -4723.0	M_{emp} -13286.47
M_c 363.3	M_c -273.6	M_c -1560.57
Empotramiento		
U1	U2	U3
θ 33.6900675	θ 33.6900675	θ 33.6900675
P_u (kgf) 31 518.3	P_u (kgf) 29 958.2	P_u (kgf) 36 431.8
M_u (kgf*m) -968.9	M_u (kgf*m) -4 723.0	M_u (kgf*m) -13 286.5
Centro		
U1	U2	U3
P_u (kgf) 25926.7	P_u (kgf) 24009.4	P_u (kgf) 27939.7
M_u (kgf*m) 363.3	M_u (kgf*m) -273.6	M_u (kgf*m) -1560.6

Diseño del arco

Datos		
P_u (kgf)	36432	k 0.65
M_u (kgf*m)	13286	ℓ (m) 3.6

Perfil	KL/r_{min}	ϕF_{cr}	P_u/P_n	Interaccion	
2 UPN 300	35	1998	0.22	0.84	64.4 m de UPN 300
4 UPN 180	20	2083	0.22	0.89	128.9 m de UPN 180
	f_c 210	f_y 4200	ω 0.59		
h	y	e/h	v	μ	v
40	0.8	0.912	0.20	0.182	0.16
				A_g	b
				1648.50	41.2
				b	45
				b/h	0.89
				b	40
				h	45



Datos

h (m)	10	w_{cp} (kgf/m)	800
L (m)	30	w_{cv} (kgf/m)	500

Calculo de g'

L_{arco} (m)	38.9	r	0.33	g (kgf/m)	800.00
		$\tan\theta$	1.33	g' (kgf/m)	533.33
		θ	53.1301024	p (kgf/m)	500.00

Resolución del arco

Caso I	Caso II	Caso V
R 12000.00	R 2666.67	R 5250.00
H 9000.00	H 857.14	H 1786.50
	M_{apoyo} -2285.7	M_{apoyo} -7785
	M_{centro} 857.1	M_{centro} -1170

Cargas de diseño

Cargas CP	CV
R 14666.67	R 5250
H 9857.14	H 1786.50
P_{cp} 17647.62	P_{cv} 5271.90
M_{emp} -2285.71	M_{emp} -7785
M_c 857.14	M_c -1170

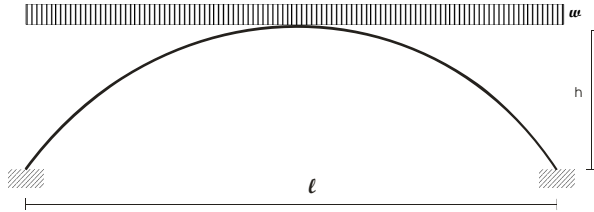
Cargas Mayoradas

U1	U2	U3
R 20533.3	R 20225.0	R 26000.00
H 13800.0	H 12721.8	H 14686.97
M_{emp} -3200.0	M_{emp} -6635.4	M_{emp} -15198.86
M_c 1200.0	M_c 443.6	M_c -843.43
Empotramiento	U2	U3
θ 53.1301024	θ 53.1301024	θ 53.1301024
P_u (kgf) 24 706.7	P_u (kgf) 23 813.1	P_u (kgf) 29 612.2
M_u (kgf*m) -3 200.0	M_u (kgf*m) -6 635.4	M_u (kgf*m) -15 198.9
Centro	U2	U3
P_u (kgf) 13800.0	P_u (kgf) 12721.8	P_u (kgf) 14687.0
M_u (kgf*m) 1200.0	M_u (kgf*m) 443.6	M_u (kgf*m) -843.4

Diseño del arco

Datos		
P_u (kgf)	29612	k 0.65
M_u (kgf*m)	15199	ℓ (m) 3.6

Perfil	KL/r_{min}	ϕF_{cr}	P_u/P_n	Interaccion	
2 UPN 300	42	1944	0.18	0.89	77.8 m de UPN 300
4 UPN 180	24	2064	0.18	0.96	155.6 m de UPN 180
	f_c 210	f_y 4200	ω 0.59		
h	y	e/h	v	μ	v
40	0.8	1.283	0.20	0.257	0.15
				A_g	b
				1429.25	35.7
				b	b/h
				40	1.00
				b	h
				40	40



Datos

h (m)	15	w_{cp} (kgf/m)	800
L (m)	30	w_{cv} (kgf/m)	500

Calculo de g'

L_{arco} (m)	50.0	r	0.50	g (kgf/m)	800.00
		$\tan\theta$	2.00	g' (kgf/m)	988.85
		θ	63.4349488	p (kgf/m)	500.00

Resolución del arco

Caso I	Caso II	Caso V
R 12000.00	R 4944.27	R 5250.00
H 6000.00	H 1059.49	H 1191.00
	M_{apoyo} -4237.9	M_{apoyo} -7785
	M_{centro} 1589.2	M_{centro} -1170

Cargas de diseño

Cargas CP	CV
R 16944.27	R 5250
H 7059.49	H 1191.00
P_{cp} 18312.52	P_{cv} 5228.37
M_{emp} -4237.95	M_{emp} -7785
M_c 1589.23	M_c -1170

Cargas Mayoradas

U1	U2	U3
R 23722.0	R 22958.1	R 28733.13
H 9883.3	H 9066.9	H 10376.98
M_{emp} -5933.1	M_{emp} -8978.0	M_{emp} -17541.54
M_c 2224.9	M_c 1322.1	M_c 35.08
Empotramiento		
U1	U2	U3
θ 63.4349488	θ 63.4349488	θ 63.4349488
P_u (kgf) 25 637.5	P_u (kgf) 24 589.2	P_u (kgf) 30 340.4
M_u (kgf*m) -5 933.1	M_u (kgf*m) -8 978.0	M_u (kgf*m) -17 541.5
Centro		
U1	U2	U3
P_u (kgf) 9883.3	P_u (kgf) 9066.9	P_u (kgf) 10377.0
M_u (kgf*m) 2224.9	M_u (kgf*m) 1322.1	M_u (kgf*m) 35.1

Diseño del arco

Datos		
P_u (kgf)	30340	k 0.65
M_u (kgf*m)	17542	ℓ (m) 3.6

Perfil	KL/r_{min}	ϕF_{cr}	P_u/P_n	Interaccion	
2 UPN 300	54	1834	0.20	1.02	100 m de UPN 300
4 UPN 200	28	2043	0.16	0.88	200 m de UPN 200
	f_c 210	f_y 4200	ω 0.59		
h	y	e/h	v	μ	v
40	0.8	1.445	0.20	0.289	0.13
				A_g	b
				1689.69	42.2
				b	45
				b/h	0.89
				b	40
				h	45



Cálculo de g'

Resolución del arco

Cargas de diseño

Fuerzas axiales P

ℓ/4

Cargas Mayoradas

Cargas de diseño

6/4

Pu (kgf) 16 992.3	Pu (kgf) 15 817.1	Pu (kgf) 18 572.0
Mu (kgf*m) 2 871.8	Mu (kgf*m) 6 151.5	Mu (kgf*m) 14 269.5

Diseño del arco

Pu (kgf) 18572.0		k 0.65															
Mu (kgf*m) 14269.5		ℓ (m) 3.9															
2UPN	A	ly	lz	Zy	Zz	ry	rz	KL/r _{min}	KL/r _{min}	ϕ Fcr	Pu/Pn	Interaccion					
UPN 300	82.6	10700	3014.14	843.45	467.52	11.38	6.04	41.8	42	1944	0.12	0.81					
4UPN	A	ly	lz	Zy	Zz	ry	rz	KL/r _{min}	KL/r _{min}	fFcr	Pu/Pn	Interaccion					
UPN 180	80	8824.264	8824.3	777.0	777.0	10.5	10.5	24.1	24	2064	0.11	0.87					



Cálculo de g'

Resolución del arco

Cargas de diseño

Fuerzas axiales P

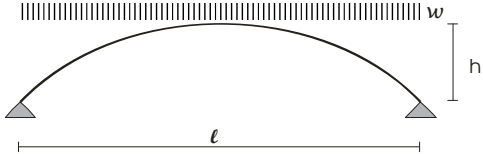
Cargas Mayoradas

Cargas de diseño

6/4

Diseño del arco

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Datos

h (m)	10	wcp (kgf/m)	300
L (m)	10	wcv (kgf/m)	400

Cálculo de g'

r	1.00	g (kgf/m)	300.00
tanθ	4.00	g' (kgf/m)	936.93
θ	1.33	p (kgf/m)	400.00
L _{arco}	36.67		

Resolución del arco

Caso I	Caso II	Caso V
R 1500 H 375	R 1561.55 H 223.08 M _{ij} 400.4 Mc -277.2	R 1340 H 192 M _{ij} 656 Mc 0

Cargas de diseño

Cargas

CP

R	3061.55	CV	
H	598.08	R	1340
M _{ij}	400.40	H	192
Mc	-277.20	M _{ij}	656
		Mc	0

Fuerzas axiales P

Centro

CP		CV	
P	598.08	P	192
Mc	-277.20	Mc	0

ℓ/4

CP		CV	
θ (rad)	1.107		1.107
θ (deg)	63.43494882		63.4349488
V	1140.39	V	340.00
H	598.08	H	192.00
P	1287.46	P	389.97
M _{ij}	400.40	M _{ij}	656.00

Cargas Mayoradas

U1

R	4286.2
H	837.3
M _{ij}	560.6
Mc	-388.1

U2

R	4343.9
H	813.7
M _{ij}	808.5
Mc	-332.6

U3

R	5817.86
H	1024.89
M _{ij}	1530.08
Mc	-332.64

Cargas de diseño

Centro

U1

Pu	837.3
Mu	-388.1

U2

Pu	813.7
Mu	-332.6

U3

Pu	1 024.9
Mu	-332.6

ℓ/4

U1

θ	1.107
Vu	1596.5

U2

θ	1.107
Vu	1538.47

U3

θ	1.107
Vu	1912.47

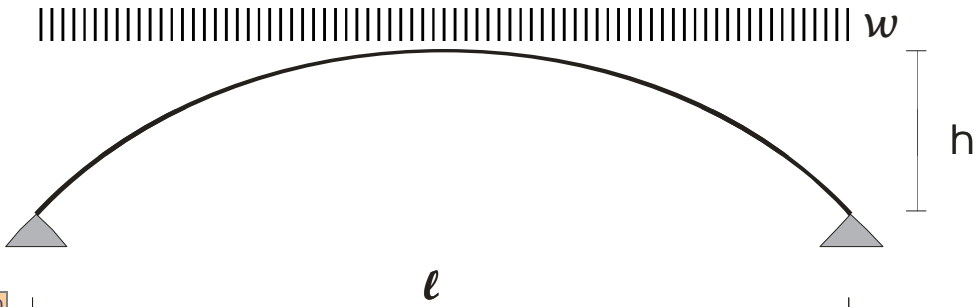
Pu (kgf)	1 802.4
Mu (kgf*m)	560.6

Pu (kgf)	1 739.9
Mu (kgf*m)	808.5

Pu (kgf)	2 168.9
Mu (kgf*m)	1 530.1

Diseño del arco

Pu (kgf)	2168.9	k	0.65																
Mu (kgf*m)	1530.1	ℓ (m)	3.7																
2UPN	A	Iy		Iz		Zy		Zz		ry		rz		KL/r _{min}	KL/r _{min}	φFcr	Pu/Pn	Interaccion	
UPN 100		21.2	318	193.44		75.88		58.94		3.87		3.02		78.9	79	1551	0.07	0.93	
4UPN	A			Iz		Zy		Zz		ry		rz		KL/r _{min}	KL/r _{min}	fFcr	Pu/Pn	Interaccion	
UPN 80		31.36	810.5328	810.5		145.7		145.7		5.1		5.1		46.9	47	1901	0.04	0.48	



wcp (kgf/m)	2784	wcv (kgf/m)	600													
Caso I			Caso II				Caso V									
	h (m)	R	H	R	H	$M_{\ell/4}$	R	H	$M_{\ell/4}$	Pu (kgf)	Mu (kgf*m)	Perfil	peso perfil	L (m)	Peso total (kgf)	
L=40	3.5	55 680.00	159 085.71	1 103.97	1 802.40	1 132.27	8 040.00	13 165.71	15 744.00	217 304.06	26 549.13	W 12x106	158	40.82	6 449.03	
	4	55 680.00	139 200.00	1 429.73	2 042.47	1 466.39	8 040.00	11 520.00	15 744.00	191 549.72	26 950.07	W 12x96	143	41.07	5 872.53	
	4.5	55 680.00	123 733.33	1 792.63	2 276.35	1 838.59	8 040.00	10 240.00	15 744.00	171 675.93	27 396.71	W 12x96	143	41.35	5 913.05	
L=50	4	69 600.00	217 500.00	1 158.90	2 069.46	1 485.76	10 050.00	18 000.00	24 600.00	295 909.67	41 142.92	W 12x152	227	50.85	11 543.71	
	5	69 600.00	174 000.00	1 787.16	2 553.09	2 291.24	10 050.00	14 400.00	24 600.00	239 437.15	42 109.48	W 12x136	202	51.33	10 369.33	
	6	69 600.00	145 000.00	2 534.23	3 016.94	3 249.01	10 050.00	12 000.00	24 600.00	202 260.83	43 258.81	W 12x136	202	51.92	10 487.84	
L=60	3.5	83 520.00	357 942.86	747.82	1 831.40	1 150.50	12 060.00	29 622.86	35 424.00	482 298.24	58 059.00	W 12x230	343	60.54	20 766.74	
	4	83 520.00	313 200.00	972.87	2 084.72	1 496.72	12 060.00	25 920.00	35 424.00	423 439.65	58 474.46	W 12x210	313	60.71	19 002.58	
	4.5	83 520.00	278 400.00	1 225.81	2 334.88	1 885.87	12 060.00	23 040.00	35 424.00	377 825.33	58 941.44	W 12x210	313	60.90	19 061.70	
	5	83 520.00	250 560.00	1 505.94	2 581.61	2 316.83	12 060.00	20 736.00	35 424.00	341 480.53	59 458.59	W 12x190	283	61.11	17 294.44	
	5.5	83 520.00	227 781.82	1 812.47	2 824.63	2 788.41	12 060.00	18 850.91	35 424.00	311 875.74	60 024.49	W 12x190	283	61.34	17 360.48	
	6	83 520.00	208 800.00	2 144.60	3 063.71	3 299.38	12 060.00	17 280.00	35 424.00	287 324.58	60 637.66	W 12x190	283	61.60	17 432.80	