CLA-VAL

ENGINEERING DATA

Flow of Water Through Standard Wrought Iron or Steel Pipe

Based on Saph and Schoder Formula

Note: For old or rough pipes, add 25% to the pressure drop given in the table. Velocities are shown in light face type. Pressure drop shown in bold face type.

$$P = \frac{3.68V^{1.86}}{d^{1.25}}$$

P = Pressure drop, lbs. per sq. in. per 1000 ft. of pipe
V = Velocity, feet per second
d = Inside diameter of pipe, inches

PRESSURE DROP POUNDS PER SQ. IN. PER 1000 FT. OF PIPE
(1.0 Lb. per Sq. In. = 2.30 Ft. of Water)

Discharge Gallons Per Min.	1" Vel. Ft. per Sec.	1" Pressure Drop	1 1/4" Vel. Ft. per Sec.	1 1/4" Pressure Drop	1 1/2" Vel. Ft. per Sec.	1 1/2" Pressure Drop	2" Vel. Ft. per Sec.	2" Pressure Drop	2 1/2" Vel. Ft. per Sec.	2 1/2" Pressure Drop	3" Vel. Ft. per Sec.	3" Pressure Drop	3 1/2" Vel. Ft. per Sec.	3 1/2" Pressure Drop	4" Vel. Ft. per Sec.	4" Pressure Drop	5" Vel. Ft. per Sec.	5" Pressure Drop	6" Vel. Ft. per Sec.	6" Pressure Drop	8" Vel. Ft. per Sec.	8" Pressure Drop
1	0.37	**0.55**																				
2	0.74	**2.00**	0.43	**0.50**																		
3	1.12	**4.25**	0.64	**1.08**	0.47	**0.50**																
4	1.49	**7.30**	0.86	**1.85**	0.63	**0.86**																
5	1.86	**11.10**	1.07	**2.81**	0.79	**1.31**																
6	2.24	**15.40**	1.28	**3.94**	0.95	**1.82**																
8	2.98	**25.30**	1.72	**6.70**	1.26	**3.11**	0.57	**0.52**														
10	3.72	**40.00**	2.14	**10.20**	1.57	**4.70**	0.76	**0.88**	0.67	**0.55**												
15	5.60	**85.00**	3.21	**21.80**	2.36	**10.10**	0.96	**1.34**	1.00	**1.18**												
20	7.44	**145.00**	4.29	**36.80**	3.15	**17.10**	1.43	**2.85**	1.34	**2.00**	0.87	**0.68**										
25			5.36	**56.00**	3.94	**26.00**	1.91	**4.85**	1.68	**3.04**	1.08	**1.02**	0.81	**0.49**								
30			6.43	**78.50**	4.72	**36.40**	2.39	**7.32**	2.01	**4.26**	1.30	**1.44**	0.97	**0.69**								
35			7.51	**100.00**	5.51	**48.30**	2.87	**10.40**	2.35	**5.14**	1.52	**1.92**	1.14	**0.93**	0.88	**0.49**						
40					6.30	**62.50**	3.35	**13.70**	2.68	**7.29**	1.74	**2.45**	1.30	**1.18**	1.01	**0.63**						
45					7.08	**78.00**	3.82	**17.60**	3.00	**9.12**	1.95	**3.08**	1.46	**1.49**	1.13	**0.79**						
50					7.87	**94.00**	4.30	**22.10**	3.35	**11.00**	2.17	**3.74**	1.62	**1.80**	1.26	**0.96**						
60							4.78	**26.70**	4.02	**15.50**	2.60	**5.20**	1.95	**2.54**	1.51	**1.24**						
70							5.74	**37.50**	4.69	**21.40**	3.04	**7.25**	2.27	**3.48**	1.76	**1.86**	1.12	**0.57**				
80							6.69	**51.80**	5.37	**26.40**	3.84	**8.90**	2.59	**4.33**	2.01	**2.30**	1.28	**0.70**				
90							7.65	**63.80**	6.04	**32.80**	3.91	**11.10**	2.92	**5.321**	2.26	**2.86**	1.44	**0.87**				
100							8.60	**79.10**	6.71	**40.00**	4.34	**13.50**	3.24	**7.78**	2.52	**3.47**	1.60	**1.06**	1.11	**0.45**		
125							9.56	**96.80**	8.38	**60.60**	5.42	**20.50**	4.05	**9.90**	3.15	**5.28**	2.00	**1.62**	1.39	**0.68**		
150									10.06	**87.10**	6.51	**28.80**	4.86	**13.90**	3.78	**7.40**	2.41	**2.28**	1.67	**0.95**		
175									11.73	**115.90**	7.59	**39.00**	5.67	**18.40**	4.41	**9.80**	2.81	**3.00**	1.94	**1.26**		
200											8.68	**49.00**	6.48	**23.60**	5.04	**12.60**	3.21	**3.85**	2.22	**1.62**		
225											9.77	**60.60**	7.29	**29.30**	5.67	**15.60**	3.61	**4.76**	2.50	**2.00**	1.44	**0.51**
250											10.85	**74.10**	8.10	**35.80**	6.30	**19.00**	4.01	**5.85**	2.78	**2.45**	1.60	**0.63**
275											11.94	**88.20**	8.91	**42.60**	6.93	**22.80**	4.41	**6.92**	3.06	**2.93**	1.76	**0.74**
300											13.02	**104.00**	9.72	**50.20**	7.56	**26.80**	4.81	**8.20**	3.33	**3.44**	1.92	**0.87**
325													10.53	**58.00**	8.18	**31.00**	5.21	**9.55**	3.61	**3.98**	2.08	**1.02**
350													11.35	**66.80**	8.82	**35.70**	5.61	**10.90**	3.89	**4.55**	2.24	**1.12**
375													12.17	**75.20**	9.45	**40.30**	6.01	**12.40**	4.16	**5.17**	2.40	**1.32**
400	1.63	**0.48**											12.97	**85.30**	10.08	**45.50**	6.41	**14.00**	4.44	**5.85**	2.56	**1.49**
425	1.73	**0.53**											13.78	**95.30**	10.70	**50.70**	6.82	**15.60**	4.72	**6.53**	2.72	**1.67**
450	1.83	**0.59**											14.59	**108.00**	11.33	**56.80**	7.22	**17.40**	5.00	**7.28**	2.88	**1.85**
475	1.93	**0.66**											15.40	**118.00**	11.96	**62.80**	7.62	**19.20**	5.27	**8.07**	3.04	**2.05**
500	2.04	**0.73**													12.59	**69.30**	8.02	**21.30**	5.55	**8.90**	3.20	**2.28**
550	2.24	**0.87**													13.84	**82.70**	8.82	**25.40**	6.11	**10.60**	3.53	**2.71**
600	2.44	**1.02**													15.10	**97.00**	9.62	**29.80**	6.66	**12.50**	3.85	**3.18**
650	2.65	**1.18**	1.84	**0.48**											16.36	**112.00**	10.42	**34.50**	7.21	**14.40**	4.17	**3.67**
700	2.85	**1.36**	1.99	**0.55**													11.22	**39.70**	7.77	**16.60**	4.49	**4.23**
750	3.05	**1.54**	2.13	**0.63**													12.02	**45.00**	8.32	**19.00**	4.81	**4.80**
800	3.26	**1.73**	2.27	**0.70**													12.82	**50.80**	8.88	**21.30**	5.13	**5.41**
850	3.46	**1.94**	2.41	**0.79**	1.98	**0.48**											13.62	**56.70**	9.44	**23.70**	5.45	**6.05**
900	3.66	**2.16**	2.55	**0.87**	2.10	**0.53**											14.42	**62.80**	10.00	**26.40**	5.77	**6.72**
950	3.87	**2.38**	2.69	**0.96**	2.21	**0.59**											15.22	**69.60**	10.55	**29.20**	6.09	**7.45**
1,000	4.07	**2.63**	2.84	**1.06**	2.33	**0.65**											16.02	**76.80**	11.10	**32.30**	6.41	**8.18**
1,100	4.48	**3.15**	3.12	**1.27**	2.56	**0.78**											17.63	**91.80**	12.22	**38.60**	7.05	**9.82**
1,200	4.88	**3.64**	3.41	**1.50**	2.80	**0.91**	2.11	**0.45**									19.24	**108.00**	13.32	**45.10**	7.69	**11.60**
1,300	5.29	**4.30**	3.69	**1.74**	3.03	**1.06**	2.28	**0.52**											14.43	**52.50**	8.33	**13.40**
1,400	5.70	**4.88**	3.97	**1.99**	3.26	**1.22**	2.46	**0.60**											15.54	**60.00**	8.97	**15.40**
1,500	6.10	**5.59**	4.26	**2.28**	3.49	**1.39**	2.64	**0.69**											16.65	**68.80**	9.62	**17.50**
1,600	6.51	**6.29**	4.54	**2.56**	3.73	**1.56**	2.81	**0.77**											17.76	**77.10**	10.26	**19.70**
1,800	7.32	**7.85**	5.11	**3.19**	4.19	**1.93**	3.16	**0.96**	2.47	**0.52**									19.98	**96.10**	11.54	**24.50**
2,000	8.13	**9.57**	5.67	**3.86**	4.66	**2.37**	3.15	**1.17**	2.75	**0.63**									22.20	**117.00**	12.83	**29.90**
2,500	10.18	**14.50**	7.09	**5.88**	5.82	**3.58**	4.39	**1.77**	3.43	**0.96**											16.03	**45.10**
3,000	12.21	**20.40**	8.51	**8.23**	6.98	**5.02**	5.27	**2.49**	4.12	**1.35**	3.30	**0.55**									19.24	**63.20**
3,500	14.25	**27.20**	9.93	**10.90**	8.16	**6.68**	6.14	**3.31**	4.81	**1.79**	3.85	**0.78**									22.43	**84.00**
4,000	16.28	**34.70**	11.35	**14.10**	9.32	**8.52**	7.02	**4.22**	5.49	**2.29**	4.41	**1.04**	3.02	**0.51**							25.65	**108.00**
4,500	18.31	**43.20**	12.76	**17.40**	10.48	**10.60**	7.90	**5.22**	6.18	**2.85**	4.96	**1.32**	3.40	**0.64**								
5,000	20.35	**52.30**	14.18	**21.30**	11.63	**12.90**	8.78	**6.40**	6.86	**3.48**	5.51	**1.64**	3.78	**0.79**	2.27	**0.24**						
6,000	24.42	**73.10**	17.02	**29.80**	13.97	**18.20**	10.52	**8.98**	8.24	**4.85**	6.61	**2.00**	4.54	**1.09**	2.72	**0.34**						
7,000	28.50	**98.00**	19.85	**39.60**	16.30	**23.20**	12.28	**11.90**	9.61	**6.47**	7.71	**3.74**	5.29	**1.45**	3.18	**0.45**						
8,000	32.57	**125.00**	22.70	**50.90**	18.62	**30.90**	14.04	**15.20**	10.98	**8.25**	8.82	**4.76**	6.05	**1.86**	3.63	**0.58**	2.52	**0.23**				
9,000			25.53	**62.80**	20.95	**38.30**	15.79	**19.00**	12.35	**10.30**	9.92	**5.90**	6.81	**2.20**	4.09	**0.72**	2.84	**0.29**				
10,000			28.37	**77.00**	23.30	**46.70**	17.57	**23.40**	13.73	**12.20**	11.02	**7.22**	7.56	**2.92**	4.54	**0.87**	3.15	**0.35**				
12,000			34.00	**108.00**	27.95	**66.00**	21.08	**32.70**	16.48	**17.70**	13.22	**10.20**	9.07	**3.96**	5.45	**1.23**	3.78	**0.49**	2.78	**0.23**		
14,000					32.80	**87.50**	24.60	**43.30**	19.22	**23.60**	15.42	**13.50**	10.59	**4.51**	6.35	**1.63**	4.41	**0.66**	3.24	**0.31**		
15,000					34.95	**99.40**	26.35	**49.50**	20.60	**26.70**	16.52	**15.30**	11.34	**5.99**	7.26	**2.09**	4.73	**0.75**	3.47	**0.35**		
16,000					37.25	**112.00**	28.10	**55.40**	21.96	**30.20**	17.62	**17.40**	12.10	**6.76**	8.17	**2.61**	5.04	**0.85**	3.71	**0.39**		
18,000							31.60	**69.20**	24.70	**37.60**	19.83	**21.60**	13.60	**8.45**	9.08	**3.17**	5.67	**1.05**	4.17	**0.49**		
20,000							35.10	**84.80**	27.45	**45.60**	22.03	**26.40**	15.12	**10.30**	9.99	**3.79**	6.30	**1.28**	4.63	**0.60**	3.55	**0.31**
22,000							38.64	**100.00**	30.20	**54.00**	24.23	**31.20**	16.63	**12.20**	10.90	**4.46**	6.93	**1.53**	5.09	**0.71**	3.90	**0.37**
24,000									32.95	**63.80**	26.43	**36.80**	18.15	**14.30**	11.80	**5.17**	7.56	**1.80**	5.56	**0.84**	4.26	**0.43**
25,000									34.30	**69.00**	27.54	**39.60**	18.90	**15.40**	12.70	**5.92**	7.88	**1.94**	5.79	**0.90**	4.43	**0.46**
30,000									41.20	**96.20**	33.04	**55.50**	22.68	**21.60**	13.60	**6.73**	9.46	**2.73**	6.95	**1.27**	5..32	**0.65**
35,000									48.10	**129.00**	38.55	**74.20**	26.45	**28.80**	15.90	**9.00**	11.00	**3.61**	8.11	**1.69**	6.21	**0.87**
40,000											44.10	**95.30**	30.25	**37.00**	18.20	**11.57**	12.60	**4.65**	9.26	**2.16**	7.09	**1.11**
45,000											49.60	**119.00**	34.00	**45.90**	20.40	**14.30**	14.18	**5.79**	10.40	**2.68**	7.98	**1.39**
50,000													37.80	**56.00**	22.70	**17.44**	15.80	**7.08**	11.60	**3.29**	8.87	**1.69**
55,000													41.60	**66.80**	25.00	**20.87**	17.34	**8.42**	12.74	**3.91**	9.75	**2.01**
60,000													45.36	**78.20**	27.20	**24.42**	18.90	**9.88**	13.90	**4.60**	10.64	**2.37**
65,000															29.50	**28.40**	20.49	**11.48**	15.05	**5.33**	11.52	**2.75**
70,000															31.80	**32.66**	22.10	**13.21**	16.20	**6.12**	12.41	**3.15**
75,000															34.00	**36.98**	23.64	**14.98**	17.37	**6.96**	13.29	**3.58**
80,000															36.30	**41.77**	25.20	**16.87**	18.50	**7.83**	14.18	**4.04**
85,000															38.60	**46.83**	26.79	**18.90**	19.68	**8.78**	15.07	**4.52**
90,000															40.90	**52.15**	28.40	**21.07**	20.80	**9.74**	15.96	**5.03**
100,000															45.40	**63.32**	31.50	**25.55**	23.20	**11.93**	17.73	**6.12**
110,000																	34.70	**30.58**	25.50	**14.22**	19.50	**7.31**
120,000																	37.80	**35.86**	27.80	**16.70**	21.28	**8.60**
130,000																	41.00	**41.71**	30.10	**19.36**	23.05	**9.97**
140,000																	44.10	**47.77**	32.40	**22.20**	24.82	**11.45**
150,000																	47.30	**54.41**	34.70	**25.22**	26.60	**13.02**
160,000																	50.40	**61.23**	37.10	**28.56**	28.40	**14.68**
170,000																	53.60	**68.66**	39.40	**31.95**	30.10	**16.42**
180,000																	56.70	**76.23**	41.70	**35.50**	31.90	**18.26**
190,000																	84.43	**84.43**	44.00	**39.23**	33.70	**20.20**
200,000																	63.00	**92.73**	46.30	**43.13**	35.50	**22.27**
250,000																			57.90	**65.37**	44.30	**33.62**
300,000																			69.50	**91.81**	53.20	**47.26**
350,000																			81.10	**122.34**	62.10	**63.02**
400,000																			92.60	**156.56**	70.90	**80.63**
450,000																					79.80	**100.47**
500,000																					88.70	**122.30**
550,000																					97.50	**145.83**
600,000																					106.00	**170.36**

Flange Dimensions and End Details

All flanged Cla-Val valves are furnished faced and drilled unless otherwise specified. The dimensions and drilling of end flanges conform to standards of the American National Standards Institute.
The ANSI tables are provided here for your convenience. When ANSI standards call for 1/16" raised face, this face is included in the dimensions for the thickness of flange. All dimensions are shown in inches.

Ductile Iron Valves* Class 150 and 300 (ANSI B16.42 — 1987)

Nominal Pipe Size	Diameter of Flange		Thickness of Flange		Diameter of Raised Face		Diameter of Bolt Circle		Number of Bolts		Diameter of Bolts		Diameter of Bolt Holes	
Pressure Class	150	300	150	300	150	300	150	300	150	300	150	300	150	300
1.5	5.00	6.12	.56	.81	2.88	2.88	3.88	4.50	4	4	.50	.75	.62	.88
2	6.00	6.50	.62	.88	3.62	3.62	4.75	5.00	4	8	.63	.63	.75	.75
2.5	7.00	7.50	.69	1.00	4.12	4.12	5.50	5.88	4	8	.63	.75	.75	.88
3	7.50	8.25	.75	1.12	5.00	5.00	6.00	6.62	4	8	.63	.75	.75	.88
4	9.00	10.00	.94	1.25	6.19	6.19	7.50	7.88	8	8	.63	.75	.75	.88
6	11.00	12.50	1.00	1.44	8.50	8.50	9.50	10.62	8	12	.75	.75	.88	.88
8	13.50	15.00	1.12	1.62	10.62	10.62	11.75	13.00	8	12	.75	.88	.88	1.00
10	16.00	17.50	1.19	1.88	12.75	12.75	14.25	15.25	12	16	.88	1.00	1.00	1.12
12	19.00	20.50	1.25	2.00	15.00	15.00	17.00	17.75	12	16	.88	1.12	1.00	1.25
14	21.00	23.00	1.38	2.12	16.25	16.25	18.75	20.25	12	20	1.00	1.12	1.12	1.25
16	23.50	25.50	1.44	2.25	18.50	18.50	21.25	22.50	16	20	1.00	1.25	1.12	1.38
18	25.00	—	1.56	—	—	—	22.75	—	16	—	1.12	—	1.25	—
20	27.50	30.50	1.69	2.50	23.00	23.00	25.00	27.00	20	24	1.13	1.25	1.25	1.38
24	32.00	36.00	1.88	2.75	27.25	27.25	29.50	32.00	20	24	1.25	1.50	1.38	1.62
30	38.75	43.00	2.12	3.00	—	37.19	36.00	39.25	28	28	1.25	1.75	1.38	2.00
36	46.00	50.00	2.38	3.38	—	42.69	42.75	46.00	32	32	1.50	2.00	1.62	2.25

Cast Iron Valves* Class 125 and 250 (ANSI B16.1 — 1989)

Nominal Pipe Size	Diameter of Flange		Thickness of Flange		Diameter of Raised Face		Diameter of Bolt Circle		Number of Bolts		Diameter of Bolts		Diameter of Bolt Holes	
Pressure Class	125	250	125	250	125	250	125	250	125	250	125	250	125	250
1.5	5.00	6.12	.56	.81	—	2.88	3.88	4.50	4	4	.50	.75	.62	.88
2	6.00	6.50	.62	.88	—	3.62	4.75	5.00	4	8	.63	.63	.75	.75
2.5	7.00	7.50	.69	1.00	—	4.12	5.50	5.88	4	8	.63	.75	.75	.88
3	7.50	8.25	.75	1.12	—	5.00	6.00	6.62	4	8	.63	.75	.75	.88
4	9.00	10.00	.94	1.25	—	6.19	7.50	7.88	8	8	.63	.75	.75	.88
6	11.00	12.50	1.00	1.44	—	8.50	9.50	10.62	8	12	.75	.75	.88	.88
8	13.50	15.00	1.12	1.62	—	10.62	11.75	13.00	8	12	.75	.88	.88	.1.00
10	16.00	17.50	1.19	1.88	—	12.75	14.25	15.25	12	16	.88	1.00	1.00	1.12
12	19.00	20.50	1.25	2.00	—	15.00	17.00	17.75	12	16	.88	1.12	1.00	1.25
14	21.00	23.00	1.38	2.12	—	16.25	18.75	20.25	12	20	1.00	1.12	1.12	1.25
16	23.50	25.50	1.44	2.25	—	18.50	21.25	22.50	16	20	1.00	1.25	1.12	1.38
18	25.00	—	1.56	—	—	—	22.75	—	16	—	1.12	—	1.25	—
20	27.50	30.50	1.69	2.50	—	23.00	25.00	27.00	20	24	1.13	1.25	1.25	1.38
24	32.00	36.00	1.88	2.75	—	27.25	29.50	32.00	20	24	1.25	1.50	1.38	1.62

Bronze Valves* Class 150 and 300 (ANSI 16.24 — 1979)

Nominal Pipe Size	Diameter of Flange		Thickness of Flange		Diameter of Raised Face		Diameter of Bolt Circle		Number of Bolts		Diameter of Bolts		Diameter of Bolt Holes	
Pressure Class	150	300	150	300	150	300	150	300	150	300	150	300	150	300
1.5	5.00	6.12	.44	.69	—	—	3.88	4.50	4	4	.50	.75	.62	.88
2	6.00	6.50	.50	.75	—	—	4.75	5.00	4	8	.63	.63	.75	.75
2.5	7.00	7.50	.56	.81	—	—	5.50	5.88	4	8	.63	.75	.75	.88
3	7.50	8.25	.62	.91	—	—	6.00	6.62	4	8	.63	.75	.75	.88
4	9.00	10.00	.69	1.06	—	—	7.50	7.88	8	8	.63	.75	.75	.88
6	11.00	12.50	.81	1.19	—	—	9.50	10.62	8	12	.75	.75	.88	.88
8	13.50	15.00	.94	1.38	—	—	11.75	13.00	8	12	.75	.88	.88	.1.00
10	16.00	—	1.00	—	—	—	14.25	—	12	—	.88	—	1.00	—
12	19.00	—	1.06	—	—	—	17.00	—	12	—	.88	—	1.00	—

Cast Steel Valves* Class 150 and 300 (ANSI 16.5 — 1988)

Nominal Pipe Size	Diameter of Flange		Thickness of Flange		Diameter of Raised Face		Diameter of Bolt Circle		Number of Bolts		Diameter of Bolts		Diameter of Bolt Holes	
Pressure Class	150	300	150	300	150	300	150	300	150	300	150	300	150	300
1.5	5.00	6.12	.56	.81	2.88	2.88	3.88	4.50	4	4	.50	.75	.62	.88
2	6.00	6.50	.62	.88	3.63	3.63	4.75	5.00	4	8	.63	.63	.75	.75
2.5	7.00	7.50	.69	1.00	4.13	4.13	5.50	5.88	4	8	.63	.75	.75	.88
3	7.50	8.25	.75	1.12	5.00	5.00	6.00	6.62	4	8	.63	.75	.75	.88
4	9.00	10.00	.94	1.25	6.19	6.19	7.50	7.88	8	8	.63	.75	.75	.88
6	11.00	12.50	1.00	1.44	8.50	8.50	9.50	10.62	8	12	.75	.75	.88	.88
8	13.50	15.00	1.12	1.62	10.63	10.63	11.75	13.00	8	12	.75	.88	.88	.1.00
10	16.00	17.50	1.19	1.88	12.75	12.75	14.25	15.25	12	16	.88	1.00	1.00	1.12
12	19.00	20.50	1.25	2.00	15.00	15.00	17.00	17.75	12	16	.88	1.12	1.00	1.25
14	21.00	23.00	1.38	2.12	16.25	16.25	18.75	20.25	12	20	1.00	1.12	1.12	1.25
16	23.50	25.50	1.44	2.25	18.50	18.50	21.25	22.50	16	20	1.00	1.25	1.12	1.38
18	25.00	—	1.56	—	—	—	22.75	—	16	—	1.12	—	1.25	—
20	27.50	30.50	1.69	2.50	23.00	23.00	25.00	27.00	20	24	1.13	1.25	1.25	1.38
24	32.00	36.00	1.88	2.75	27.25	27.25	29.50	32.00	20	24	1.25	1.50	1.38	1.62

*Cla-Val valves can be furnished in aluminum.