

Tubos e Perfis Calandrados

Características técnicas

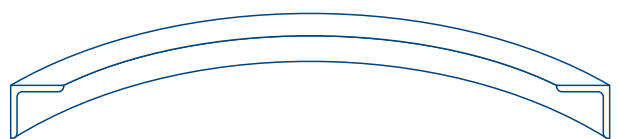
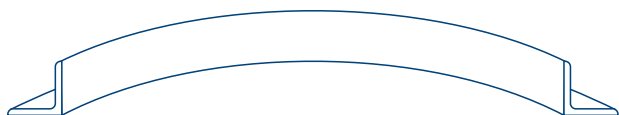


GRAVIA

www.gravia.com

PERFIL - CANTONEIRA LAMINADA (aba interna ou externa)
Obs.: calandragem em par, uma de costa para outra.

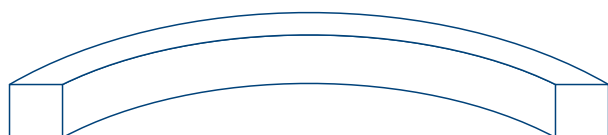
Cantoneira Laminada



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
5/8"	1/8"	800	400
3/4"	1/8"	800	400
7/8"	1/8"	800	400
1"	1/8"	800	400
1.1/4"	1/8"	800	400
1.1/2"	1/8"	800	400
1.3/4"	1/8"	800	400
2"	1/8"	1000	500
1"	3/16"	800	400
1.1/4"	3/16"	800	400
1.1/2"	3/16"	800	400
1.3/4"	3/16"	800	400
2"	3/16"	1000	500
2.1/2"	3/16"	1000	500
3"	3/16"	1200	600
1"	1/4"	800	400
1.1/4"	1/4"	800	400
1.1/2"	1/4"	800	400
1.3/4"	1/4"	800	400
2"	1/4"	1000	500
2.1/2"	1/4"	1000	500
3"	1/4"	1200	600
4"	1/4"	2000	1000
2"	5/16"	1000	500
2.1/2"	5/16"	1000	500
3"	5/16"	1200	600
4"	5/16"	2000	800
2"	3/8"	1000	500
2.1/2"	3/8"	1000	1000
3"	3/8"	1200	600
4"	3/8"	2000	1000

Sob encomenda (consultar)

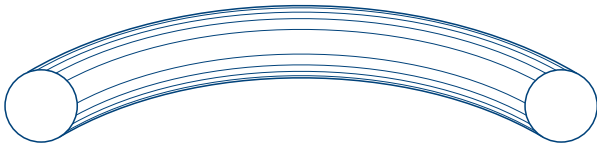
Ferro Quadrado Laminado



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
1/4"	1/4"	500	250
5/16"	5/16"	500	250
3/8"	3/8"	500	250
1/2"	1/2"	500	250
5/8"	5/8"	500	250
3/4"	3/4"	500	250
7/8"	7/8"	500	250
1"	1"	500	250
1.1/8"	1.1/4"	500	250
1.1/4"	1.1/4"	500	250
1.1/2"	1.1/2"	800	400
1.3/4"	1.3/4"	800	400
2"	2"	800	400

Sob encomenda (consultar)

Ferro Redondo Laminado



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
1"	-	500	250
1.1/4"	-	500	250
1.1/2"	-	500	250
1.3/4"	-	800	400
2"	-	800	400
3"	-	1000	500
4"	-	2000	1000

Sob encomenda (consultar)

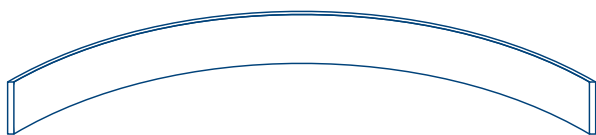
Ferro Chato Laminado Horizontal



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
1/2"	3/16"	800	400
5/8"	3/16"	800	400
3/4"	3/16"	800	400
7/8"	3/16"	800	400
1"	3/16"	800	400
1.1/4"	3/16"	800	400
1.1/2"	3/16"	800	400
2"	3/16"	1000	500
1/2"	1/4"	800	400
5/8"	1/4"	800	400
3/4"	1/4"	800	400
7/8"	1/4"	800	400
1"	1/4"	800	400
1.1/4"	1/4"	800	400
1.1/2"	1/4"	800	400
2"	1/4"	1000	500
2.1/2"	1/4"	1000	500
3"	1/4"	1200	600
4"	1/4"	1600	800
1"	5/16"	800	400
1.1/4"	5/16"	800	400
1.1/2"	5/16"	800	400
2"	5/16"	1000	500
2.1/2"	5/16"	1000	500
3"	5/16"	1200	600
4"	5/16"	1600	800
1"	3/8"	800	400
1.1/4"	3/8"	800	400
1.1/2"	3/8"	800	400
2"	3/8"	1000	500
2.1/2"	3/8"	1000	500
3"	3/8"	1200	600
4"	3/8"	1600	800
1.1/4"	1/2"	800	400
1.1/2"	1/2"	800	400
2"	1/2"	1000	500
2.1/2"	1/2"	1000	500
3"	1/2"	1200	600
4"	1/2"	1600	800
1.1/2"	5/8"	800	400
2"	5/8"	1000	500
2.1/2"	5/8"	1000	500
3"	5/8"	1200	600
3.1/2"	5/8"	1200	600
4"	5/8"	1600	800
2"	3/4"	1000	500
2.1/2"	3/4"	1000	500
3"	3/4"	1200	600
3.1/2"	3/4"	1200	600
4"	3/4"	1400	700
3"	1"	1200	600
4"	1"	1600	800

Sob encomenda (consultar)

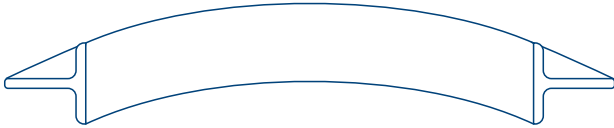
Ferro Chato Laminado Vertical



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
3/8"	1/8"	500	250
1/2"	1/8"	500	250
5/8"	1/8"	500	250
3/4"	1/8"	500	250
7/8"	1/8"	500	250
1"	1/8"	500	250
1.1/4"	1/8"	500	250
1.1/2"	1/8"	500	250
1.3/4"	1/8"	500	250
2"	1/8"	500	250
1/2"	3/16"	500	250
5/8"	3/16"	500	250
3/4"	3/16"	500	250
7/8"	3/16"	500	250
1"	3/16"	500	250
1.1/4"	3/16"	500	250
1.1/2"	3/16"	500	250
1.3/4"	3/16"	500	250
2"	3/16"	500	250
1/2"	1/4"	500	250
5/8"	1/4"	500	250
3/4"	1/4"	500	250
7/8"	1/4"	500	250
1"	1/4"	500	250
1.1/4"	1/4"	500	250
1.1/2"	1/4"	500	250
1.3/4"	1/4"	500	250
2"	1/4"	500	250
2.1/2"	1/4"	500	250
3"	1/4"	500	250
4"	1/4"	500	250
6"	1/4"	500	250
1"	5/16"	500	250
1.1/4"	5/16"	500	250
1.1/2"	5/16"	500	250
2"	5/16"	500	250
2.1/2"	5/16"	500	250
3"	5/16"	500	250
4"	5/16"	500	250
6"	5/16"	500	250
1"	3/8"	500	250
1.1/4"	3/8"	500	250
1.1/2"	3/8"	500	250
2"	3/8"	500	250
2.1/2"	3/8"	500	250
3"	3/8"	500	250
4"	3/8"	500	250
6"	3/8"	500	250
1.1/4"	1/2"	500	250
1.1/2"	1/2"	500	250
2"	1/2"	500	250
2.1/2"	1/2"	500	250
3"	1/2"	500	250
4"	1/2"	500	250
6"	1/2"	500	250
1.1/2"	5/8"	500	250
2"	5/8"	500	250
2.1/2"	5/8"	500	250
3"	5/8"	500	250
3.1/2"	5/8"	500	250
4"	5/8"	500	250
6"	5/8"	500	250
2"	3/4"	600	300
2.1/2"	3/4"	600	300
3"	3/4"	600	300
3.1/2"	3/4"	600	300
4"	3/4"	600	300
6"	3/4"	600	300
3"	1"	600	300
4"	1"	600	300
6"	1"	600	300

Sob encomenda (consultar)

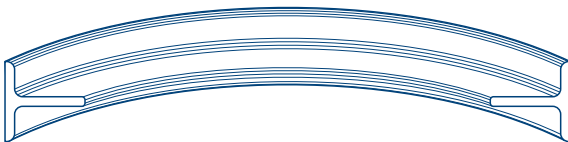
Ferro Tee Laminado Externo



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
5/8"	1/8"	1500	750
3/4"	1/8"	1500	750
7/8"	1/8"	1500	750
1"	1/8"	1500	750
1.1/4"	1/8"	1500	750
1.1/2"	1/8"	1500	750
1.1/4"	3/16"	1500	750
1.1/2"	3/16"	1500	750
2"	3/16"	1500	750
2"	1/4"	1500	750

Sob encomenda (consultar)

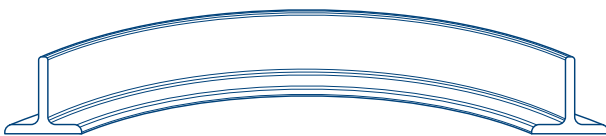
Ferro Tee Laminado Interno



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
5/8"	1/8"	1200	600
3/4"	1/8"	1200	600
7/8"	1/8"	1200	600
1"	1/8"	1200	600
1.1/4"	1/8"	1200	600
1.1/2"	1/8"	1200	600
1.1/4"	3/16"	1200	600
1.1/2"	3/16"	1200	600
2"	3/16"	1200	600
2"	1/4"	1200	600

Sob encomenda (consultar)

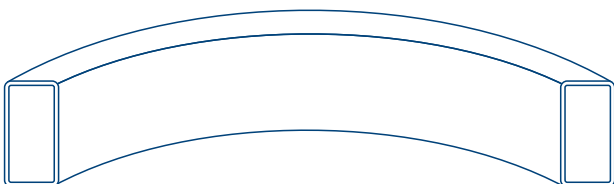
Ferro Tee Laminado Lateral



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
5/8"	1/8"	1500	750
3/4"	1/8"	1500	750
7/8"	1/8"	1500	750
1"	1/8"	1500	750
1.1/4"	1/8"	1500	750
1.1/2"	1/8"	1500	750
1.1/4"	3/16"	1500	750
1.1/2"	3/16"	1500	750
2"	3/16"	1500	750
2"	1/4"	1500	750

Sob encomenda (consultar)

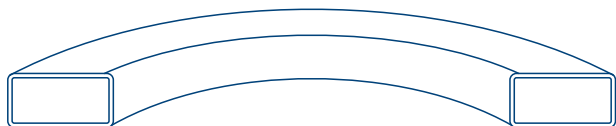
Tubo Retangular Vertical



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
30x20	1,50 (#16)	1500	750
40x20	1,50 (#16)	1500	750
50x20	1,50 (#16)	1500	750
35x25	1,50 (#16)	1500	750
40x30	1,50 (#16)	2000	1000
50x30	1,50 (#16)	2000	1000
70x30	1,50 (#16)	2000	1000
40x30	2,00 (#14)	2000	1000
50x30	2,00 (#14)	2000	1000
70x30	2,00 (#14)	3000	1500
60x40	1,50 (#16)	3000	1500
60x40	2,00 (#14)	3000	1500
80x40	2,00 (#14)	3000	1500
75x50	2,65 (#12)	3000	1500
75x50	3,00 (#11)	3000	1500
100x50	2,65 (#12)	3000	1500
100x50	3,00 (#11)	3000	1500

Sob encomenda (consultar)

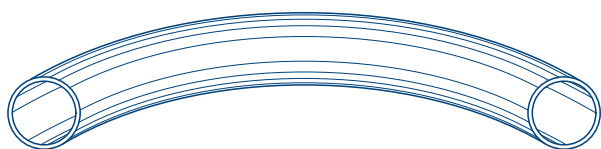
Tubo Retangular Horizontal



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
30x20	1,50 (#16)	2000	1000
35x25	1,50 (#16)	3000	1500
40x20	1,50 (#16)	3000	1500
40x30	1,50 (#16)	3000	1500
50x20	1,50 (#16)	4000	2000
50x30	1,50 (#16)	4000	2000
40x30	2,00 (#14)	3000	1500
50x30	2,00 (#14)	3000	1500
70x30	2,00 (#14)	5000	2500
60x40	2,00 (#14)	4000	2000

Sob encomenda (consultar)

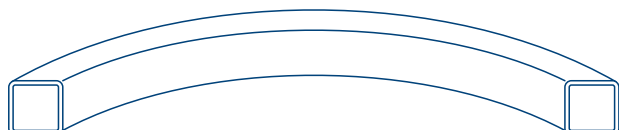
Tubo Redondo



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Ø1"	1,50 (#16)	1000	500
Ø1.1/4"	1,50 (#16)	1000	500
Ø1.1/2"	1,50 (#16)	1200	600
Ø1.3/4"	1,50 (#16)	1200	600
Ø1"	2,00 (#14)	1000	500
Ø1.1/4"	2,00 (#14)	1000	500
Ø1.1/2"	2,00 (#14)	1200	600
Ø1.3/4"	2,00 (#14)	1200	600
Ø2"	2,00 (#14)	1500	750
Ø3"	2,00 (#14)	2000	1000
Ø4"	2,00 (#14)	2000	1000
Ø1"	2,25 (#13)	1000	500
Ø1.1/4"	2,25 (#13)	1000	500
Ø1.1/2"	2,25 (#13)	1200	600
Ø1.3/4"	2,25 (#13)	1200	600
Ø2"	2,25 (#13)	1500	750
Ø3"	2,25 (#13)	2000	1000
Ø4"	2,25 (#13)	2000	1000
Ø1.1/4"	2,65 (#12)	1000	500
Ø1.1/2"	2,65 (#12)	1200	600
Ø1.3/4"	2,65 (#12)	1200	600
Ø2"	2,65 (#12)	1500	750
Ø3"	2,65 (#12)	2000	1000
Ø4"	2,65 (#12)	2000	1000
Ø2"	3,00 (#11)	1500	750
Ø3"	3,00 (#11)	2000	1000
Ø4"	3,00 (#11)	2000	1000
Ø3"	3,35 (#10)	1000	500
Ø4"	3,35 (#10)	1000	500
Ø3"	3,75 (#9)	2000	1000
Ø4"	3,75 (#9)	2000	1000
Ø3"	4,25 (#8)	2000	1000
Ø4"	4,25 (#8)	2000	1000
Ø3"	4,75 (#3/16")	2000	1000
Ø4"	4,75 (#3/16")	2000	1000

Sob encomenda (consultar)

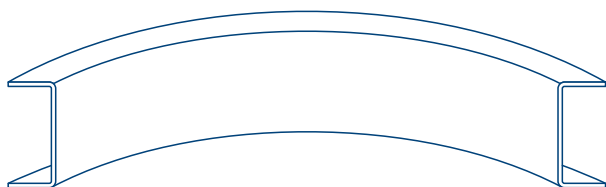
Tubo Quadrado



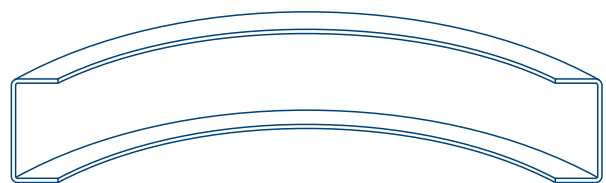
MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
20x20	1,50 (#16)	2000	1000
25x25	1,50 (#16)	2000	1000
30x30	1,50 (#16)	2000	1000
35x35	1,50 (#16)	2000	1000
40x40	1,50 (#16)	2000	1000
50x50	1,50 (#16)	3000	1500
40x40	2,00 (#14)	3000	1500
50x50	2,00 (#14)	3000	1500

Sob encomenda (consultar)

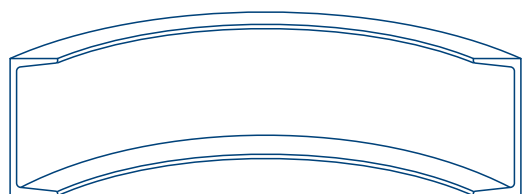
Perfil "U" Dobrado Aba Externa



Perfil "U" Dobrado Aba Interna



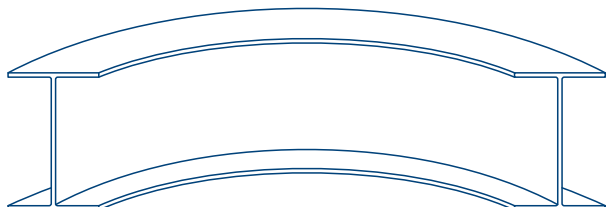
Perfil "U" Laminado



MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
50x25	2,00 (#14)	1000	500
50x25	2,25 (#13)	1000	500
50x25	2,65 (#12)	1000	500
50x25	3,00 (#11)	1000	500
50x30	2,00 (#14)	1500	750
50x30	2,25 (#13)	1500	750
50x30	2,65 (#12)	1500	750
50x30	3,00 (#11)	1500	750
50x40	2,00 (#14)	2000	1000
50x40	2,25 (#13)	2000	1000
50x40	2,65 (#12)	2000	1000
50x40	3,00 (#11)	2000	1000
60x20	2,00 (#14)	1000	500
60x20	2,25 (#13)	1000	500
60x20	2,65 (#12)	1000	500
60x20	3,00 (#11)	1000	500
60x30	2,00 (#14)	1500	750
60x30	2,25 (#13)	1500	750
60x30	2,65 (#12)	1500	750
60x30	3,00 (#11)	1500	750
60x40	2,00 (#14)	2000	1000
60x40	2,25 (#13)	2000	1000
60x40	2,65 (#12)	2000	1000
60x40	3,00 (#11)	2000	1000
60x40	2,00 (#14)	2000	1000
60x40	2,25 (#13)	2000	1000
60x40	2,65 (#12)	2000	1000
60x40	3,00 (#11)	2000	1000
60x50	2,00 (#14)	3000	1500
60x50	2,25 (#13)	3000	1500
60x50	2,65 (#12)	3000	1500
60x50	3,00 (#11)	3000	1500
75x40	2,00 (#14)	2000	1000
75x40	2,25 (#13)	2000	1000
75x40	2,65 (#12)	2000	1000
75x40	3,00 (#11)	2000	1000
100x40	2,00 (#14)	2000	1000
100x40	2,25 (#13)	2000	1000
100x40	2,65 (#12)	2000	1000
100x40	3,00 (#11)	2000	1000
100x50	2,00 (#14)	3000	1500
100x50	2,25 (#13)	3000	1500
100x50	2,65 (#12)	3000	1500
100x50	3,00 (#11)	3000	1500
127x50	2,00 (#14)	3000	1500
127x50	2,25 (#13)	3000	1500
127x50	2,65 (#12)	3000	1500
127x50	3,00 (#11)	3000	1500
150x50	2,00 (#14)	3000	1500
150x50	2,25 (#13)	3000	1500
150x50	2,65 (#12)	3000	1500
150x50	3,00 (#11)	3000	1500
150x50	3,35 (#10)	3000	1500
150x50	3,75 (#9)	3000	1500
150x50	4,25 (#8)	3000	1500
150x50	4,75 (#3/16")	3000	1500
200x50	2,00 (#14)	3000	1500
200x50	2,25 (#13)	3000	1500
200x50	2,65 (#12)	3000	1500
200x50	3,00 (#11)	3000	1500
200x50	3,35 (#10)	3000	1500
200x50	3,75 (#9)	3000	1500
200x50	4,25 (#8)	3000	1500
200x50	4,75 (#3/16")	3000	1500

Sob encomenda (consultar)

Perfil "I" Laminado Vertical Viga "I" e Viga "H"



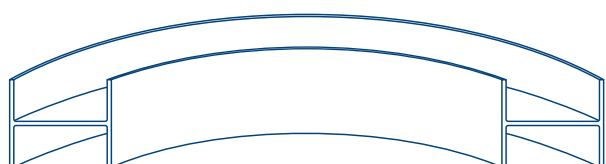
BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga I W150x13,0	148x100	4,30/4,90	2000	1000
Viga I W150x18,0	153x102	5,80/7,10	2000	1000
Viga I W200x15,0	200x100	4,30/5,20	2000	1000
Viga I W200x19,3	203x102	5,80/6,50	consultar	
Viga I W200x22,5	206x102	6,20/8,00	consultar	
Viga I W200x26,6	207x133	5,80x8,40	consultar	

Sob encomenda (consultar)

Viga H W150x22,5	152x152	5,80x6,60	2000	1000
Viga H W150x29,8	157x153	6,60/9,30	2000	1000
Viga H W150x37,1	162x154	8,10/11,60	2000	1000
Viga H W200x35,9	201x165	6,20/10,20	2000	1000
Viga H W200x46,1	203x203	7,2/11,0	consultar	

Sob encomenda (consultar)

Perfil "I" Laminado Horizontal Viga "I" e Viga "H"



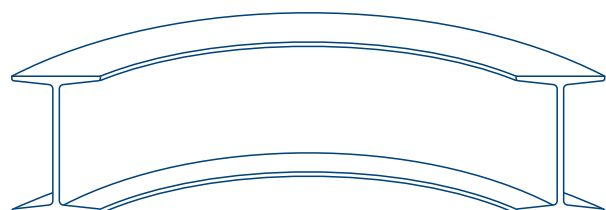
BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga I W150x13,0	148x100	4,30/4,90	consultar	
Viga I W150x18,0	153x102	5,80/7,10	consultar	
Viga I W200x15,0	200x100	4,30/5,20	consultar	
Viga I W200x19,3	203x102	5,80/6,50	consultar	
Viga I W200x22,5	206x102	6,20/8,00	consultar	
Viga I W200x26,6	207x133	5,80x8,40	consultar	

Sob encomenda (consultar)

Viga H W150x22,5	152x152	5,80x6,60	consultar	
Viga H W150x29,8	157x153	6,60/9,30	consultar	
Viga H W150x37,1	162x154	8,10/11,60	consultar	
Viga H W200x35,9	201x165	6,20/10,20	consultar	
Viga H W200x46,1	203x203	7,2/11,0	consultar	

Sob encomenda (consultar)

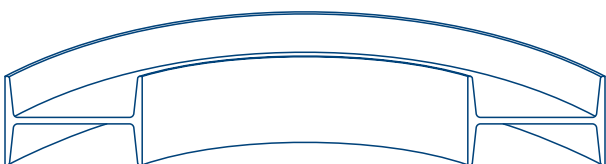
Perfil "I" Laminado Vertical



BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga I 3"aba inclinada	76x59 (1ª)	4,32/6,60	2000	1000
Viga I 4"aba inclinada	102x68(1ª)	4,90/7,44	2000	1000
Viga I 5"aba inclinada	127x76(1ª)	5,44/8,28	2000	1000
Viga I 6"aba inclinada	152x85(1ª)	5,89/9,12	2000	1000
Viga I 8"aba inclinada	203x102	6,86/	2000	1000

Sob encomenda (consultar)

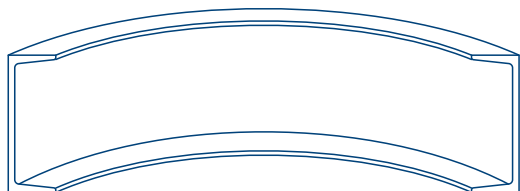
Perfil "I" Laminado Horizontal



BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga I 3"aba inclinada	76x59 (1ª)	4,32/6,60	consultar	
Viga I 4"aba inclinada	102x68(1ª)	4,90/7,44	consultar	
Viga I 5"aba inclinada	127x76(1ª)	5,44/8,28	consultar	
Viga I 6"aba inclinada	152x85(1ª)	5,89/9,12	consultar	
Viga I 8"aba inclinada	203x102	6,86/	consultar	

Sob encomenda (consultar)

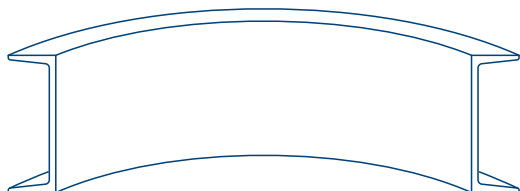
Viga "U" Laminado Aba Interna



BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga U 3"x1.1/2"	76,2x35,8 (1ª)	4.32	2000	1000
Viga U 4"x1.5/8"	101,6x40,2 (1ª)	4.47	2000	1000
Viga U 6"x2"	152,4x48,8 (1ª)	5.08	2000	1000
Viga U 8"x2"	203,2x57,2 (1ª)	5.59	2000	1000

Sob encomenda (consultar)

Viga "U" Laminado Aba Externa



BITOLA	MEDIDA	ESPESSURA	Ø MÍNIMO	RAIO MÍNIMO
Viga U 3"x1.1/2"	76,2x35,8 (1ª)	4.32	2000	1000
Viga U 4"x1.5/8"	101,6x40,2 (1ª)	4.47	2000	1000
Viga U 6"x2"	152,4x48,8 (1ª)	5.08	2000	1000
Viga U 8"x2"	203,2x57,2 (1ª)	5.59	2000	1000

Sob encomenda (consultar)

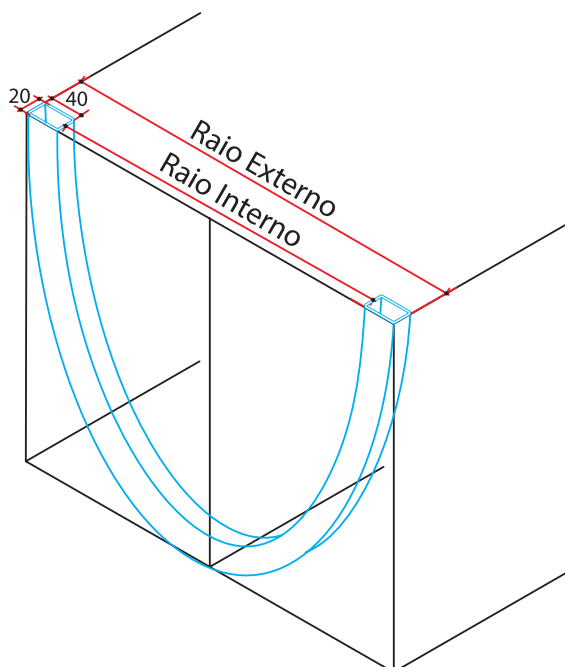
NÃO PODEM SER CALANDRADOS:

- Perfil "U" dobrado para calandragem na lateral,
- Perfil "U" laminado para calandragem na lateral,
- Perfís dobrados em geral não constantes nesta tabela,
- Vigas com seção maior de 200mm,
- Diâmetros ou Raio menor aos mencionados.

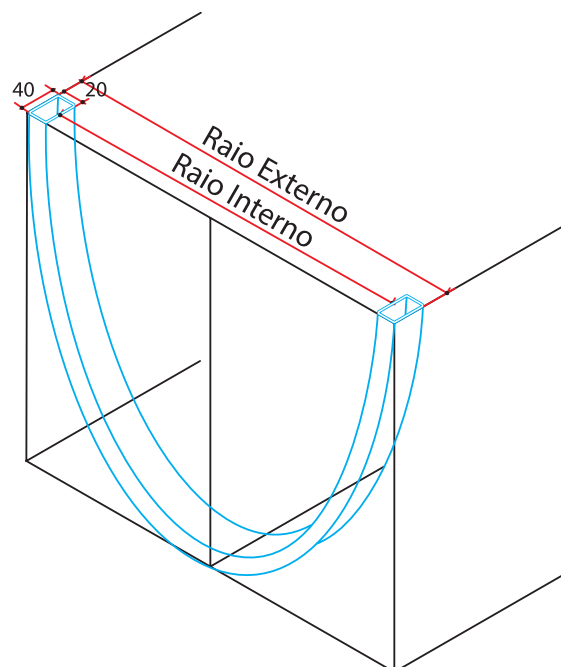
PARA ENCOMENDA INFORMAR:

Raio da curva solicitado pela face externa do material,
Flexa do arco solicitado,
Corda do arco solicitado.

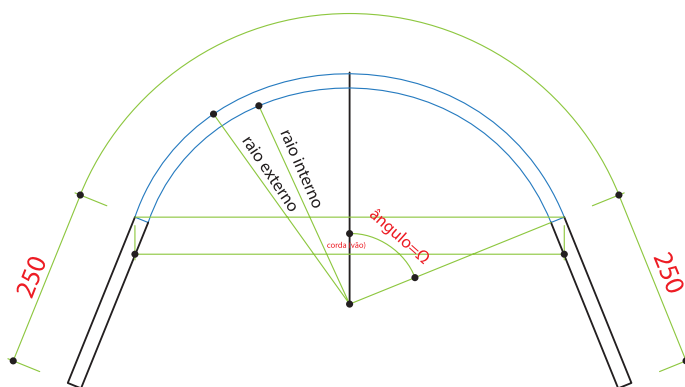
Exemplo de calandragem
Perfil na horizontal



Exemplo de calandragem
Perfil na vertical

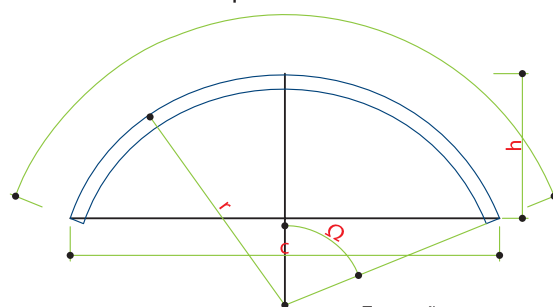


Comprimento do arco



Base para calandragem:
(considerar mais pontas não calandradas)

Equações para determinação do arco
b=comprimento do arco



Equações :

Ω = ângulo
h = flexa do arco
r = raio
c = corda(vão)
b = compr. arco

$$\begin{aligned} \text{sen}\Omega &= \frac{c}{2.r} \\ r &= \frac{h^2 + (0,5c)^2}{2h} \\ b &= \frac{3,1416.r.\Omega}{90^\circ} \end{aligned}$$



Os produtos constantes deste catálogo podem sofrer alterações nas especificações sem prévio aviso