

HYDRAULIC SYSTEM DESIGN REPORT		
PIPE TABLE LILLO 3 OF 3 PUMPS RUNNING 600 M3/H @ 12 BAR	VOPAK TEMINAL EUROPOORT	SCENARIO 045
	ONDERGRONSE BLUSHATERNET	CAP 33.500 DM3/MIN @ 10.6 BAR
Designed By JAAP SCHUELER		AT A63 AT NODE 236
		IMPAIRMENT NONE

PROJECT NAME: VOPVTEUG 045

PROJECT NUMBER: 31.307

UNITS TABLE

Lengths and Elevations in Metres	Pipe Diameters in Millimetres
Flows in Litres per Minute	Pressures in Bars
Velocities in Metres per Second	Volumes in Litres

FITTING AND VALVE SYMBOLS

EF = 1 Standard 90° Elbow
HE = 1 45° Elbow
TF = 1 Turning Flow Tee Fitting
GV = 1 Gate Valve
E2 = 2 Standard 90° Elbows
E3 = 3 Standard 90° Elbows
H2 = 2 45° Elbow
H3 = 3 45° Elbow
H4 = 4 45° Elbow
H6 = 6 45° Elbow
H8 = 8 45° Elbow
H9 = 9 45° Elbow
G2 = 2 Gate Valve
G3 = 3 Gate Valve

WATER SUPPLIES AND PUMPS

Name	Entry Mode and Description	Static	Test Flow	Test Flow
SUPPLY	0	14.4 BARS	12 BARS ■ 30000 Litres	7.8 BARS ■ 45000 Litres

DESIGN SUMMARY REPORT

11.34 BARS Pressure Available at Primary Water Supply Flowing 33500 Litres/Min. 7.6 Metres/Sec. = Max. Velocity.
 11.34 BARS Pressure Required at Primary Water Supply.
 0. Litres/Min. is Required Additional Flow.

SYSTEM PIPES

SYSTEM CONFIGURATION		Pipe Length	EqLt. Ref.	Elev. Change	Pipe Dian.	H-W Coef.	Pres. Loss	Total Pres.	Pipe Flow	Vel.	Vel. Pres.	Normal Pres.	*In/Out Flow	Supplies & Br. Lines
SUPPLY>														
{2}>														
N_1														
{1}														
{2}														
i														
i														
i														
i														
i														
i														
{3}<														
N_2														
{3}>														
N_3														
{31}<														
N_58														
i														
N_1<														

SYSTEM CONFIGURATION		SYSTEM PIPES												
	Mode	Pipe Length	EqLt. Ref.	Elev. Change	Pipe Diam.	H-W Coef.	Pres. Loss	Total Pres.	Pipe Flow	Vel.	Vel. Pres.	Normal Pres.	*In/Out Flow	Supplies & Br. Lines
N_2>	(3)	13	#7		*300	140	.27	10.26	Loop					
(34)<	N_63	14	#9		*300	140	.38	9.89	↓ 24597.5	5.6	.16	10.11		
		15			*300	140		9.89	↓ 24597.5	5.6		9.89		
		16			*300	140		9.89	↑ 8902.47	2	.02	9.87		
(11)<	N_18	17			*300	140	-.026	9.91	↑ 8902.47	2	.02	9.89		
		18	#10		*300	140	-.043	9.96	↑ 4816.82	1.1	.01	9.91		
		19			*300	140		9.96	↑ 4816.82	1.1	.01	9.95		
(4)<	N_4	20	#11		*300	140	-.025	9.98	↑ 4816.82	1.1		9.98		
		21			*300	140		9.98	↑ 2044.42	.5		9.98		
		22	#12		*300	140	-.003	9.98	↑ 2044.42	.5		9.98		
		23	#13		*300	140	-.001	9.99	↑ 2044.42	.5		9.98		
		24			*300	140		9.99	↑ 2044.42	.5		9.98		
		25	#11		*300	140	-.005	9.99	↑ 2044.42	.5		9.99		
		26			*300	140		9.99	↑ 2044.42	.5		9.99		
		27	#14		*300	140	-.011	10	↑ 2044.42	.5		10		
		28			*300	140		10	↑ 2044.42	.5		10		
		29	#15		*300	140	-.002	10	↑ 2044.42	.5		10		
		30			*300	140		10	↑ 2044.42	.5		10		
(27)<	N_50	31	#15		*300	140	-.002	10.01	↑ 2044.42	.5		10.01		
		32			*300	140		10.01	↑ 1326.19	.3		10.01		
		33	#5		*300	140	-.001	10.01	↑ 1326.19	.3		10.01		
		34			*300	140		10.01	↑ 1326.19	.3		10.01		
		35	#16		*300	140		10.01	↑ 1326.19	.3		10.01		
		36			*300	140		10.01	↑ 1326.19	.3		10.01		
(28)<	N_52	37	#17		*300	140	-.004	10.01	↑ 1326.19	.3		10.01		
		38			*300	140		10.01	↑ 911.38	.2		10.01		
(30)<	N_56	39	#18		*300	140	-.003	10.02	↑ 911.38	.2		10.01		
		40			*250	140		10.02	↑ 590.91	.2		10.01		
		41	#19		*250	140		10.02	↑ 590.91	.2		10.02		
		42	#20		*250	140	-.002	10.02	↑ 590.91	.2		10.02		
(27)>	N_51	43			*250	140		10.02	↑ 590.91	.2		10.02		
		44			*250	140	-.002	10.02	↑ 1007.49	.3		10.02		
		45			*250	140		10.02	↑ 1007.49	.3		10.02		
(23)<	N_42	46	#21		*250	140	-.002	10.02	↑ 1007.49	.3		10.02		
		47			*250	140		10.02	↑ 909.72	.3		10.02		
(25)<	N_46	48	#22		*250	140	-.006	10.03	↑ 909.72	.3		10.03		
		49			*250	140		10.03	↑ 522.8	.2		10.03		
		50	#23		*250	140	-.003	10.03	↑ 522.8	.2		10.03		
		51			*250	140		10.03	↑ 522.8	.2		10.03		
		52	#24		*250	140		10.03	↑ 522.8	.2		10.03		
		53			*250	140		10.03	↑ 522.8	.2		10.03		
(23)>	N_43	54	#25		*250	140	-.002	10.03	↑ 522.8	.2		10.03		
		55			*250	140		10.03	↑ 1191.71	.4		10.03		
(22)<	N_40	56	#26		*250	140	-.004	10.04	↑ 1191.71	.4		10.04		
		57			*250	140		10.04	↑ 662.94	.2		10.04		
		58	#27		*250	140	-.005	10.04	↑ 662.94	.2		10.04		
		59			*250	140		10.04	↑ 662.94	.2		10.04		
(21)<	N_38	60	#19		*250	140		10.04	↑ 662.94	.2		10.04		
		61			*250	140		10.04	↑ 511.43	.2		10.04		
(33)<	N_61	62	#28		*250	140	-.004	10.05	↑ 511.43	.2		10.05		
		63			*250	140		10.05	↓ 132.04			10.05		
(32)<	N_59	64	#29		*250	140		10.05	↓ 132.04			10.05		
		65			*250	140		10.05	↓ 802.22	.3		10.05		
		66	#30		*250	140	.004	10.04	↓ 802.22	.3		10.04		
(21)>	N_39	67			*250	140		10.04	↓ 802.22	.3		10.04		
		68	#31		*250	140	.001	10.04	↓ 650.7	.2		10.04		
(22)>	N_41	69			*250	140		10.04	↓ 650.7	.2		10.04		
		70	#32		*250	140	-.004	10.05	↑ 730.78	.2		10.05		
		71			*250	140		10.05	↑ 730.78	.2		10.05		
		72			*250	140		10.05	↑ 730.78	.2		10.05		
(20)<	N_36	73	#33		*300	140	-.002	10.05	↑ 730.78	.2		10.05		
		74			*300	140		10.05	↑ 971.5	.2		10.05		
(13)<	N_22	75	#34		*300	140	-.004	10.05	↑ 971.5	.2		10.05		
		76			*300	140		10.05	↓ 360.47	.1		10.05		
		77	#35		*300	140		10.05	↓ 360.47	.1		10.05		
(16)<	N_28	78	#36		*300	140		10.05	↓ 360.47	.1		10.05		
		79			*300	140		10.05	↓ 580.48	.1		10.05		
(20)>	N_37	80	#37		*300	140		10.05	↓ 580.48	.1		10.05		
		81			*300	140		10.05	↑ 492.44	.1		10.05		
(15)<	N_26	82	#38		*300	140		10.05	↑ 492.44	.1		10.05		
		83			*300	140		10.05	↑ 320.89	.1		10.05		
(14)<	N_24	84	#39		*300	140		10.05	↑ 320.89	.1		10.05		
		85			*300	140		10.05	↑ 197.06			10.05		
		86	#40		*300	140		10.05	↑ 197.06			10.05		
		87	#41		*300	140		10.05	↑ 197.06			10.05		

(14)▶	N_25	88	260	#42	*300	140		10.05	↑ 197.06			10.05		
		89			*300	140		10.05	↑ 320.89	.1		10.05		
(15)▶	N_27	90	236	#43	*300	140		10.05	↑ 320.89	.1		10.05		
		91			*300	140		10.05	↑ 492.44	.1		10.05		
(16)▶	N_29	92	176	#44	*300	140		10.05	↑ 492.44	.1		10.05		
		93			*300	140		10.05	↑ 712.45	.2		10.05		
(17)▶	N_30	94	131	#45	*300	140	-.001	10.06	↑ 712.45	.2		10.06		
		95			*300	140		10.06	↑ 902.94	.2		10.06		
(18)▶	N_32	96	153	#46	*300	140	-.002	10.06	↑ 902.94	.2		10.06		
		97			*250	140		10.06	↑ 979.12	.3		10.06		
(19)▶	N_34	98	110	#47	*250	140	-.005	10.06	↑ 979.12	.3		10.06		
		99			*250	140		10.06	↑ 1222.72	.4		10.06		
		100	155	#48	*250	140	-.011	10.07	↑ 1222.72	.4		10.07		
{4}▶	N_5	101			*250	140		10.07	↑ 1222.72	.4		10.07		
{7}▶	N_10	102	282	#49	*250	140	-.033	10.11	↑ 1593.11	.5		10.1		
		103			*250	140		10.11	↑ 1987.66	.7		10.1		
		104	244	#50	*250	140	-.04	10.15	↑ 1987.66	.7		10.14		
		105	182	#51	*250	140	-.03	10.18	↑ 1987.66	.7		10.17		
		106			*250	140		10.18	↑ 1987.66	.7		10.17		
{6}▶	N_8	107	35	#52	*250	140	-.006	10.18	↑ 1987.66	.7	.01	10.17		
		108			*250	140		10.18	↑ 3666.48	1.2	.01	10.17		
		109	200	#23	*250	140	-.1	10.28	↑ 3666.48	1.2	.01	10.27		
		110			*250	140		10.28	↑ 3666.48	1.2	.01	10.27		
{5}▶	N_6	111	27	#53	*250	140	-.024	10.31	↑ 3666.48	1.2	.02	10.29		
		112			*300	140		10.31	↑ 8902.47	2	.02	10.29		
		113	112	#54	*300	140	-.15	10.46	↑ 8902.47	2	.02	10.44		
N_3<		114	83	#55	*300	140	-.094	10.55	↑ 8902.47	2		10.55		

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SYSTEM PIPES

SYSTEM CONFIGURATION		Pipe Length	EqLt. Ref.	Elev. Change	Pipe Diam.	H-W Coef.	Pres. Loss	Total Pres.	Pipe Flow	Vel.	Vel. Pres.	Normal Pres.	*In/Out Flow	Supplies & Br. Lines
Node														
N_4>	(4)								Loop					
(12)▶	N_20	115	176	#56	*250	140	-.063	10.04	↑ 2772.39	.9	.01	10.04		
{5}▶	N_7	116			*250	140		10.04	↑ 3180.82	1		10.04		
		117	170	#57	*250	140	-.01	10.05	↑ 1102.49	.4		10.05		
		118			*250	140		10.05	↑ 1102.49	.4		10.05		
(13)▶	N_23	119	169	#58	*250	140	-.011	10.06	↑ 1102.49	.4		10.06		
		120			*250	140		10.06	↑ 1924.19	.6		10.06		
{6}▶	N_9	121	8		*250	140	-.001	10.07	↑ 1924.19	.6		10.07		
		122			*250	140		10.07	↑ 998.98	.3		10.07		
{8}▶	N_12	123	157	#59	*250	140	-.007	10.07	↑ 998.98	.3		10.07		
		124			*250	140		10.07	↑ 370.39	.1		10.07		
N_5<		125	93	#60	*250	140		10.07	↑ 370.39	.1		10.07		
N_6>	(5)								Loop					
		126	225	#61	*250	140	.22	10.08	↓ 5235.99	1.7	.01	10.07		
(11)▶	N_19	127			*250	140		10.08	↓ 5235.99	1.7	.01	10.07		
		128	38		*250	140	.004	10.08	↓ 1558.76	.5		10.08		
{10}▶	N_16	129			*250	140		10.08	↓ 1558.76	.5		10.08		
N_7<		130	200	#23	*250	140	.035	10.04	↓ 2078.33	.7		10.04		
N_8>	(6)								Loop					
{7}▶		131	200	#62	*200	140	.074	10.11	↓ 1678.81	.9		10.1		
		132	43	#63	*200	140	.007	10.1	↓ 1110.33	.6		10.1		
(10)▶	N_17	133	83	#64	*200	140	.015	10.09	↓ 1110.33	.6		10.08		
		134			*200	140		10.09	↓ 590.77	.3		10.09		
{9}▶	N_14	135	144	#65	*200	140	.009	10.08	↓ 590.77	.3		10.08		
		136			*200	140		10.08	↓ 925.21	.5		10.08		
N_9<		137	95	#66	*200	140	.011	10.07	↓ 925.21	.5		10.07		
N_10>	(7)								Loop					
		138	124	#67	*200	140	.003	10.1	↓ 394.55	.2		10.1		
{8}▶	N_13	139			*200	140		10.1	↓ 394.55	.2		10.1		
		140	95	#66	*200	140	-.004	10.11	↑ 568.48	.3		10.11		
N_12>	(8)								Loop					
{9}▶	N_15	141	90	#68	*200	140	-.007	10.08	↑ 628.59	.3		10.08		
		142			*200	140		10.08	↑ 963.04	.5		10.08		
N_13<		143	160	#69	*200	140	-.024	10.1	↑ 963.04	.5		10.1		
N_14>	(9)								Loop					
		144	130	#70	*200	140	-.002	10.08	↑ 334.45	.2		10.08		
N_15<		145	27	#71	*200	140		10.08	↑ 334.45	.2		10.08		
N_16>	(10)								Loop					
		146	25	#72	*200	140	-.002	10.08	↑ 519.56	.3		10.08		
N_17<		147	135		*200	140	-.005	10.09	↑ 519.56	.3		10.09		
N_18>	(11)								Loop					
		148	35	#73	*250	140	-.029	9.94	↑ 4085.65	1.3	.01	9.93		
		149	157	#59	*250	140	-.096	10.04	↑ 4085.65	1.3	.01	10.03		
{12}▶	N_21	150			*250	140		10.04	↑ 4085.65	1.3	.01	10.03		
N_19<		151	79	#74	*250	140	-.044	10.08	↑ 3677.23	1.2		10.08		
N_20>	(12)								Loop					
		152	150	#75	*200	140	.004	10.04	↓ 408.42	.2		10.04		
N_21<		153	52	#76	*200	140	.001	10.04	↓ 408.42	.2		10.04		

N_22>	(13)	154	15	#7		*300	140	-.001	10.05	↑ 1331.98	.3		10.05		
(17)>	N_31	155				*300	140		10.05	↑ 1331.98	.3		10.05		
(18)>	N_33	156	153	#46		*300	140	-.004	10.06	↑ 1141.48	.3		10.06		
(19)>	N_35	157				*300	140		10.06	↑ 1141.48	.3		10.06		
		158	109	#77		*300	140	-.002	10.06	↑ 1065.3	.2		10.06		
		159				*250	140		10.06	↑ 1065.3	.3		10.06		
		160	68	#78		*250	140	-.002	10.06	↑ 821.7	.3		10.06		
		161				*250	140		10.06	↑ 821.7	.3		10.06		
N_23<		162	79	#79		*250	140	-.002	10.06	↑ 821.7	.3		10.06		
N_24>	(14)	163	100	#80		*200	140		10.05	↑ 123.83	.1		10.05		
N_25<		164	77	#81		*200	140		10.05	↑ 123.83	.1		10.05		
N_26>	(15)	165	124	#67		*200	140		10.05	↑ 171.55	.1		10.05		
		166	171			*200	140		10.05	↑ 171.55	.1		10.05		
N_27<		167	4	#82		*200	140		10.05	↑ 171.55	.1		10.05		
N_28>	(16)	168	200	#62		*200	140	-.002	10.05	↑ 220.01	.1		10.05		
N_29<		169	29	#83		*200	140		10.05	↑ 220.01	.1		10.05		
N_30>	(17)	170	200	#62		*200	140	.001	10.05	↓ 190.49	.1		10.05		
N_31<		171	43	#63		*200	140		10.05	↓ 190.49	.1		10.05		
N_32>	(18)	172	200	#62		*200	140		10.06	↓ 76.18			10.06		
N_33<		173	63	#84		*200	140		10.06	↓ 76.18			10.06		

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SYSTEM PIPES

SYSTEM CONFIGURATION		Pipe Length	EqLt. Ref.	Elev. Change	Pipe Dian.	H-H Coef.	Pres. Loss	Total Pres.	Pipe Flow	Vel.	Vel. Pres.	Normal Pres.	*In/Out Flow	Supplies & Br. Lines
N_34>	(19)	Node							Loop					
		174	180	#85		*200	140	.002	10.06	↓ 243.6	.1		10.06	
N_35<		175	95	#66		*200	140		10.06	↓ 243.6	.1		10.06	
N_36>	(20)	176	130	#86		*350	140		10.05	↓ 240.72			10.05	
(32)>	N_60	177				*350	140		10.05	↑ 429.45	.1		10.05	
		178	172	#87		*350	140		10.05	↑ 429.45	.1		10.05	
(33)>	N_62	179				*350	140		10.05	↑ 429.45	.1		10.05	
N_37<		180	168	#88		*350	140	-.002	10.05	↑ 1072.92	.2		10.05	
N_38>	(21)	181	161	#89		*250	140		10.04	↑ 151.51			10.04	
		182	100			*250	140		10.04	↑ 151.51			10.04	
N_39<	(22)	183	70	#90		*250	140	-.001	10.04	↑ 528.77	.2		10.04	
N_40>		184				*250	140		10.04	↑ 528.77	.2		10.04	
(24)>	N_44	185	42	#91		*250	140	-.004	10.04	↑ 1381.48	.5		10.04	
N_41<	(23)	186	182	#92		*250	140		10.02	↑ 97.76			10.02	
N_42>		187				*250	140		10.02	↑ 626.34	.2		10.02	
(26)>	N_48	188	104	#93		*250	140	-.003	10.02	↑ 626.34	.2		10.02	
		189				*250	140		10.02	↑ 626.34	.2		10.02	
(26)>	N_49	190	35	#52		*250	140	-.002	10.03	↑ 1134.7	.4		10.03	
		191				*250	140		10.03	↑ 1134.7	.4		10.03	
(24)>	N_45	192	56	#94		*250	140	-.003	10.03	↑ 1134.7	.4		10.03	
		193				*250	140		10.03	↑ 281.98	.1		10.03	
(25)>	N_47	194	4			*250	140		10.03	↑ 281.98	.1		10.03	
		195				*250	140		10.03	↑ 281.98	.1		10.03	
		196	106	#95		*250	140	-.002	10.03	↑ 668.91	.2		10.03	
		197	68	#78		*250	140	-.001	10.03	↑ 668.91	.2		10.03	
N_44>	(24)	198	70	#90		*250	140	.003	10.04	↓ 852.72	.3		10.04	
		199				*250	140		10.04	↓ 852.72	.3		10.04	
N_45<		200	152	#96		*250	140	.006	10.03	↓ 852.72	.3		10.03	
N_46>	(25)	201	72	#97		*250	140		10.03	↑ 386.93	.1		10.03	
N_47<		202	142	#98		*250	140	-.001	10.03	↑ 386.93	.1		10.03	
N_48>	(26)	203	46	#99		*250	140		10.02	↓ 528.58	.2		10.02	
(29)>	N_54	204				*250	140		10.02	↑ 508.36	.2		10.02	
		205	95	#100		*250	140	-.001	10.02	↑ 508.36	.2		10.02	
		206				*250	140		10.02	↑ 508.36	.2		10.02	
		207	116	#101		*250	140	-.002	10.02	↑ 508.36	.2		10.02	
N_49<		208	22	#102		*250	140		10.02	↑ 508.36	.2		10.02	
N_50>	(27)	209	152	#103		*250	140	-.004	10.01	↑ 718.24	.2		10.01	
		210	36	#19		*250	140		10.01	↑ 718.24	.2		10.01	
		211	38	#24		*250	140		10.01	↑ 718.24	.2		10.01	
		212	39			*250	140		10.01	↑ 718.24	.2		10.01	

(28)▶	N_53	213	35	#52		*250	140		10.01	↑ 718.24	.2		10.01		
		214				*250	140		10.01	↑ 718.24	.2		10.01		
		215	35	#52		*250	140	-.002	10.02	↑ 1133.05	.4		10.02		
(29)▶	N_55	216				*250	140		10.02	↑ 1133.05	.4		10.02		
		217	110	#47		*250	140		10.02	↑ 96.11			10.02		
(30)▶	N_57	218				*250	140		10.02	↑ 96.11			10.02		
		219	54	#104		*250	140		10.02	↑ 416.58	.1		10.02		
		220				*250	140		10.02	↑ 416.58	.1		10.02		
		221	45	#105		*250	140		10.02	↑ 416.58	.1		10.02		
N_51<		222	45	#106		*250	140		10.02	↑ 416.58	.1		10.02		
N_52<	(28)									Loop					
		223	104	#30		*250	140	-.001	10.01	↑ 414.81	.1		10.01		
N_53<		224	68	#78		*250	140		10.01	↑ 414.81	.1		10.01		
N_54<	(29)									Loop					
		225	20	#107		*250	140	.002	10.02	↓ 1036.94	.3		10.02		
N_55<		226	71			*250	140	.003	10.02	↓ 1036.94	.3		10.02		
N_56<	(30)									Loop					
		227	161	#89		*250	140		10.02	↑ 320.46	.1		10.02		
N_57<		228	12	#108		*250	140		10.02	↑ 320.46	.1		10.02		
N_58<	(31)									Main					
		229	28	#109		*300	140		10.84				10.84		
		230	65	#36		*300	140		10.84				10.84		
		231	63	#110		*300	140		10.84				10.84		
N_59>	(32)									Loop					
N_60<		232	34	#111		*300	140		10.05	↑ 670.18	.2		10.05		
		233				*300	140		10.05	↑ 670.18	.2		10.05		

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SYSTEM PIPES

SYSTEM CONFIGURATION		Pipe Length	EqLt. Ref.	Elev. Change	Pipe Dian.	H-W Coef.	Pres. Loss	Total Pres.	Pipe Flow	Vel.	Vel. Pres.	Normal Pres.	*In/Out Flow	Supplies & Br. Lines
N_61>	(33)	Node							Loop					
		234	34	#111	*300	140		10.05	↑ 643.47	.1		10.05		
N_62<		235	34		*300	140		10.05	↑ 643.47	.1		10.05		
N_63>	(34)								Main					
		236	25	#112	*300	140	.62	9.26	↓ 33500	7.6		9.26	33500	

DIAMETERS AND FITTING AND VALVE EQUIVALENT LENGTHS						
Pipe Dian.	Pipe I.D.	EF Std.90° Elbow	HE 45° Elbow	TF Tee Turn	GV Gate Valve	
200	210.1	4.88	2.74	10.67	1.22	
*200	203.2	4.88	2.74	10.67	1.22	
250	263	5.79	3.35	15.24	1.52	
*250	254.4	5.79	3.35	15.24	1.52	
300	312.7	6.71	3.96	18.29	1.83	
*300	305.6	6.71	3.96	18.29	1.83	
350	344.4	7.92	4.57	20.42	2.13	
*350	352.6	7.92	4.57	20.42	2.13	

EQUIVALENT LENGTH ADJUSTMENTS FOR FITTINGS AND VALVES

Ref. No.	Pipe Dian.	Pipe I.D.	Pipe Length	Fitting - Valve Assignment	Equiv. Length	Hazen & Williams	Adjusted Eq. Lgt.	Adjusted Length
#1	300	312.7	3	TF	18.29	120		21.29
#2	300	312.7	3	GV	1.83	120		4.83
#3	*300	305.6	70	E2	13.42	140	17.85	87.85
#4	*300	305.6	5	EF	6.71	140	8.92	13.92
#5	*300	305.6	20	TF GV	20.12	140	26.76	46.76
#6	*300	305.6	80	H4	15.84	140	21.07	101.07
#7	*300	305.6	15	TF	18.29	140	24.33	39.33
#8	*300	305.6	20	GV EF	8.54	140	11.36	31.36
#9	*300	305.6	50	HE	3.96	140	5.27	55.27
#10	*300	305.6	120	G2 HE	7.62	140	10.13	130.13
#11	*300	305.6	73	GV	1.83	140	2.43	75.43
#12	*300	305.6	40	GV	1.83	140	2.43	42.43
#13	*300	305.6	18	GV	1.83	140	2.43	20.43
#14	*300	305.6	161	GV	1.83	140	2.43	163.43
#15	*300	305.6	25	GV EF	8.54	140	11.36	36.36
#16	*300	305.6	7	GV	1.83	140	2.43	9.43
#17	*300	305.6	111	G2 H4	19.5	140	25.93	136.93
#18	*300	305.6	146	TF GV EF	26.83	140	35.68	181.68
#19	*250	254.4	36	HE	3.35	140	4.46	40.46
#20	*250	254.4	115	GV	1.52	140	2.02	117.02
#21	*250	254.4	49	GV HE	4.87	140	6.48	55.48
#22	*250	254.4	130	TF GV H4	30.16	140	40.11	170.11
#23	*250	254.4	200	G2	3.04	140	4.04	204.04
#24	*250	254.4	38	GV	1.52	140	2.02	40.02
#25	*250	254.4	168	GV EF HE	10.66	140	14.18	182.18
#26	*250	254.4	37	TF G2	18.28	140	24.31	61.31
#27	*250	254.4	234	TF GV HE	20.11	140	26.75	260.75
#28	*250	254.4	285	TF G3 EF H3	35.64	140	47.4	332.4
#29	*250	254.4	147	GV	1.52	140	2.02	149.02
#30	*250	254.4	104	TF GV	16.76	140	22.29	126.29
#31	*250	254.4	20	TF GV EF	22.55	140	29.99	49.99
#32	*250	254.4	111	TF G2 E2	29.86	140	39.71	150.71
#33	*300	305.6	161	TF GV	20.12	140	26.76	187.76
#34	*300	305.6	190	G2 E2	17.08	140	22.72	212.72
#35	*300	305.6	81	TF GV	20.12	140	26.76	107.76
#36	*300	305.6	65	GV	1.83	140	2.43	67.43
#37	*300	305.6	120	GV	1.83	140	2.43	122.43
#38	*300	305.6	57	G2	3.66	140	4.87	61.87
#39	*300	305.6	233	G3	5.49	140	7.3	240.3
#40	*300	305.6	228	GV H4	17.67	140	23.5	251.5
#41	*300	305.6	55	GV EF	8.54	140	11.36	66.36
#42	*300	305.6	260	G2 E2	17.08	140	22.72	282.72
#43	*300	305.6	236	G2	3.66	140	4.87	240.87
#44	*300	305.6	176	G2	3.66	140	4.87	180.87
#45	*300	305.6	131	G2	3.66	140	4.87	135.87
#46	*300	305.6	153	G2	3.66	140	4.87	157.87

#47	*250	254.4	110	G2	3.04	140	4.04	114.04
#48	*250	254.4	155	G2 H2	9.74	140	12.95	167.95
#49	*250	254.4	282	TF G2 EF	24.07	140	32.01	314.01
#50	*250	254.4	244	G2 HE	6.39	140	8.5	252.5
#51	*250	254.4	182	EF	5.79	140	7.7	189.7
#52	*250	254.4	35	GV	1.52	140	2.02	37.02
#53	*250	254.4	27	TF GV	16.76	140	22.29	49.29
#54	*300	305.6	112	TF GV H2	28.04	140	37.29	149.29
#55	*300	305.6	83	GV HE	5.79	140	7.7	90.7
#56	*250	254.4	176	TF G2 E2	29.86	140	39.71	215.71
#57	*250	254.4	170	G2 H3	13.09	140	17.41	187.41
#58	*250	254.4	169	TF G2 EF	24.07	140	32.01	201.01
#59	*250	254.4	157	G2	3.04	140	4.04	161.04
#60	*250	254.4	93	G2	3.04	140	4.04	97.04
#61	*250	254.4	225	GV H2	8.22	140	10.93	235.93
#62	*200	203.2	200	TF GV	11.89	140	15.81	215.81
#63	*200	203.2	43	GV	1.22	140	1.62	44.62
#64	*200	203.2	83	GV EF	6.1	140	8.11	91.11
#65	*200	203.2	144	TF GV EF H4	27.73	140	36.88	180.88
#66	*200	203.2	95	GV	1.22	140	1.62	96.62
#67	*200	203.2	124	TF GV	11.89	140	15.81	139.81
#68	*200	203.2	90	TF GV H4	22.85	140	30.39	120.39
#69	*200	203.2	160	GV H8	23.14	140	30.78	190.78
#70	*200	203.2	130	GV	1.22	140	1.62	131.62

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EQUIVALENT LENGTH ADJUSTMENTS FOR FITTINGS AND VALVES

Ref. No.	Pipe Dian.	Pipe I.D.	Pipe Length	Fitting - Valve Assignment	Equiv. Length	Hazen & Williams	Adjusted Eq. Lgt.	Adjusted Length
#71	*200	203.2	27	GV	1.22	140	1.62	28.62
#72	*200	203.2	25	TF GV	11.89	140	15.81	40.81
#73	*250	254.4	35	GV EF HE	10.66	140	14.18	49.18
#74	*250	254.4	79	GV H2	8.22	140	10.93	89.93
#75	*200	203.2	150	TF	10.67	140	14.19	164.19
#76	*200	203.2	52	GV	1.22	140	1.62	53.62
#77	*300	305.6	109	G2	3.66	140	4.87	113.87
#78	*250	254.4	68	GV	1.52	140	2.02	70.02
#79	*250	254.4	79	GV	1.52	140	2.02	81.02
#80	*200	203.2	100	TF GV	11.89	140	15.81	115.81
#81	*200	203.2	77	GV	1.22	140	1.62	78.62
#82	*200	203.2	4	GV	1.22	140	1.62	5.62
#83	*200	203.2	29	GV	1.22	140	1.62	30.62
#84	*200	203.2	63	GV	1.22	140	1.62	64.62
#85	*200	203.2	180	TF G2	13.11	140	17.44	197.44
#86	*350	352.6	130	G2 H9	45.39	140	60.37	190.37
#87	*350	352.6	172	GV E2	17.97	140	23.9	195.9
#88	*350	352.6	168	GV EF H4	28.33	140	37.68	205.68
#89	*250	254.4	161	TF GV	16.76	140	22.29	183.29
#90	*250	254.4	70	TF GV	16.76	140	22.29	92.29
#91	*250	254.4	42	EF HE	9.14	140	12.16	54.16
#92	*250	254.4	182	G2 H4	16.44	140	21.87	203.87
#93	*250	254.4	104	TF G2 H2	24.98	140	33.22	137.22
#94	*250	254.4	56	GV HE	4.87	140	6.48	62.48
#95	*250	254.4	106	GV	1.52	140	2.02	108.02
#96	*250	254.4	152	G2 H4	16.44	140	21.87	173.87
#97	*250	254.4	72	TF G2 HE	21.63	140	28.77	100.77
#98	*250	254.4	142	GV H2	8.22	140	10.93	152.93
#99	*250	254.4	46	G2	3.04	140	4.04	50.04
#100	*250	254.4	95	GV EF	7.31	140	9.72	104.72
#101	*250	254.4	116	GV HE	4.87	140	6.48	122.48
#102	*250	254.4	22	GV HE	4.87	140	6.48	28.48
#103	*250	254.4	152	G2 HE	6.39	140	8.5	160.5
#104	*250	254.4	54	GV	1.52	140	2.02	56.02
#105	*250	254.4	45	TF GV	16.76	140	22.29	67.29
#106	*250	254.4	45	GV H2	8.22	140	10.93	55.93
#107	*250	254.4	20	TF GV	16.76	140	22.29	42.29
#108	*250	254.4	12	GV	1.52	140	2.02	14.02
#109	*300	305.6	28	GV	1.83	140	2.43	30.43
#110	*300	305.6	63	GV E3	21.96	140	29.21	92.21
#111	*300	305.6	34	TF GV H6	43.88	140	58.36	92.36
#112	*300	305.6	25	TF GV	20.12	140	26.76	51.76

