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# Flow

The nomogram and tables that follow on page 4 provide a guide to friction losses that can be expected when using clean HDPE pressure pipes with clean water at 20°C. No account has been taken of any possible fittings in a line.

The flow charts given here, on pages 6-13, have each been calculated for a particular SDR and can therefore be applied to various pressure classes depending on the material designation and design stress. Only sizes covered by SABS ISO 4427 have been included in these charts. The table below gives the PN classes (pressure in bar) covered by each SDR.

SDR	PE100	PE80	PE63
33	----	4	3.2
26	6.3	----	4
21	8	6.3	----
17	10	8	6.3
13.6	12.5	10	8
11	16	12.5	10
9	20	16	12.5
7.4	----	20	16

# Nomogram

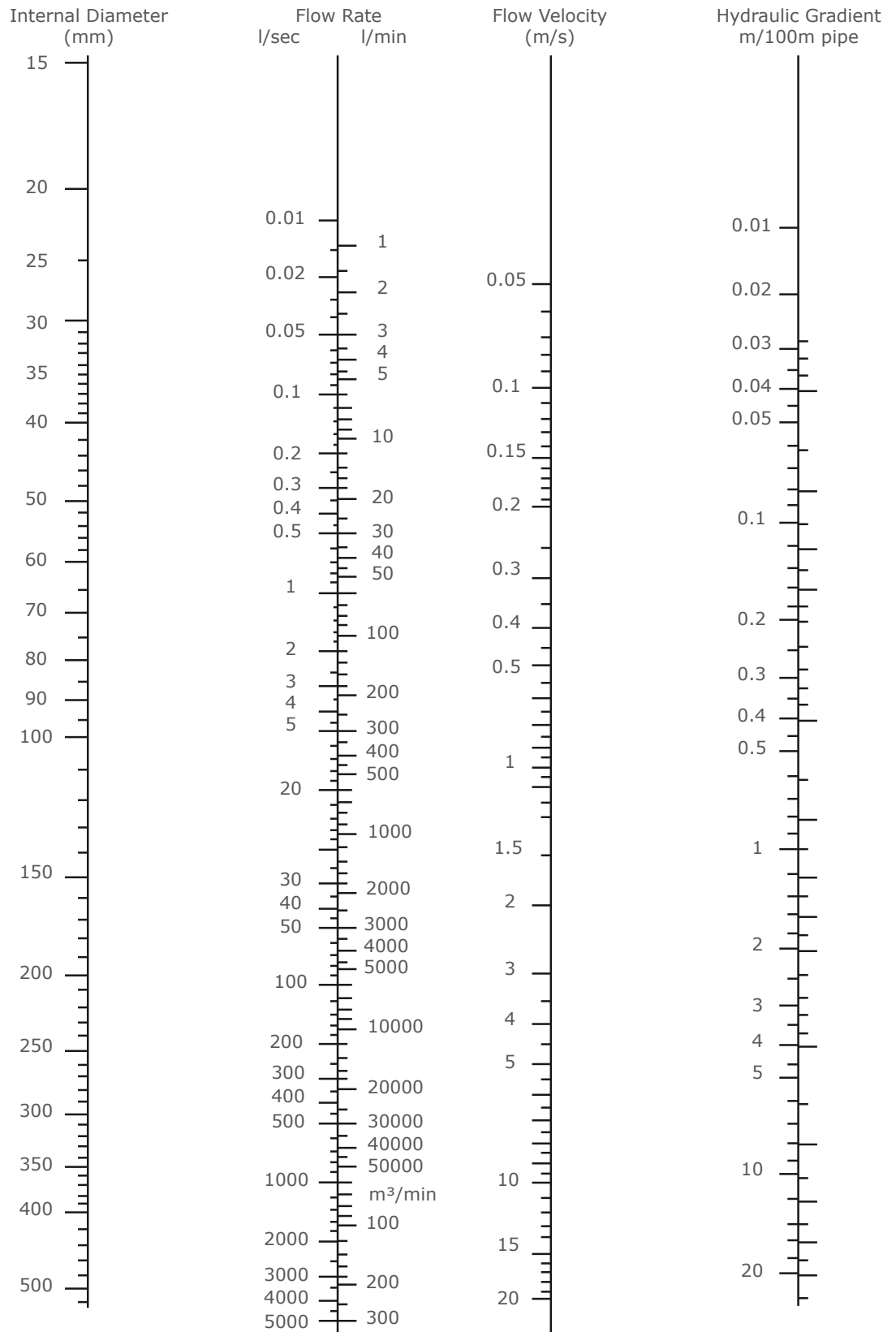


Diagram for water at 20°C

Approximate values only

Note: For sizes not covered by Nomogram, please contact Technical Support Department.

The nomogram is based on the Prandti - Coalbrook formula using a k factor of  $k = 0.007\text{mm}$ .

Factors applicable to other flow formulae are:

Hazen Williams  $c = 150$

Manning  $n = 0.010$

Darcy roughness factor  $= 0.007$

## Flow Charts

To interpret the information given in the following flow charts, follow the instructions below:

1. Choose the particular chart for the material designation (PE 100, PE 80, PE 63) and pressure class (PN 16, PN 10 etc.) of pipe being used.
2. In one of the first 3 columns find the nearest value of the quantity of water to be pumped. The three columns give the quantity of water in different units – GPH = Gallons per hour, m<sup>3</sup>/hr = cubic meters per hour, l/s = litres per second.
3. Run your eye along the horizontal line found in instruction 2 above until you get to numbers which are shaded light green. The number in the shaded block is the friction loss (expressed in meters per 100 meters) for the size of pipe given at the top of the particular column.
4. The reverse sequence can be used to determine the amount of water that can be put through a given pipe size (and the how much friction loss is created).

	Colour code	Velocity-m/s	Comments
	Unshaded numbers above the	< 0.5 but not < 0.3	too big
	Yellow	- 0.5 to 0.99	a smaller pipe may be more suitable
	Light Green	- 1.0 to 1.49	about right
	Dark Green	- 1.5 to 1.99	about right
	Tan	- 2.0 to 2.49	a bigger pipe may be more suitable
	Unshaded numbers below the	> 2.5 but not > 3.0.	too small



1. The colour coding represents the approximate velocity of the water in the size of pipe chosen.
2. If two or more size columns have the same colouring then there is a choice of suitable sizes each with its own friction loss value.
3. The range of velocities (metres per second) represented by the colours is as above

# SDR 33

Size (mm-O.D.)			315	355	400	450	500	560	630
Min W.T.			9.7	10.9	12.3	13.8	15.3	17.2	19.3
I.D.			295.6	333.2	375.4	422.4	469.4	525.6	591.4
G.P.H.	m3/hr	l/s							
396	1.8	0.5							
792	3.6	1							
1584	7.2	2							
2376	10.8	3							
3168	14.4	4							
3960	18	5							
4752	21.6	6							
5544	25.2	7							
6336	28.8	8							
7128	32.4	9							
7920	36	10							
9504	43.2	12							
11088	50.4	14							
12672	57.6	16							
14256	64.8	18							
15840	72	20							
17424	79.2	22	0.04						
19008	86.4	24	0.04						
20592	93.6	26	0.05	0.03					
22176	100.8	28	0.06	0.03					
23760	108	30	0.06	0.04					
25344	115.2	32	0.07	0.04					
26928	122.4	34	0.08	0.04	0.02				
28512	129.6	36	0.09	0.05	0.03				
30096	136.8	38	0.09	0.05	0.03				
31680	144	40	0.10	0.06	0.03				
35640	162	45	0.13	0.07	0.04	0.02			
39600	180	50	0.15	0.09	0.05	0.03			
43560	198	55	0.18	0.10	0.06	0.03	0.02		
47520	216	60	0.21	0.12	0.07	0.04	0.02		
51480	234	65	0.24	0.14	0.08	0.04	0.03	0.02	
55440	252	70	0.28	0.16	0.09	0.05	0.03	0.02	
59400	270	75	0.32	0.18	0.10	0.06	0.03	0.02	
63360	288	80	0.35	0.20	0.11	0.06	0.04	0.02	
71280	324	90	0.44	0.25	0.14	0.08	0.05	0.03	0.02
79200	360	100	0.52	0.30	0.17	0.10	0.06	0.03	0.02
87120	396	110	0.62	0.35	0.20	0.11	0.07	0.04	0.02
95040	432	120	0.72	0.41	0.23	0.13	0.08	0.05	0.03
102960	468	130	0.83	0.47	0.27	0.15	0.09	0.05	0.03
110880	504	140	0.95	0.54	0.30	0.17	0.10	0.06	0.03
118800	540	150	1.08	0.61	0.34	0.20	0.12	0.07	0.04
126720	576	160	1.21	0.68	0.39	0.22	0.13	0.08	0.04
134640	612	170	1.34	0.76	0.43	0.24	0.15	0.09	0.05
142560	648	180	1.48	0.84	0.47	0.27	0.16	0.10	0.05
150480	684	190	1.63	0.92	0.52	0.30	0.18	0.10	0.06
158400	720	200	1.79	1.01	0.57	0.33	0.20	0.11	0.07
166320	756	210		1.10	0.62	0.36	0.21	0.13	0.07
174240	792	220		1.20	0.68	0.39	0.23	0.14	0.08
182160	828	230		1.29	0.73	0.42	0.25	0.15	0.08
190080	864	240		1.40	0.79	0.45	0.27	0.16	0.09
198000	900	250		1.50	0.85	0.48	0.29	0.17	0.10
205920	936	260		1.61	0.91	0.52	0.31	0.18	0.10
213840	972	270			0.97	0.55	0.34	0.20	0.11
221760	1008	280			1.04	0.59	0.36	0.21	0.12
229680	1044	290			1.10	0.63	0.38	0.22	0.13
237600	1080	300			1.17	0.67	0.40	0.24	0.13
245520	1116	310			1.24	0.71	0.43	0.25	0.14
253440	1152	320			1.31	0.75	0.45	0.26	0.15
261360	1188	330			1.39	0.79	0.48	0.28	0.16
269280	1224	340				0.83	0.50	0.29	0.17
277200	1260	350				0.88	0.53	0.31	0.18
285120	1296	360				0.92	0.56	0.33	0.19
293040	1332	370				0.97	0.59	0.34	0.19
300960	1368	380				1.02	0.61	0.36	0.20
308880	1404	390				1.06	0.64	0.37	0.21
316800	1440	400				1.11	0.67	0.39	0.22
332640	1512	420				1.21	0.73	0.43	0.24
348480	1584	440					0.80	0.46	0.26
364320	1656	460					0.86	0.50	0.29
380160	1728	480					0.93	0.54	0.31
396000	1800	500					1.00	0.58	0.33
435600	1980	550						0.69	0.39
475200	2160	600						0.80	0.46
514800	2340	650						0.93	0.53
554400	2520	700							0.60
594000	2700	750							0.68
633600	2880	800							0.76

# SDR 26

Size (mm-O.D.)	50	63	75	90	110	125	140	160	200	250	315	355	400	450	500	560	630
Min W.T.	2	2.5	2.9	3.5	4.2	4.8	5.4	6.2	7.7	9.6	12.1	13.6	15.3	17.2	19.1	21.4	24.1
I.D.	46	58	69.2	83	101.6	115.4	129.2	147.6	184.6	230.8	290.8	327.8	369.4	415.6	461.8	517.2	581.8
G.P.H.	m <sup>3</sup> /hr	l/s															
396	1.8	0.5	0.32														
792	3.6	1	1.08	0.36													
1584	7.2	2	3.69	1.22	0.53	0.22											
2376	10.8	3	7.56	2.50	1.08	0.45	0.17										
3168	14.4	4	12.57	4.16	1.79	0.75	0.29	0.16	0.09								
3960	18	5	18.66	6.18	2.66	1.12	0.43	0.23	0.14								
4752	21.6	6	8.53	3.67	1.54	0.59	0.32	0.19	0.10								
5544	25.2	7	11.20	4.83	2.03	0.77	0.42	0.25	0.13								
6336	28.8	8		6.11	2.57	0.98	0.53	0.31	0.16	0.06							
7128	32.4	9		7.53	3.16	1.21	0.66	0.38	0.20	0.07							
7920	36	10		9.07	3.81	1.45	0.79	0.46	0.24	0.08							
9504	43.2	12			5.26	2.01	1.09	0.64	0.34	0.12							
11088	50.4	14			6.91	2.64	1.44	0.84	0.44	0.15	0.05						
12672	57.6	16			8.76	3.34	1.82	1.06	0.56	0.19	0.07						
14256	64.8	18				4.11	2.24	1.31	0.69	0.24	0.08						
15840	72	20				4.96	2.70	1.57	0.83	0.29	0.10	0.03					
17424	79.2	22				5.87	3.20	1.86	0.99	0.34	0.12	0.04					
19008	86.4	24				6.84	3.73	2.17	1.15	0.40	0.14	0.05					
20592	93.6	26					4.29	2.51	1.33	0.46	0.16	0.05	0.03				
22176	100.8	28					4.90	2.86	1.51	0.52	0.18	0.06	0.03				
23760	108	30					5.53	3.23	1.71	0.59	0.20	0.07	0.04				
25344	115.2	32						3.62	1.92	0.66	0.23	0.08	0.04	0.02			
26928	122.4	34						4.03	2.13	0.73	0.25	0.08	0.05	0.03			
28512	129.6	36						4.46	2.36	0.81	0.28	0.09	0.05	0.03			
30096	136.8	38						4.90	2.60	0.89	0.31	0.10	0.06	0.03			
31680	144	40							2.85	0.98	0.34	0.11	0.06	0.04			
35640	162	45							3.51	1.21	0.42	0.14	0.08	0.04	0.03		
39600	180	50							4.22	1.45	0.50	0.17	0.09	0.05	0.03	0.02	
43560	198	55								1.72	0.59	0.20	0.11	0.06	0.04	0.02	
47520	216	60								2.01	0.69	0.23	0.13	0.07	0.04	0.03	
51480	234	65								2.31	0.80	0.26	0.15	0.08	0.05	0.03	0.02
55440	252	70								2.64	0.91	0.30	0.17	0.10	0.05	0.03	0.02
59400	270	75								2.98	1.03	0.34	0.19	0.11	0.06	0.04	0.02
63360	288	80								3.34	1.15	0.38	0.22	0.12	0.07	0.04	0.02
71280	324	90									1.42	0.47	0.27	0.15	0.09	0.05	0.03
79200	360	100									1.71	0.57	0.32	0.18	0.10	0.06	0.04
87120	396	110									2.02	0.67	0.38	0.21	0.12	0.07	0.04
95040	432	120									2.36	0.78	0.44	0.25	0.14	0.09	0.05
102960	468	130										0.90	0.51	0.29	0.16	0.10	0.06
110880	504	140										1.03	0.58	0.33	0.19	0.11	0.07
118800	540	150										1.16	0.66	0.37	0.21	0.13	0.07
126720	576	160										1.30	0.74	0.42	0.24	0.14	0.08
134640	612	170										1.45	0.82	0.46	0.26	0.16	0.09
142560	648	180										1.61	0.91	0.51	0.29	0.18	0.10
150480	684	190										1.77	1.00	0.56	0.32	0.19	0.11
158400	720	200											1.09	0.62	0.35	0.21	0.12
166320	756	210											1.19	0.67	0.38	0.23	0.14
174240	792	220											1.29	0.73	0.42	0.25	0.15
182160	828	230											1.40	0.79	0.45	0.27	0.16
190080	864	240											1.51	0.85	0.49	0.29	0.17
198000	900	250											1.62	0.92	0.52	0.32	0.18
205920	936	260												0.98	0.56	0.34	0.20
213840	972	270												1.05	0.60	0.36	0.21
221760	1008	280												1.12	0.64	0.39	0.23
229680	1044	290												1.19	0.68	0.41	0.24
237600	1080	300												1.27	0.72	0.44	0.25
245520	1116	310												1.34	0.77	0.46	0.27
253440	1152	320												1.42	0.81	0.49	0.29
261360	1188	330													0.85	0.52	0.30
269280	1224	340													0.90	0.55	0.32
277200	1260	350													0.95	0.57	0.33
285120	1296	360													1.00	0.60	0.35
293040	1332	370													1.05	0.63	0.37
300960	1368	380													1.10	0.66	0.39
308880	1404	390													1.15	0.69	0.40
316800	1440	400													1.20	0.73	0.42
332640	1512	420														0.79	0.46
348480	1584	440														0.86	0.50
364320	1656	460														0.93	0.54
380160	1728	480														1.00	0.58
396000	1800	500														1.08	0.63
435600	1980	550															0.74
475200	2160	600														0.87	0.49
514800	2340	650															0.57
554400	2520	700															0.65
594000	2700	750															0.73
633600	2880	800															

# SDR 21

Size (mm-O.D.)	40	50	63	75	90	110	125	140	160	200	250	315	355	400	450	500	560	630
Min W.T.	2	2.4	3	3.8	4.3	5.3	6	6.7	7.7	9.6	11.9	15	16.9	19.1	21.5	23.9	26.7	30
I.D.	36	45.2	57	67.4	81.4	99.4	113	126.6	144.6	180.8	226.2	285	321.2	361.8	407	452.2	506.6	570
G.P.H.	m <sup>3</sup> /hr	l/s																
79.2	0.36	0.1																
158.4	0.72	0.2																
237.6	1.08	0.3																
316.8	1.44	0.4	0.69															
396	1.8	0.5	1.02	0.34														
475.2	2.16	0.6	1.41	0.48														
554.4	2.52	0.7	1.85	0.63														
633.6	2.88	0.8	2.34	0.79	0.26													
712.8	3.24	0.9	2.89	0.98	0.32													
792	3.6	1	3.48	1.18	0.39													
1584	7.2	2	11.87	4.01	1.33	0.60	0.24											
2376	10.8	3	24.33	8.22	2.72	1.22	0.50	0.19	0.10									
3168	14.4	4		13.67	4.52	2.03	0.83	0.32	0.17	0.10								
3960	18	5			6.71	3.02	1.23	0.47	0.26	0.15	0.08							
4752	21.6	6			9.27	4.17	1.69	0.65	0.35	0.21	0.11							
5544	25.2	7			12.17	5.47	2.22	0.86	0.47	0.27	0.14							
6336	28.8	8				6.93	2.82	1.09	0.59	0.34	0.18	0.06						
7128	32.4	9				8.54	3.47	1.34	0.73	0.42	0.22	0.08						
7920	36	10				10.29	4.18	1.61	0.87	0.51	0.27	0.09						
9504	43.2	12					5.78	2.23	1.21	0.70	0.37	0.13	0.04					
11088	50.4	14					7.59	2.93	1.59	0.92	0.49	0.17	0.06					
12672	57.6	16						3.71	2.01	1.17	0.62	0.21	0.07					
14256	64.8	18						4.56	2.48	1.44	0.76	0.26	0.09					
15840	72	20						5.50	2.98	1.74	0.92	0.32	0.11	0.04				
17424	79.2	22						6.51	3.53	2.05	1.09	0.38	0.13	0.04				
19008	86.4	24							4.12	2.40	1.27	0.44	0.15	0.05	0.03			
20592	93.6	26							4.75	2.76	1.46	0.50	0.17	0.06	0.03			
22176	100.8	28							5.41	3.15	1.67	0.58	0.20	0.07	0.04			
23760	108	30							6.12	3.56	1.89	0.65	0.22	0.07	0.04			
25344	115.2	32								3.99	2.11	0.73	0.25	0.08	0.05	0.03		
26928	122.4	34								4.44	2.35	0.81	0.28	0.09	0.05	0.03		
28512	129.6	36								4.91	2.60	0.90	0.31	0.10	0.06	0.03		
30096	136.8	38									2.87	0.99	0.34	0.11	0.06	0.04		
31680	144	40									3.14	1.08	0.37	0.12	0.07	0.04	0.02	
35640	162	45									3.87	1.33	0.46	0.15	0.09	0.05	0.03	
39600	180	50										1.61	0.55	0.18	0.10	0.06	0.03	0.02
43560	198	55										1.90	0.65	0.22	0.12	0.07	0.04	0.02
47520	216	60										2.22	0.76	0.25	0.14	0.08	0.05	0.03
51480	234	65										2.55	0.88	0.29	0.16	0.09	0.05	0.03
55440	252	70										2.91	1.00	0.33	0.19	0.11	0.06	0.04
59400	270	75										3.29	1.13	0.38	0.21	0.12	0.07	0.04
63360	288	80											1.27	0.42	0.24	0.13	0.08	0.05
71280	324	90											1.56	0.52	0.29	0.17	0.09	0.06
79200	360	100											1.88	0.62	0.35	0.20	0.11	0.07
87120	396	110											2.23	0.74	0.42	0.24	0.14	0.08
95040	432	120											2.60	0.86	0.49	0.28	0.16	0.10
102960	468	130												0.99	0.56	0.32	0.18	0.11
110880	504	140												1.13	0.64	0.36	0.21	0.13
118800	540	150												1.28	0.72	0.41	0.23	0.14
126720	576	160												1.43	0.81	0.46	0.26	0.16
134640	612	170												1.60	0.90	0.51	0.29	0.18
142560	648	180												1.77	1.00	0.57	0.32	0.20
150480	684	190												1.95	1.10	0.62	0.36	0.22
158400	720	200													1.20	0.68	0.39	0.24
166320	756	210													1.31	0.74	0.42	0.26
174240	792	220													1.43	0.81	0.46	0.28
182160	828	230													1.54	0.87	0.50	0.30
190080	864	240													1.66	0.94	0.54	0.33
198000	900	250														1.01	0.58	0.35
205920	936	260														1.09	0.62	0.37
213840	972	270														1.16	0.66	0.40
221760	1008	280														1.24	0.71	0.43
229680	1044	290														1.32	0.75	0.45
237600	1080	300														1.40	0.80	0.48
245520	1116	310															0.85	0.51
253440	1152	320																0.51
261360	1188	330																0.54
269280	1224	340																0.57
277200	1260	350																0.60
285120	1296	360																0.63
293040	1332	370																0.67
300960	1368	380																0.70
308880	1404	390																0.73
316800	1440	400																0.77
332640	1512	420																0.80
348480	1584	440																0.84
364320	1656	460																0.88
380160	1728	480																0.91
396000	1800	500																0.95
435600	1980	550																1.03
475200	2160	600																1.11
514800	2340	650																1.16
554400	2520	700																1.21
594000	2700	750																1.27
633600	2880	800																1.32



# SDR17

Size (mm-O.D.)	32	40	50	63	75	90	110	125	140	160	200	250	315	355	400	450	500	560	630
W.T.	2	2.4	3	3.8	4.5	5.4	6.6	7.4	8.3	9.5	11.9	14.8	18.7	21.1	23.7	26.7	29.7	33.2	37.4
I.D.	28	35.2	44	55.4	66	79.2	96.8	110.2	123.4	141	176.2	220.4	277.6	312.8	352.6	396.6	440.6	493.6	555.2
G.P.H.	m3/hr	l/s																	
79.2	0.36	0.1																	
158.4	0.72	0.2	0.67																
237.6	1.08	0.3	1.37	0.46															
316.8	1.44	0.4	2.28	0.77															
396	1.8	0.5	3.38	1.14	0.39														
475.2	2.16	0.6	4.67	1.57	0.54														
554.4	2.52	0.7	6.14	2.06	0.71														
633.6	2.88	0.8	7.77	2.61	0.90	0.30													
712.8	3.24	0.9	9.58	3.21	1.11	0.37													
792	3.6	1	11.54	3.87	1.34	0.45													
1584	7.2	2		13.21	4.56	1.52	0.66	0.28											
2376	10.8	3			9.34	3.11	1.35	0.57	0.22	0.12									
3168	14.4	4		15.54	5.18	2.25	0.94	0.36	0.19	0.11									
3960	18	5			7.69	3.33	1.40	0.54	0.29	0.17	0.09								
4752	21.6	6			10.62	4.61	1.93	0.74	0.40	0.23	0.12								
5544	25.2	7			13.95	6.05	2.54	0.97	0.52	0.31	0.16								
6336	28.8	8				7.66	3.21	1.23	0.66	0.39	0.21	0.07							
7128	32.4	9				9.44	3.96	1.52	0.82	0.48	0.25	0.09							
7920	36	10				11.37	4.77	1.83	0.99	0.57	0.30	0.11							
9504	43.2	12					6.58	2.53	1.36	0.79	0.42	0.15	0.05						
11088	50.4	14					8.65	3.32	1.79	1.04	0.55	0.19	0.07						
12672	57.6	16						4.21	2.27	1.32	0.70	0.24	0.08						
14256	64.8	18						5.18	2.79	1.63	0.86	0.30	0.10	0.03					
15840	72	20						6.24	3.36	1.96	1.04	0.36	0.12	0.04					
17424	79.2	22						7.39	3.98	2.32	1.23	0.42	0.15	0.05					
19008	86.4	24							4.64	2.71	1.43	0.50	0.17	0.06	0.03				
20592	93.6	26							5.35	3.12	1.65	0.57	0.20	0.07	0.04				
22176	100.8	28							6.10	3.56	1.88	0.65	0.22	0.07	0.04				
23760	108	30								4.02	2.13	0.73	0.25	0.08	0.05	0.03			
25344	115.2	32								4.50	2.38	0.82	0.28	0.09	0.05	0.03			
26928	122.4	34								5.02	2.66	0.92	0.32	0.10	0.06	0.03			
28512	129.6	36									2.94	1.01	0.35	0.12	0.07	0.04			
30096	136.8	38									3.23	1.12	0.38	0.13	0.07	0.04	0.02		
31680	144	40									3.54	1.22	0.42	0.14	0.08	0.04	0.03		
35640	162	45									4.36	1.51	0.52	0.17	0.10	0.06	0.03		
39600	180	50										1.81	0.62	0.21	0.12	0.07	0.04	0.02	
43560	198	55										2.15	0.74	0.25	0.14	0.08	0.04	0.03	
47520	216	60										2.51	0.86	0.29	0.16	0.09	0.05	0.03	0.02
51480	234	65										2.89	0.99	0.33	0.19	0.11	0.06	0.04	0.02
55440	252	70										3.29	1.13	0.38	0.21	0.12	0.07	0.04	0.02
59400	270	75											1.28	0.43	0.24	0.14	0.08	0.05	0.03
63360	288	80											1.43	0.48	0.27	0.15	0.09	0.05	0.03
71280	324	90											1.77	0.59	0.33	0.19	0.11	0.06	0.04
79200	360	100											2.13	0.71	0.40	0.23	0.13	0.08	0.05
87120	396	110											2.52	0.84	0.47	0.27	0.15	0.09	0.05
95040	432	120												0.98	0.55	0.31	0.18	0.11	0.06
102960	468	130												1.13	0.64	0.36	0.21	0.12	0.07
110880	504	140												1.28	0.73	0.41	0.23	0.14	0.08
118800	540	150												1.45	0.82	0.46	0.26	0.16	0.09
126720	576	160												1.63	0.92	0.52	0.30	0.18	0.10
134640	612	170												1.81	1.02	0.58	0.33	0.20	0.12
142560	648	180												2.00	1.13	0.64	0.37	0.22	0.13
150480	684	190													1.25	0.70	0.40	0.24	0.14
158400	720	200													1.37	0.77	0.44	0.27	0.16
166320	756	210													1.49	0.84	0.48	0.29	0.17
174240	792	220													1.62	0.91	0.52	0.32	0.18
182160	828	230													1.75	0.99	0.56	0.34	0.20
190080	864	240														1.07	0.61	0.37	0.21
198000	900	250														1.15	0.65	0.40	0.23
205920	936	260														1.23	0.70	0.42	0.25
213840	972	270														1.31	0.75	0.45	0.26
221760	1008	280														1.40	0.80	0.48	0.28
229680	1044	290														1.49	0.85	0.51	0.30
237600	1080	300															0.90	0.55	0.32
245520	1116	310															0.96	0.58	0.34
253440	1152	320															1.01	0.61	0.36
261360	1188	330															1.07	0.65	0.38
269280	1224	340															1.13	0.68	0.40
277200	1260	350															1.19	0.72	0.42
285120	1296	360															1.25	0.75	0.44
293040	1332	370															1.31	0.79	0.46
300960	1368	380																0.83	0.48
308880	1404	390																0.87	0.51
316800	1440	400																0.91	0.53
332640	1512	420																0.99	0.58
348480	1584	440																1.08	0.63
364320	1656	460																	0.68
380160	1728	480																	0.73
396000	1800	500																	0.79
435600	1980	550																	0.93
475200	2160	600																	0.62
514800	2340	650																	0.71
554400	2520	700																	0.81





























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