



Thrustline

Stone Arch Bridges

Belgian development agency

enabel.be



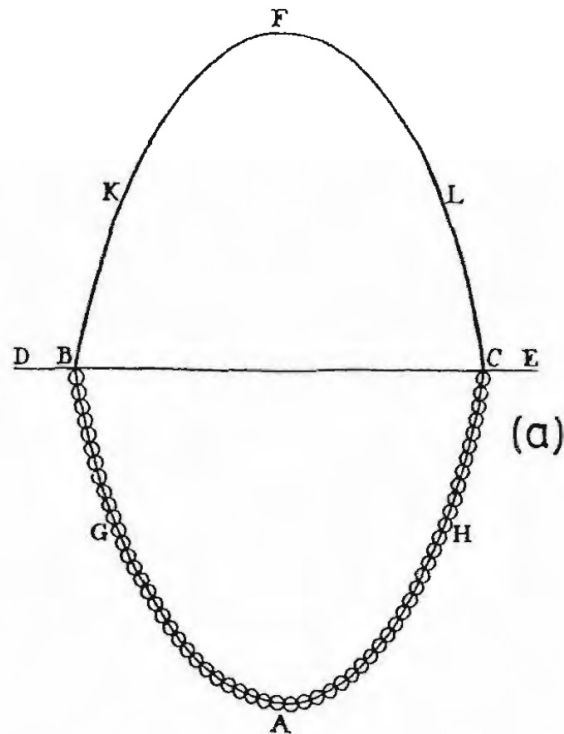
Robert Hooke ca. 1675

Catenary

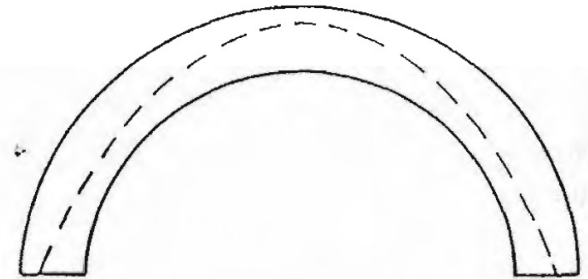
Statics

Archie-M

Dequeeker



(a)



(b)

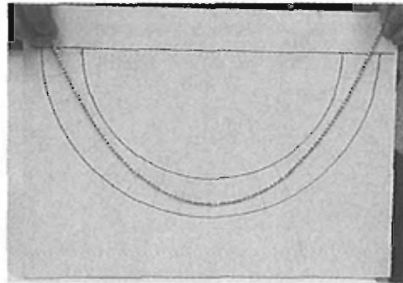


Catenary

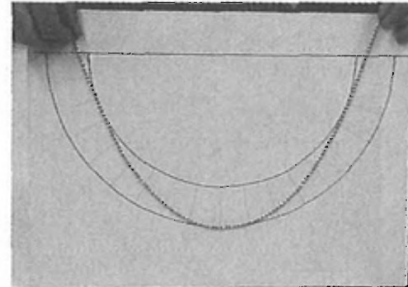
Statics

Archie-M

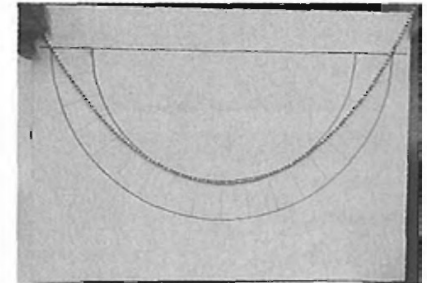
Dequeeker



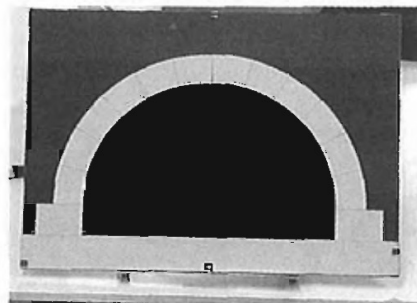
(a)



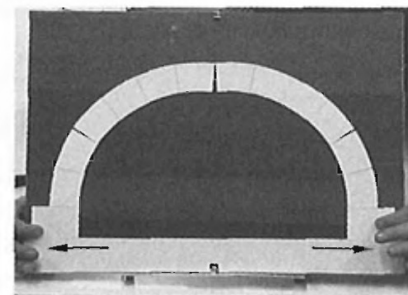
(b)



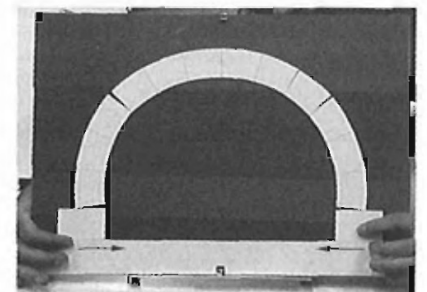
(c)



(d)



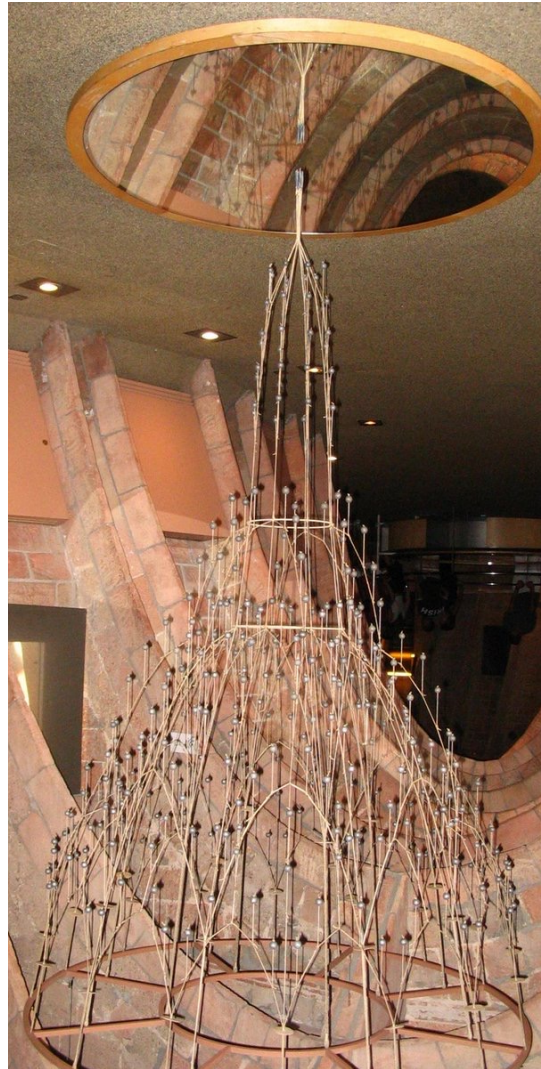
(e)



(f)

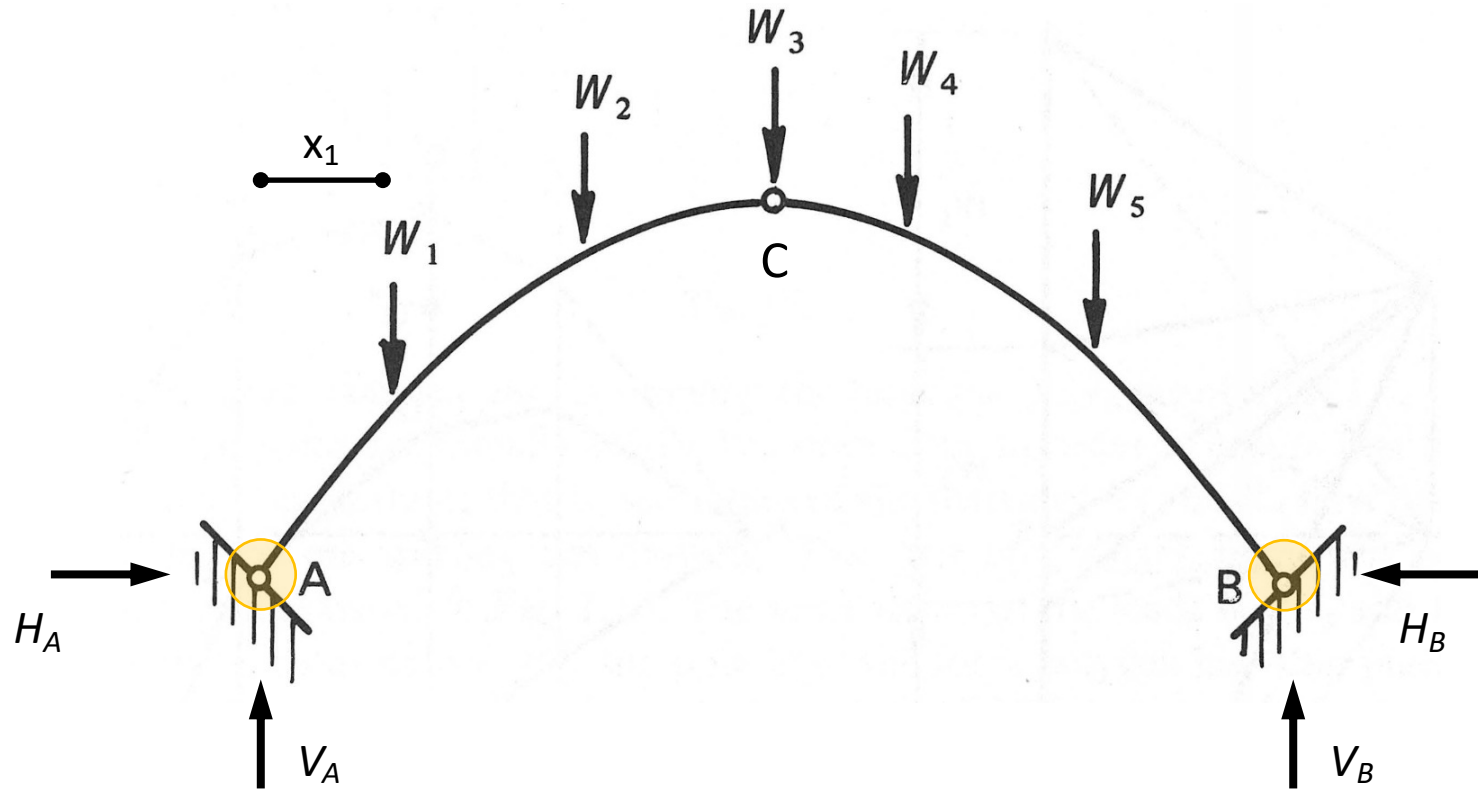


Antonio Gaudi ca. 1880





Catenary
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Dequeker



$$\sum F_x = 0 \Rightarrow H_A = -H_B$$

$$\sum F_y = 0 \Rightarrow V_A + V_B = \sum W_n$$

$$\sum M_A = 0 \Rightarrow V_B = \sum W_n * x_n$$

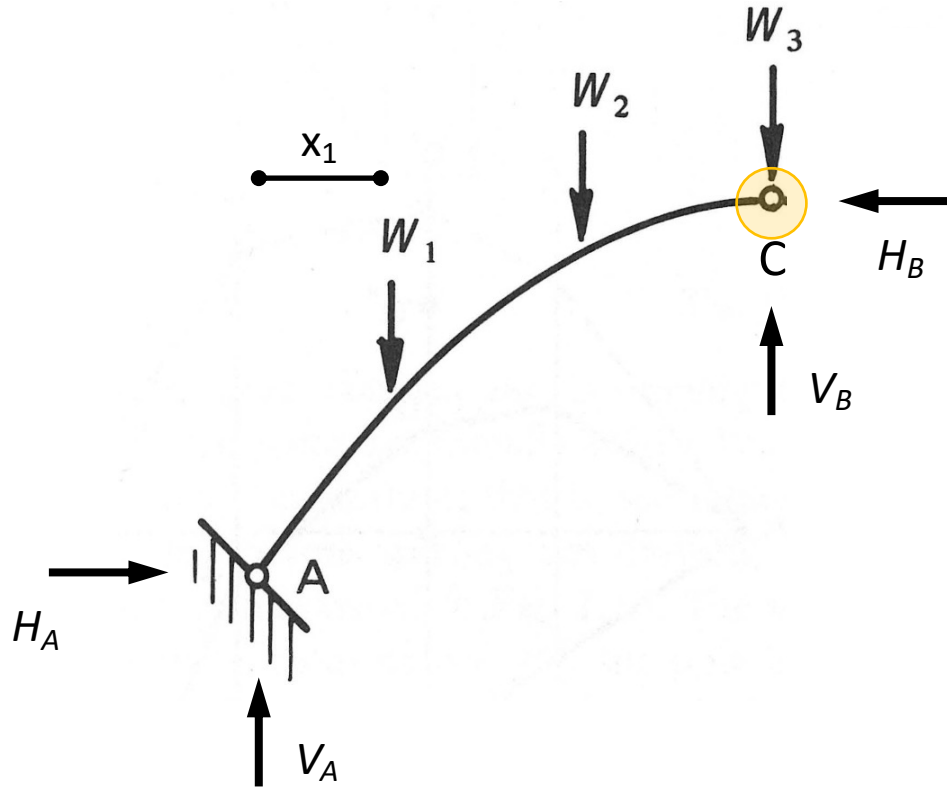


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$$\sum M_C = 0$$

$$y_C H_A = \sum (x_C - x_n) W_n = x_C V_A$$



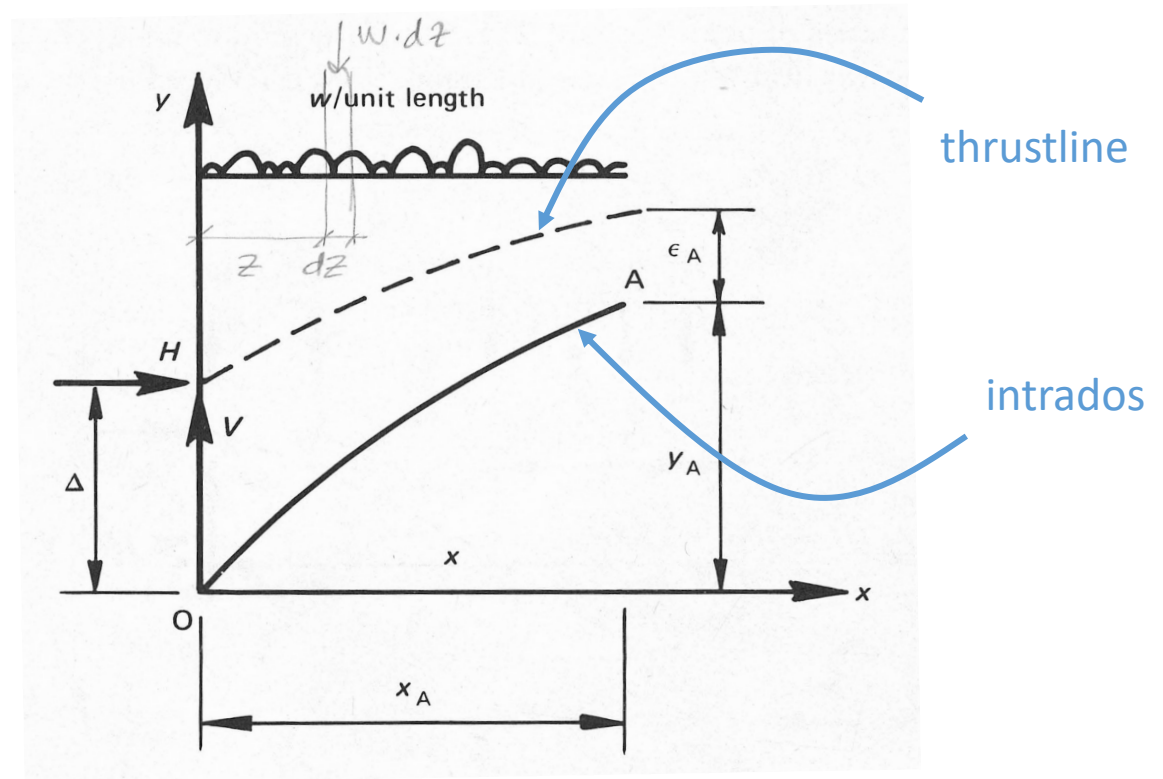
Catenary

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$$(y_A + \epsilon_A - \Delta)H + \int_0^{x_A} (x_A - z)w dz = Vx_A$$





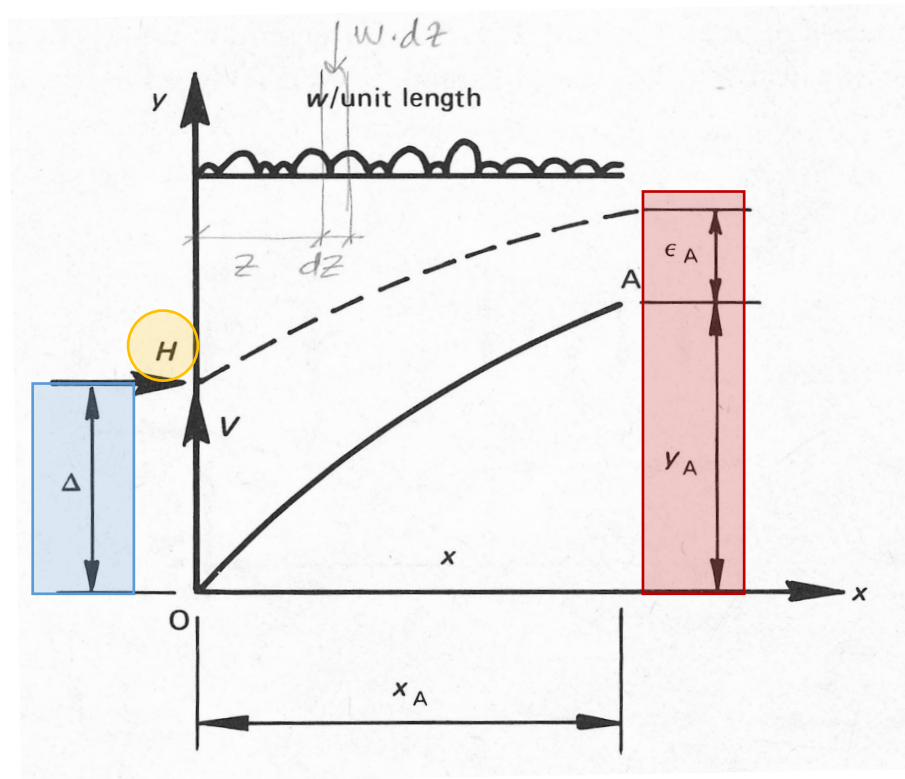
Catenary

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$$(V_A + \epsilon_A) - \Delta H + \int_0^{x_A} (x_A - z) w dz = V x_A$$





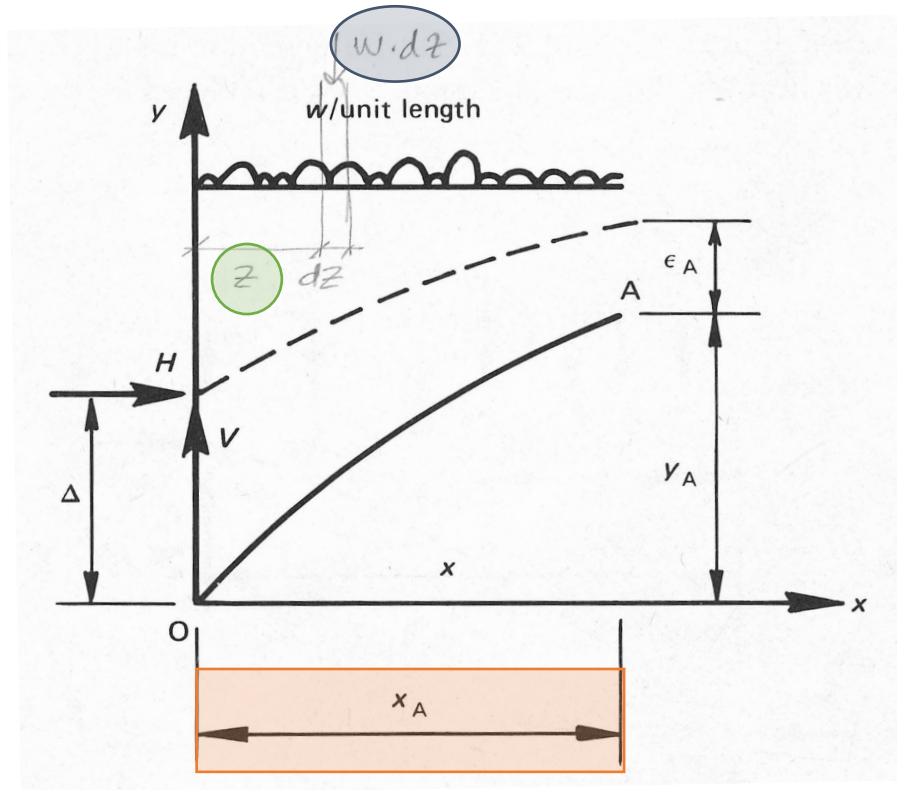
Catenary

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Dequeekeer

$$(y_A + \epsilon_A - \Delta)H + \int_0^{x_A} (x_A - z) w dz = Vx_A$$





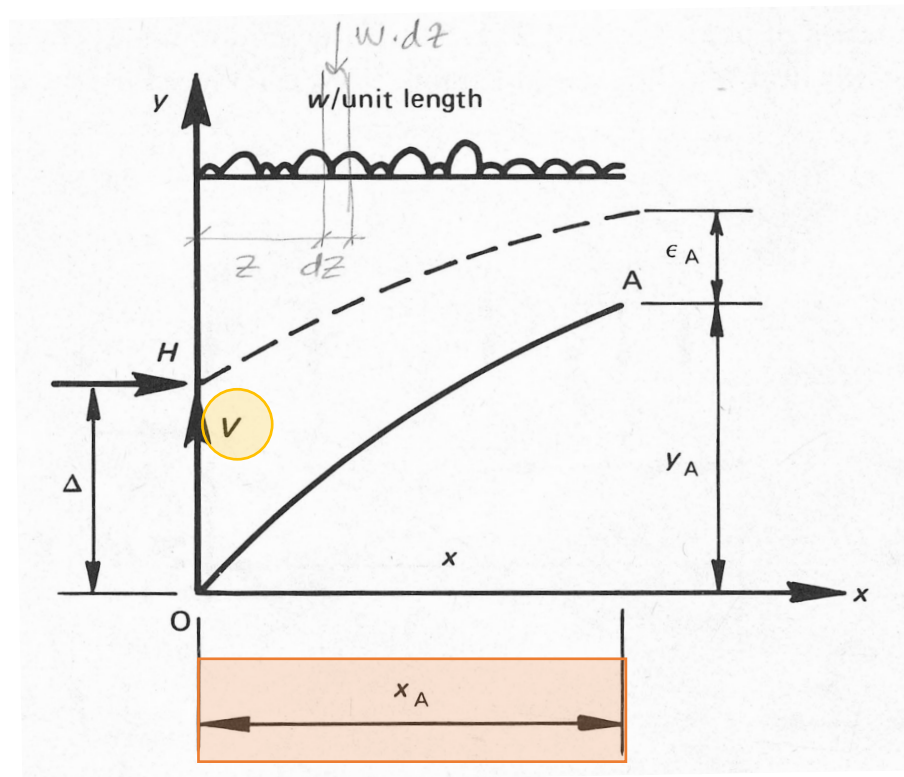
Catenary

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$$(y_A + \epsilon_A - \Delta)H + \int_0^{x_A} (x_A - z) w dz = V x_A$$





Catenary

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$$(y_A + \epsilon_A - \Delta)H + \int_0^{x_A} (x_A - z)w dz = Vx_A$$

$$\epsilon_A = \Delta - y_A + \frac{V}{H}x_A - \frac{1}{H} \int_0^{x_A} (x_A - z)w dz$$



Catenary

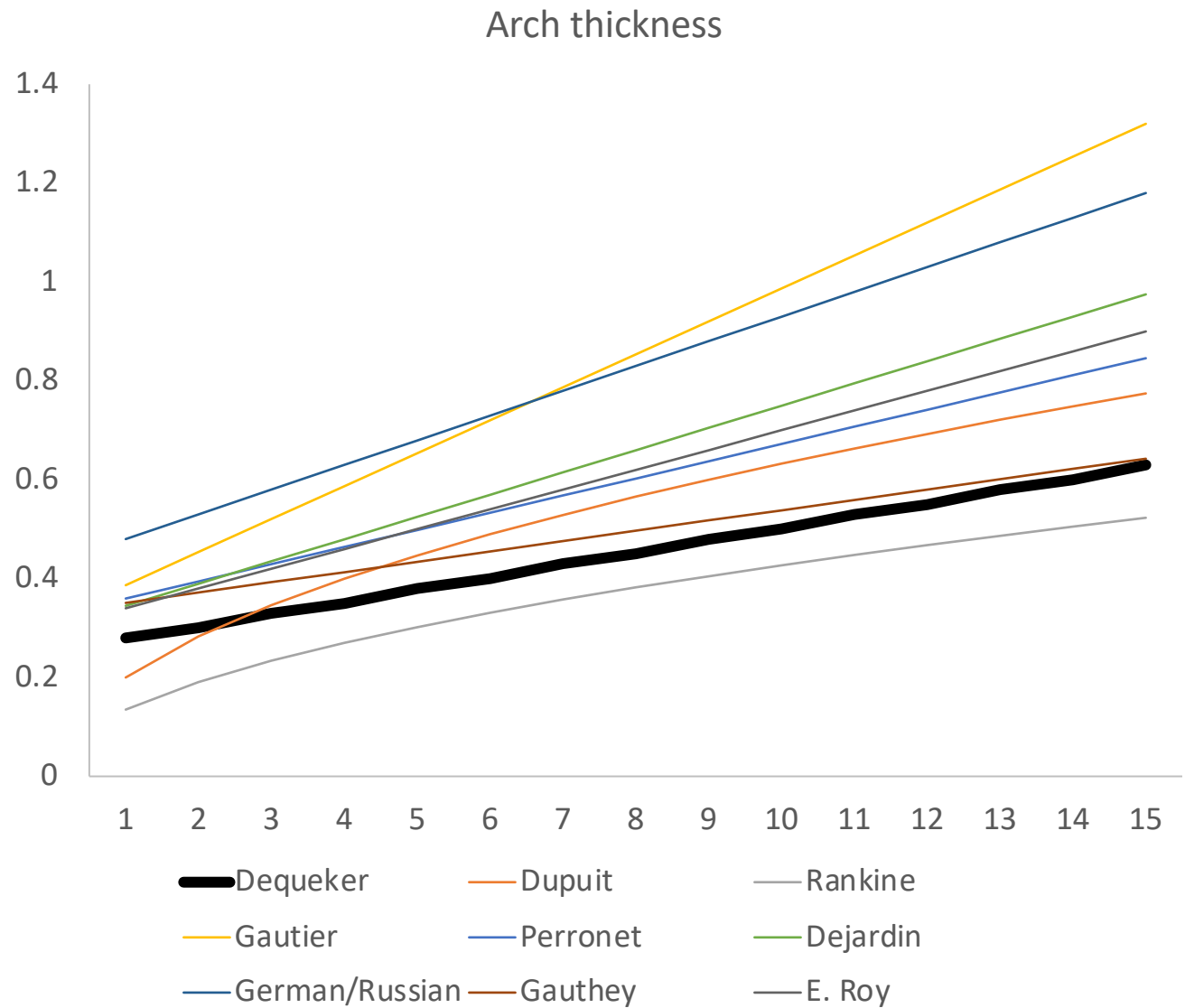
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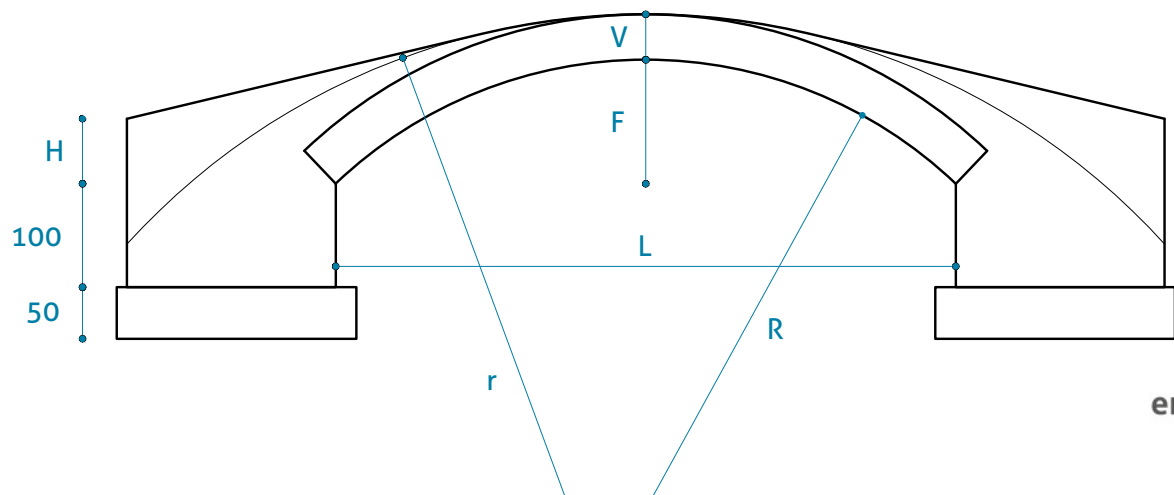
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Catenary Statics Archie-M Dequeker

Segmental arch										
Span	Arch height	Radius intrados	Thickness keystone	Radius extrados	Thickness abutments	Thickness pier	Height abutments	Unitary volume	Bags of cement	
L	F	R	V	r	E	E'	H	m ³ /m	bags/m	
1	0.2	0.72	0.28	3.37	0.64	0.63	0.38	2.77	6	
2	0.4	1.45	0.31	3.59	0.94	0.92	0.43	4.54	9	
3	0.6	2.17	0.34	4.29	1.23	1.19	0.48	6.36	13	
4	0.8	2.90	0.38	5.09	1.50	1.43	0.53	8.28	16	
5	1.0	3.62	0.41	5.93	1.76	1.65	0.58	10.33	20	
6	1.2	4.35	0.44	6.78	2.02	1.87	0.63	12.50	24	
7	1.4	5.07	0.47	7.65	2.28	2.09	0.67	14.80	29	
8	1.6	5.80	0.51	8.52	2.54	2.30	0.72	17.25	33	
9	1.8	6.52	0.54	9.39	2.79	2.49	0.77	19.83	38	
10	2.0	7.25	0.57	10.26	3.05	2.68	0.81	22.55	43	
11	2.2	7.97	0.61	11.14	3.30	2.86	0.86	25.41	49	
12	2.4	8.70	0.64	12.02	3.56	3.05	0.91	28.42	54	
13	2.6	9.42	0.67	12.90	3.81	3.22	0.95	31.57	60	
14	2.8	10.15	0.70	13.78	4.06	3.38	1.00	34.86	67	
15	3.0	10.87	0.74	14.66	4.32	3.54	1.04	38.29	73	
16	3.2	11.60	0.77	15.54	4.57	3.69	1.09	41.86	80	
17	3.4	12.32	0.80	16.42	4.82	3.84	1.18	45.65	87	
18	3.6	13.05	0.83	17.30	5.08	3.98	1.18	49.43	94	
19	3.8	13.77	0.87	18.19	5.33	4.11	1.23	53.44	102	
20	4.0	14.50	0.90	19.07	5.58	4.24	1.28	57.58	110	





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