

KYPipe, LLC

Figures from KYPipe Reference Manual

Original Manual date April 1995 - Imaged December 2011

Jana
[Pick the date]

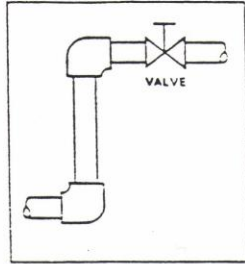


Figure 1 Pipe Section

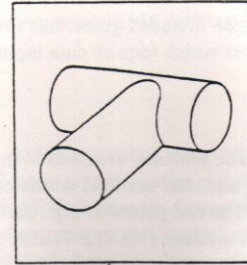


Figure 2 Junction Node

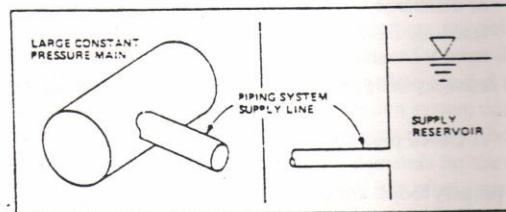


Figure 3 Fixed Grade Node

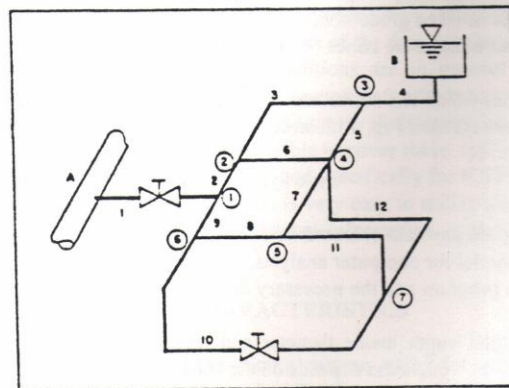


Figure 4 Geometric Relation Demonstration
 $p=12, j=7, l=4$ and $f=2$ ($12=7+4+2-1$)

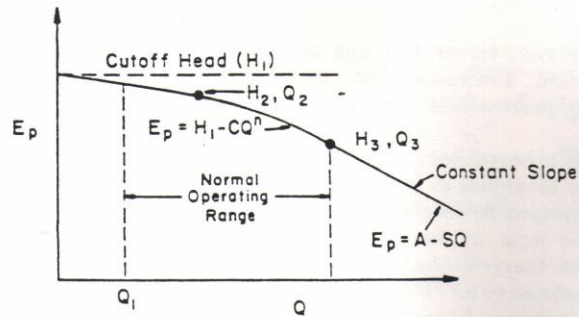


Figure 5a Pump Curve for Three Data Points

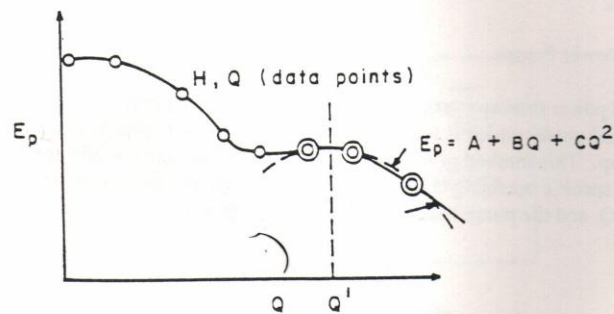


Figure 5b Pump Curve for Multiple Data Points

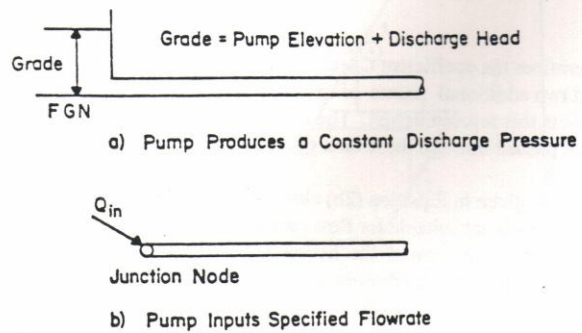


Figure 6 Alternate Pump Representations

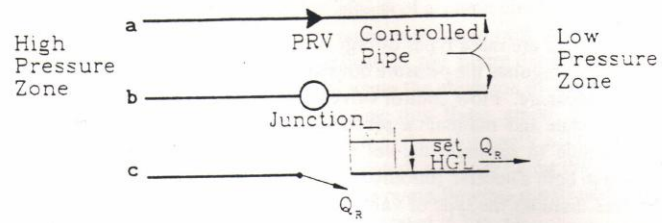


Figure 7 Pressure Regulating Valve (PRV)

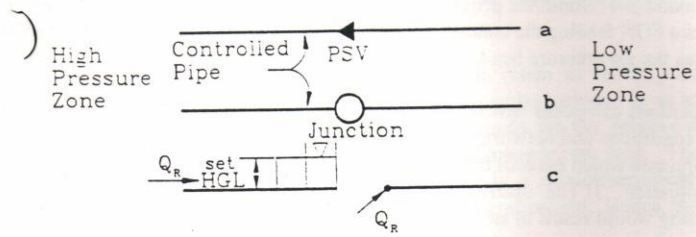


Figure 8 Pressure Sustaining Valve (PSV)

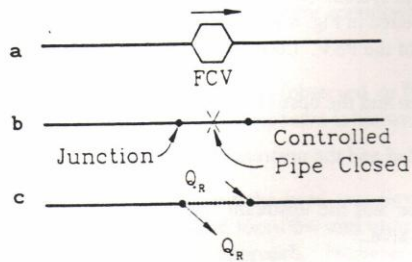


Figure 9 Flow Control Valve (FCV)

flowrate (gpm)	available pressure (psi)	head increase (ft)
0	70	161.5
1800	62	143.0
2500	53	122.3

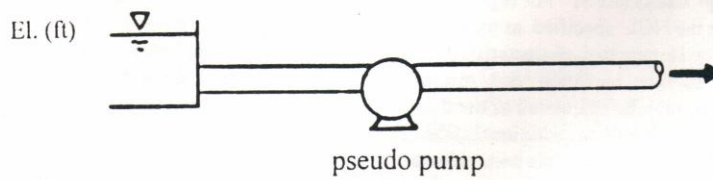
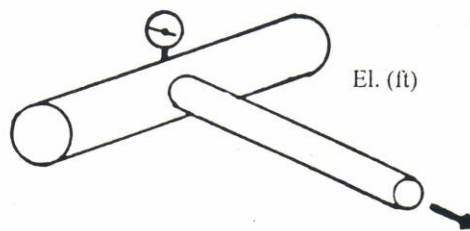


Figure 10 Variable Pressure Supply

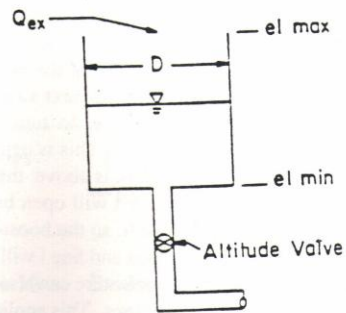
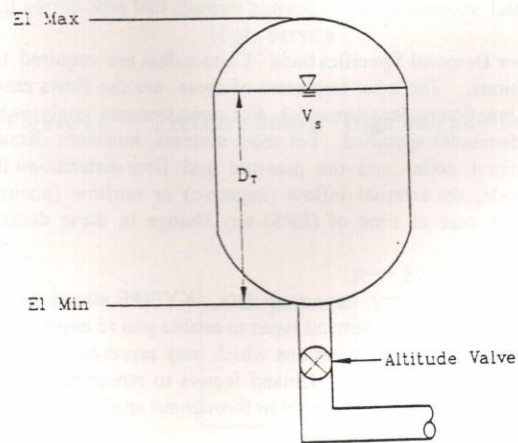


Figure 11 Constant Diameter Tank



b) variable area tank

Figure 12 Variable Area Tank

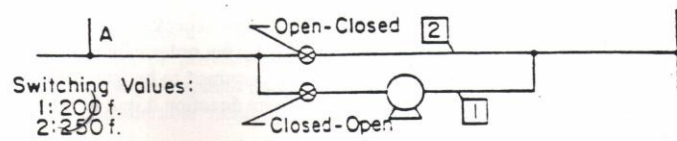


Figure 13 Pressure Switch - Pump and Bypass

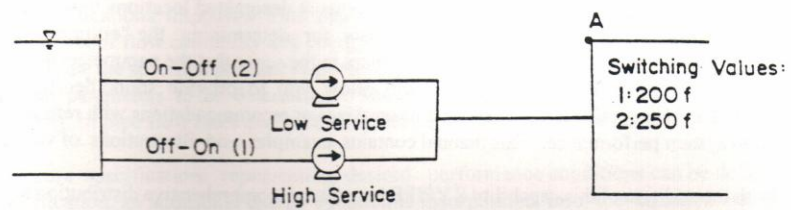


Figure 14 Pressure Switch - High and Low Service Pump

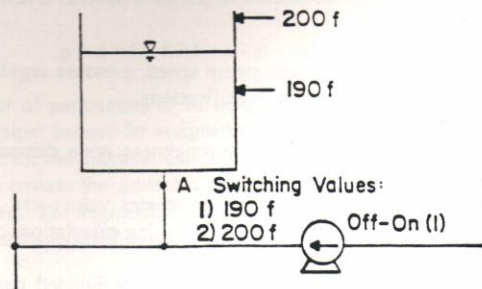


Figure 15 Pressure Switch - Booster Pump to Storage Tank

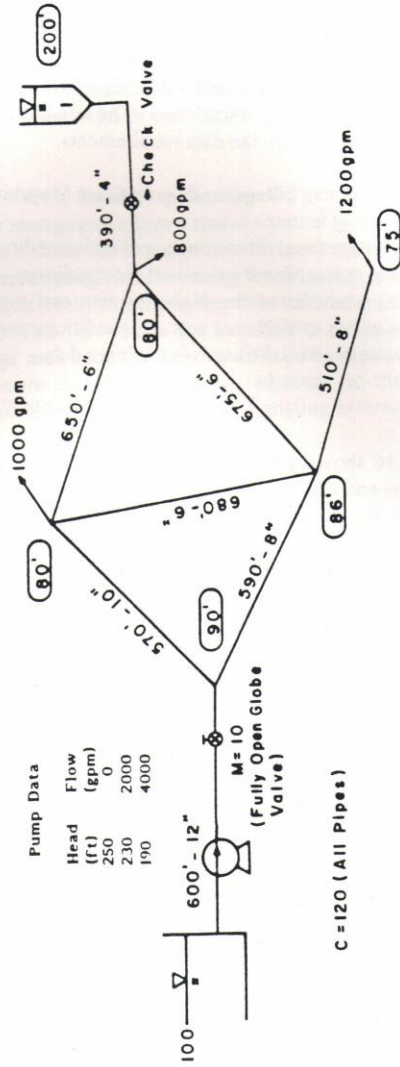
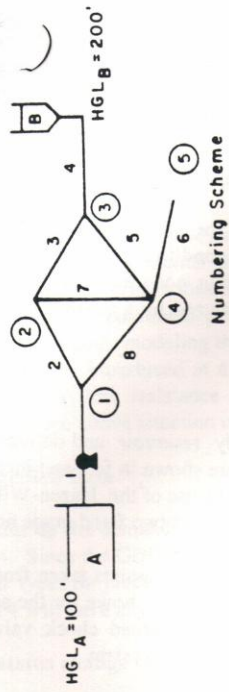


Figure 16 Example 1 - Eight Pipe System

***** K Y P I P E 2 *****
 University of Kentucky Hydraulic Analysis Program
 for the Distribution of Pressure and Flows in Pipe Network Systems
 FORTRAN VERSION - 1.00 (09/15/91)

DATE: 9/10/1991
 TIME: 14:31:20

INPUT DATA FILENAME ----- EX1.DAT
 TABULATED OUTPUT FILENAME ----- EX1.OUT
 POSTPROCESSOR RESULTS FILENAME --- EX1.RES

 SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE = gallons/minute
 HEAD (HGL) = feet
 PRESSURE = psig

PIPELINE DATA

STATUS CODE: XX - CLOSED PIPE EG - FIXED GRADE NODE PU - PUMP LINE
 CV - CHECK VALVE RV - REGULATING VALVE

PIPE NUMBER	NODE NOS. #1 #2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	FGN-HGL (ft)
1-FGUV	0 1	600.0	12.0	120.00	10.00	100.00
2	1 2	570.0	10.0	120.00	.00	
3	2 3	650.0	6.0	120.00	.00	
4-FGCV	3 0	390.0	4.0	120.00	.00	200.00
5	4 3	675.0	6.0	120.00	.00	
6	4 5	510.0	8.0	120.00	.00	
7	2 4	680.0	6.0	120.00	.00	
8	1 4	590.0	8.0	120.00	.00	

PUMP DATA

THERE IS A PUMP IN LINE 1 DESCRIBED BY THE FOLLOWING DATA:

HEAD (ft)	FLOWRATE (gpm)
250.00	.00
230.00	2000.00
190.00	4000.00

JUNCTION NODE DATA

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	CONNECTING PIPES
1		.00	90.00	1 2 8
2		1000.00	87.00	2 3 7
3		800.00	86.00	3 4 5
4		.00	85.00	4 5 6 7
5		1200.00	75.00	5 6 7 8

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

SYSTEM CONFIGURATION

NUMBER OF PIPES (p) = 8
 NUMBER OF JUNCTION NODES (j) = 5
 NUMBER OF PRIMARY LOOPS (l) = 2
 NUMBER OF FIXED GRADE NODES (f) = 2
 NUMBER OF SUPPLY ZONES (z) = 1

SIMULATION RESULTS

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00046

SIMULATION DESCRIPTION (LABEL)

Example 1 - KPIPE2 Users Manual

Pump Fed - 8 pipes and 5 junction nodes

One change specified - close pipe no. 4

Table 1 Results - Example 1

SIMULATION RESULTS

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00000

PIPELINE RESULTS

STATUS CODE:		XX - CLOSED PIPE		FG - FIXED GRADE NODE		PU - PUMP LINE	
		CV - CHECK VALVE		RV - REGULATING VALVE		TK - STORAGE TANK	
PIPE NUMBER	NODE NOS. #1 #2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO (ft/s)	HL/1000 (ft/ft)
1-FGPU	0 1	3352.12	16.58	204.66	14.04	9.51	27.63
2	1 2	1982.11	14.46	.00	.00	8.10	25.37
3	2 3	642.13	24.61	.00	.00	7.29	37.86
4-FGCV	3 0	352.12	34.96	.00	.00	8.99	89.65
5	4 3	509.99	16.88	.00	.00	5.79	24.71
6	4 5	1200.00	15.15	.00	.00	7.66	29.70
7	2 4	339.99	7.83	.00	.00	3.86	11.66
8	1 4	1370.01	22.39	.00	.00	8.74	37.96

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		.00	274.04	90.00	184.04	79.75
2		1000.00	259.58	80.00	179.58	77.82
3		800.00	234.96	80.00	154.96	67.15
4		.00	251.65	86.00	165.65	71.78
5		1200.00	236.50	75.00	161.50	69.98

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (gpm)
1	3352.12
4	-352.12
NET SYSTEM INFLOW = 3352.12	
NET SYSTEM OUTFLOW = -352.12	
NET SYSTEM DEMAND = 3000.00	

DATA CHANGES FOR NEXT SIMULATION

PIPE STATUS CHANGES

LINE 5 IS CLOSED

PIPELINE RESULTS

STATUS CODE:		XX - CLOSED PIPE		FG - FIXED GRADE NODE		PU - PUMP LINE	
		CV - CHECK VALVE		RV - REGULATING VALVE		TK - STORAGE TANK	
PIPE NUMBER	NODE NOS. #1 #2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO (ft/s)	HL/1000 (ft/ft)
1-FGPU	0 1	3185.20	15.00	208.18	12.67	9.04	25.11
2	1 2	2085.20	15.04	.00	.00	8.38	27.03
3-FGCV	3 0	185.20	54.38	.00	.00	11.18	83.66
4	4 3	185.20	10.64	.00	.00	4.73	27.27
5-XX	4 5	1200.00	15.15	.00	.00	7.66	29.70
6	2 4	65.73	.38	.00	.00	.75	.56
7	1 4	1134.27	15.79	.00	.00	7.24	26.76
8	1 4						

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		.00	280.43	90.00	190.43	82.52
2		1000.00	265.02	80.00	185.02	80.17
3		800.00	210.64	80.00	130.64	56.61
4		.00	264.64	86.00	178.64	77.41
5		1200.00	249.49	75.00	174.49	75.61

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (gpm)
1	3185.20
4	-185.20
NET SYSTEM INFLOW = 3185.20	
NET SYSTEM OUTFLOW = -185.20	
NET SYSTEM DEMAND = 3000.00	

**** KYPE SIMULATION COMPLETED ****

Table 1 (cont.) Results - Example 1

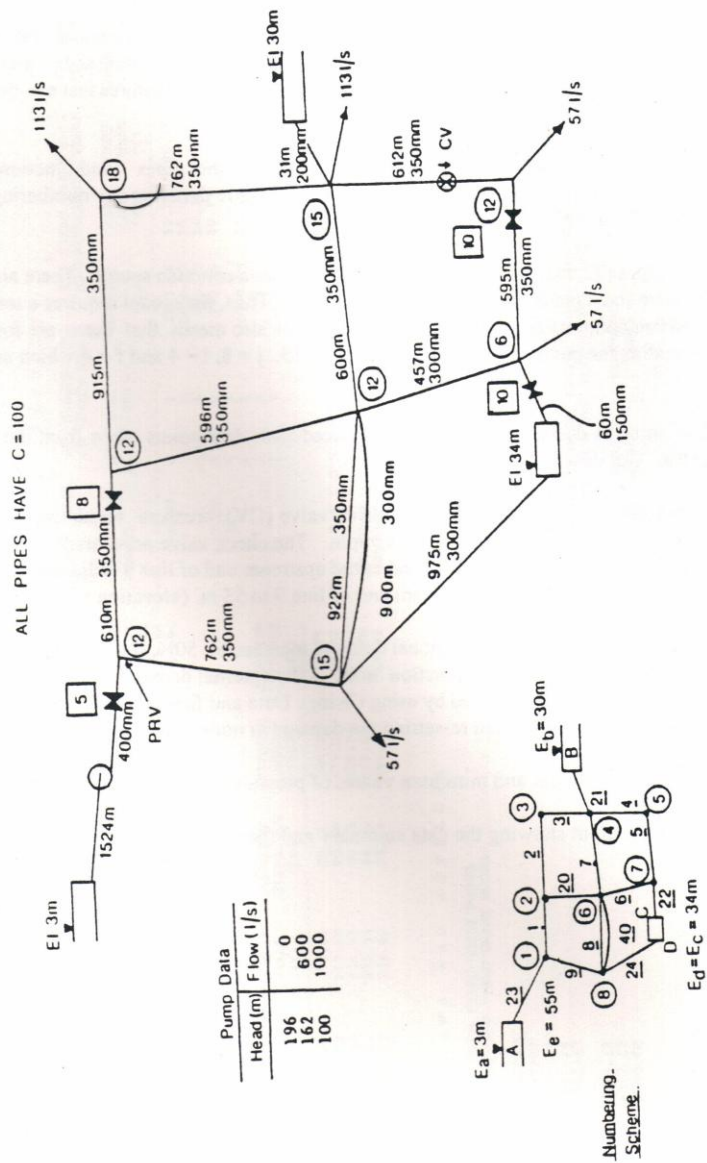


Figure 17 Example 2 - Fifteen Pipe System

***** K Y P I P E 2 *****
University of Kentucky Hydraulic Analysis Program
* for the Distribution of Pressure and Flows in Pipe Network Systems *
***** FORTAN VERSION - 1.00 (09/15/91) *****

DATE: 9/11/1991
TIME: 10:22:26

INPUT DATA FILENAME EX3.DAT
TABULATED OUTPUT FILENAME EX3.OUT
POSTPROCESSOR RESULTS FILENAME --- EX2.RES

SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE = liters/second
HEAD (HGL) = meters
PRESSURE = kpa

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
MAXIMUM AND MINIMUM PRESSURES = 2
MAXIMUM AND MINIMUM VELOCITIES = 3

SYSTEM CONFIGURATION

NUMBER OF PIPES (p) = 15
NUMBER OF JUNCTION NODES (j) = 8
NUMBER OF VALVE NODES (v) = 4
NUMBER OF FIXED GRADE NODES (f) = 4
NUMBER OF SUPPLY ZONES (z) = 1

SIMULATION RESULTS

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00001

SIMULATION DESCRIPTION (LABEL)

Example 2 - KYPE Users Manual
Illustrates following features: PRV, Max - Min tables, non-consecutive numbering, data check (*), etc.

PIPELINE RESULTS

STATUS CODE: XX - CLOSED PIPE FG - FIXED GRADE NODE PU - PUMP LINE
CV - CHECK VALVE RV - REGULATING VALVE TK - STORAGE TANK

PIPE NUMBER	NODE #1	NODE #2	FLOWRATE (l/s)	HEAD LOSS (m)	PUMP HEAD (m)	MINOR LOSS (m)	LINE VELO. (m/s)	HL/1000 (m/m)
1	1	2	325.68	26.82	.00	4.67	3.39	43.96
2	2	3	167.74	11.77	.00	.00	1.74	12.86
3	3	4	54.74	1.23	.00	.00	.57	1.62
4	4	5						
5	5	6	-57.00	-1.04	.00	-1.18	-5.59	-1.74
6	6	7	100.46	4.82	.00	.00	1.42	10.55
7	7	8	-148.31	-6.15	.00	.00	-1.54	-10.34
8	8	9	-46.69	-1.11	.00	.00	-4.49	-1.20
9	9	10	217.21	15.82	.00	.00	2.26	20.76
10	10	11	157.94	6.86	.00	.00	1.57	11.76
20	2	6	90.06	1.92	.00	.00	2.87	62.55
21	FG	4	53.54	90.08	168.25	4.76	4.32	59.11
22	FG	7	54.83	5.18	.00	.00	.98	5.31
23	FG	0	49.37	-1.11	.00	.00	-6.62	-1.23
24	FG	6						

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (l/s)	HYDRAULIC GRADE ELEVATION (m)	JUNCTION ELEVATION (m)	PRESSURE HEAD (m)	JUNCTION PRESSURE (kpa)
1		.00	76.82			
2		113.00	33.16	18.00	15.16	148.63
3		113.00	31.92	15.00	16.92	165.96
4		57.00	32.03	12.00	20.03	196.46
5		.00	38.07			
6		57.00	33.25	6.00	27.25	267.22
7		57.00	39.18	15.00	24.18	237.12
8						

MAXIMUM AND MINIMUM VALUES

location (node or pipe) and value

MAXIMUM PRESSURES - MINIMUM PRESSURES	
7	267.22
8	237.12
3	148.63
4	165.96
MAXIMUM VELOCITIES - MINIMUM VELOCITIES	
23	4.32
1	3.39
21	2.87
5	.59

REGULATING VALVE REPORT

VALVE TYPE	POSITION	CONTROLLED PIPE	VALVE SETTING (m or l/s)	STATUS	UPSTREAM GRADE (m)	DOWNSIDE GRADE (m)	THROUGH FLOW (l/s)
PRV-1	1	9	55.00	THROTTLED	76.42	39.18	217.21

Results - Example 2

Table 2

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (l/s)
----------------	-------------------

21 -90.06
22 13.54
23 542.89
24 -69.37

NET SYSTEM INFLOW = 556.43
NET SYSTEM OUTFLOW = -159.43
NET SYSTEM DEMAND = 397.00

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL GRADE (l/s)	HYDRAULIC GRADE (m)	JUNCTION ELEVATION (m)	PRESSURE HEAD (m)	JUNCTION PRESSURE (kpa)
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DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.500

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND (l/s)
--------------------	-----------------

3 113.00

***** SIMULATION RESULTS *****

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00039

PIPELINE RESULTS

PIPE NUMBER	PIPE NODE #1	PIPE NODE #2	FLOWRATE (l/s)	HEAD LOSS (m)	PUMP HEAD (m)	MINOR LOSS (m)	LINE VELO. (m/s)	HL/ 1000 (m/m)
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Table 2 (cont.) Results - Example 2

MAXIMUM AND MINIMUM VALUES

location (node or pipe) and value

MAXIMUM PRESSURES - MINIMUM PRESSURES	
7	240.34
8	215.96
MAXIMUM VELOCITIES - MINIMUM VELOCITIES	
23	4.39
1	3.31
9	2.42

REGULATING VALVE REPORT

VALVE TYPE	POSITION NODE	CONTROLLED PIPE	VALVE SETTING (m or l/s)	STATUS (m or l/s)	UPSTREAM GRADE (m)	DOWNSTREAM GRADE (m)	THROUGH FLOW (l/s)
---------------	------------------	--------------------	--------------------------------	----------------------	--------------------------	----------------------------	--------------------------

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (l/s)
----------------	-------------------

21 9.03
22 30.23
23 531.60
24 -31.86

NET SYSTEM INFLOW = 590.86
NET SYSTEM OUTFLOW = -51.86
NET SYSTEM DEMAND = 539.00

**** KPIPE SIMULATION COMPLETED ****

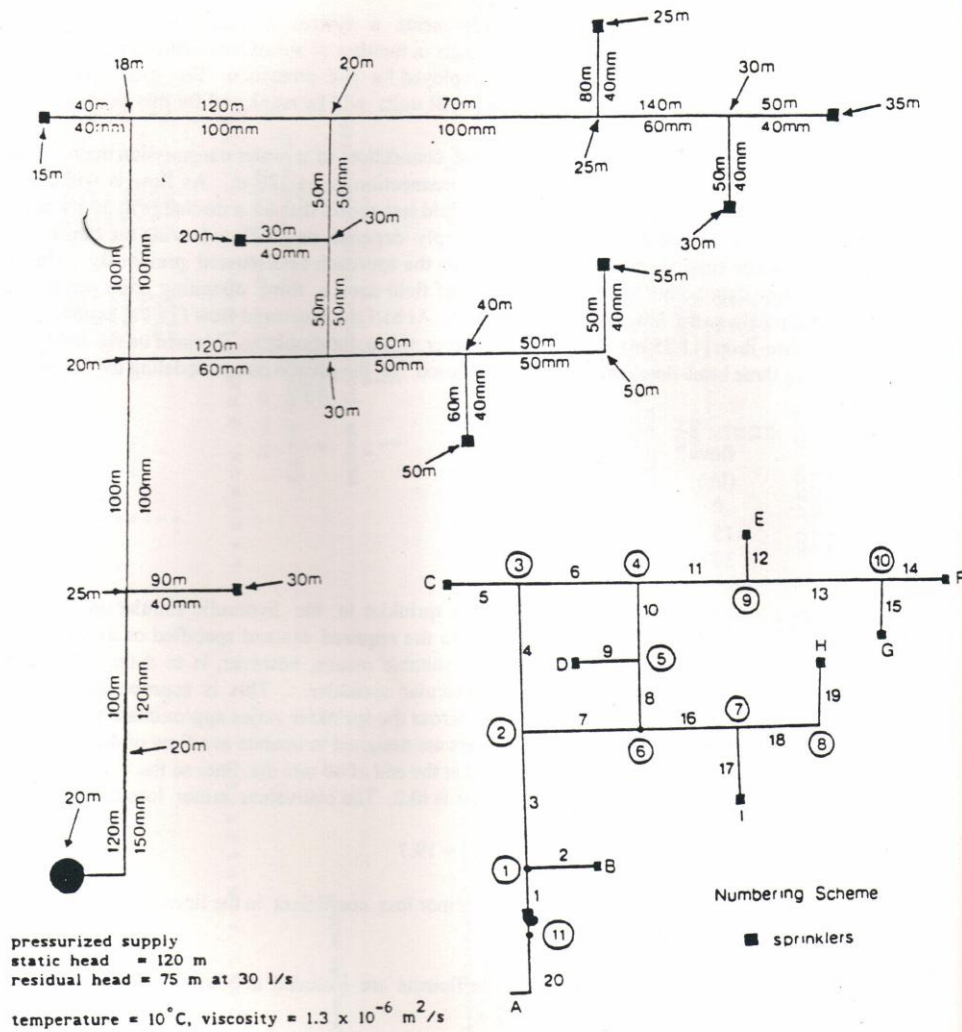


Figure 18 Example 3 - Twenty Pipe Sprinkler System

***** K Y P I P E 2 *****
 University of Kentucky Hydraulic Analysis Program
 for the Distribution of Pressure and Flows in Pipe Network Systems
 FORTAN VERSION - 1.00 (09/15/91)

DATE: 9/11/1991
 TIME: 13:43:55

INPUT DATA FILENAME ----- EX3.DAT
 TABULATED OUTPUT FILENAME ----- EX3.OUT
 POSTPROCESSOR RESULTS FILENAME --- EX3.RES

 SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE = liters/second
 HEAD (HGL) = meters
 PRESSURE = Kpa

THE DARCY WEISBACH HEAD LOSS EQUATION IS USED, THE KINEMATIC VIS. = .0000013

PIPELINE DATA

STATUS_CODE:		XX - CLOSED PIPE		FG - FIXED GRADE NODE		PU - PUMP LINE	
		CV - CHECK VALVE		RV - REGULATING VALVE			
PIPE NUMBER	NODE NOS. #1 #2	LENGTH (m)	DIAMETER (cm)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	FGN-HGL (m)	
1	11	100.0	12.0	.20	.00	30.00	
2-FG	1 0	90.0	4.0	.20	21.50		
3	1 2	100.0	10.0	.50	.30		
4	2 3	100.0	10.0	.50	.30		
5-FG	3 0	40.0	4.0	.20	21.50	15.00	
6	3 4	120.0	10.0	.50	1.80		
7	2 6	120.0	6.0	.20	1.80		
8	5 6	30.0	4.0	.20	21.50	20.00	
9-FG	5 0	50.0	4.0	.20	.30		
10	4 5	80.0	5.0	.20	.30		
11	9 0	70.0	10.0	.50	.30		
12-FG	9 0	140.0	6.0	.20	21.50	25.00	
13	9 10	50.0	4.0	.20	.30		
14-FG	10 0	50.0	4.0	.20	20.00	35.00	
15-FG	10 0	50.0	4.0	.20	21.50	30.00	
16	6 7	60.0	5.0	.20	.30		
17-FG	7 0	60.0	4.0	.20	21.50	50.00	
18	7 8	50.0	5.0	.20	.30		
19-FG	8 0	50.0	4.0	.20	20.60	55.00	
20-FG	0 11	120.0	15.0	.20	1.40	20.00	

PUMP DATA

THERE IS A PUMP IN LINE 20 DESCRIBED BY THE FOLLOWING DATA:

HEAD (m)	FLOWRATE (l/s)
120.00	.00
108.75	15.00
75.00	30.00

JUNCTION NODE DATA

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (l/s)	JUNCTION ELEVATION (m)	CONNECTING PIPES
1		.00	25.00	1 2 3
2		.00	20.00	3 4 7
3		.00	18.00	4 5 6
4		.00	20.00	6 10 11
5		.00	30.00	8 9 10
6		.00	30.00	7 8 16
7		.00	40.00	16 17 18
8		.00	50.00	18 19
9		.00	25.00	11 12 13
10		.00	30.00	13 14 15
11		.00	20.00	1 20

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

SYSTEM CONFIGURATION

NUMBER OF PIPES(p) = 20
 NUMBER OF JUNCTION NODES(j) = 11
 NUMBER OF PRIMARY LOOPS(l) = 1
 NUMBER OF FIXED GRADE NODES(f) = 9
 NUMBER OF SUPPLY ZONES(z) = 1

Table 3 Data Input Summary Example 3

SIMULATION RESULTS

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00006

SIMULATION DESCRIPTION (LABEL)

Example 3 - KPIPE2 Users Manual

Twenty Pipe Sprinkler System (8 sprinklers)

three cycles of operation

PIPELINE RESULTS

STATUS CODE:		XX - CLOSED PIPE		FG - FIXED GRADE NODE		PU - PUMP LINE		TK - STORAGE TANK	
		CV - CHECK VALVE		RV - REGULATING VALVE		PUMP		TK	
						HEAD		MINOR	
						LOSS		LOSS	
						(m)		(m/s)	
						FLOWRATE		LINE	
						(l/s)		VELO.	
								1000	
								(m/m)	

PIPE STATUS CHANGES

LINE	5	IS	CLOSED
LINE	12	IS	CLOSED
LINE	14	IS	CLOSED
LINE	17	IS	CLOSED

CONCLUSION AND RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMORG (1/2)	HYDRAULIC GRADE	JUNCTION ELEVATION (m)	PRESSURE HEAD (m)	JUNCTION PRESSURE (kpa)
1		.00	112.34	25.00	87.34	856.54
2		.00	105.67	20.00	85.67	840.15
3		.00	102.96	18.00	84.96	833.22
4		.00	99.59	20.00	79.59	780.55
5		.00	90.58	30.00	60.58	594.04
6		.00	92.73	30.00	62.73	615.95
7		.00	86.33	50.00	36.33	353.95
8		.00	99.04	25.00	74.04	726.12
9		.00	86.67	20.00	66.67	655.74
10		.00	115.90	20.00	95.90	940.46

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00016

PIPELINE RESULTS

60	STATUS CODE:	XX -CLOSED PIPE	FG -FIXED GRADE NODE	PU -PUMP LINE
60		CV -CHECK VALVE	RV -REGULATING VALVE	TK -STORAGE TANK

PIPE NUMBER	NODE NOS.		FLOWRATE (l/s)	HEAD LOSS (m)	PUMP HEAD (m)	MINOR LOSS (m)	LINE VELO. (m/s)	HL/ 1000 (m/m)
	#1	#2						
1	11	1	21.28	3.56	.00	.00	1.98	35.58
2-FG	1	0	5.27	63.09	.00	19.25	4.19	701.07
3	1	0	16.01	6.61	.00	.06	2.04	26.77
4	2	3	10.14	2.68	.00	.03	1.29	26.81
5-XXFG	3	0						
6	3	4	10.14	3.22	.00	.15	1.39	26.81
7	2	6	5.88	12.64	.00	.40	2.08	104.54
8	5	6	6.58	27.01	.00	.12	-1.3	-40.76
9-FG	5	0	8.76	36.73	.00	33.84	5.56	1324.38
10	4	9	6.76	8.91	.00	.09	2.42	178.58
11	4	9	5.38	.54	.00	.01	.69	7.76
12-XXFG	9	10	5.38	12.32	.00	.06	1.90	87.99
13-XXFG	9	0						
14-XXFG	10	0	5.38	36.57	.00	20.10	4.28	731.47
15-FG	10	0	6.39	6.39	.00	.05	1.86	106.48
16	6	7						
17-XXFG	7	0						
18	7	8	3.65	5.32	.00	.05	1.86	106.48
19-FG	8	0	3.65	17.05	.00	8.87	2.91	340.92
20-FGPU	0	11	21.28	1.35	97.36	.10	1.20	11.28

SUMMARY OF INFLOWS AND OUTFLOWS

(4) YNET OWLS INTO THE SYSTEM FROM FIXED GRADE NODES

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (l/s)
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00
16	0.00
17	0.00
18	0.00
19	0.00
20	0.00
21	0.00
22	0.00
23	0.00
24	0.00
25	0.00
26	0.00
27	0.00
28	0.00
29	0.00
30	0.00
31	0.00
32	0.00
33	0.00
34	0.00
35	0.00
36	0.00
37	0.00
38	0.00
39	0.00
40	0.00
41	0.00
42	0.00
43	0.00
44	0.00
45	0.00
46	0.00
47	0.00
48	0.00
49	0.00
50	0.00
51	0.00
52	0.00
53	0.00
54	0.00
55	0.00
56	0.00
57	0.00
58	0.00
59	0.00
60	0.00
61	0.00
62	0.00
63	0.00
64	0.00
65	0.00
66	0.00
67	0.00
68	0.00
69	0.00
70	0.00
71	0.00
72	0.00
73	0.00
74	0.00
75	0.00
76	0.00
77	0.00
78	0.00
79	0.00
80	0.00
81	0.00
82	0.00
83	0.00
84	0.00
85	0.00
86	0.00
87	0.00
88	0.00
89	0.00
90	0.00
91	0.00
92	0.00
93	0.00
94	0.00
95	0.00
96	0.00
97	0.00
98	0.00
99	0.00
100	0.00

NET SYSTEM INFLOW	=
NET SYSTEM OUTFLOW	=
NET SYSTEM DEMAND	=

Table 3 (cont.) Results (case 2) - Example 3

DATA CHANGES FOR NEXT SIMULATION

PIPE STATUS CHANGES

LINE 5 IS OPENED
 LINE 12 IS OPENED
 LINE 14 IS OPENED
 LINE 17 IS OPENED
 LINE 18 IS OPENED
 LINE 9 IS CLOSED
 LINE 15 IS CLOSED
 LINE 19 IS CLOSED

SIMULATION RESULTS

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00006

JUNCTION NODE RESULTS						
JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (l/s)	HYDRAULIC GRADE (m)	JUNCTION ELEVATION (m)	PRESSURE HEAD (m)	JUNCTION PRESSURE (kpa)
1		.00	113.65	25.00	88.65	869.40
2		.00	102.49	20.00	72.49	708.99
3		.00	93.17	20.00	73.17	712.52
4		.00	93.17	20.00	73.17	712.52
5		.00	93.45	30.00	63.45	622.25
6		.00	93.45	30.00	63.45	622.25
7		.00	85.97	40.00	45.97	450.80
8		.00	85.97	40.00	45.97	450.80
9		.00	91.37	25.00	66.37	650.87
10		.00	81.03	30.00	51.03	500.46
11		.00	117.05	20.00	97.05	951.70

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK									
PIPE NUMBER	NODE NOS. #1 #2	FLOWRATE (l/s)	HEAD (m)	PUMP HEAD (m)	MINOR LOSS (m)	LINE VELO. (m/s)	1000 VELO. (m/m)	HL/ 1000 (m/m)	
1	11	20.77	3.39	.00	.00	1.84	33.92		
2	XXFG 1 0								
3	1 2	20.77	11.05	.00	.11	2.64	110.53		
4	2 3	15.96	6.56	.00	.06	2.03	65.63		
5	3 0	6.90	47.83	.00	33.04	5.49	1195.67		
6	3 4	9.06	2.58	.00	.12	1.13	21.50		
7	2 6	4.81	8.48	.00	.27	1.70	70.67		
8	5 6	-.79	-.28	.00	-.01	-.40	-5.66		
9	XXFG 5 0								
10	4 9	-.79	-.28	.00	-.02	1.25	25.32		
11	9 0	4.98	1.77	.00	.02	3.93	617.92		
12	FG 9 0	4.91	10.29	.00	.05	1.76	73.51		
13	9 10	4.91	30.49	.00	15.54	3.90	609.77		
14	FG 10 0	4.02	7.72	.00	.06	2.05	128.60		
15	XXFG 10 0								
16	6 7	4.02	24.74	.00	11.23	3.20	412.31		
17	FG 7 0	.00	.00	.00	.00	.00	.00		
18	7 8								
19	XXFG 8 0								
20	FGPU 0 0	20.77	1.29	98.44	.10	1.18	10.76		

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
 (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (l/s)
5	-6.90
12	-6.94
14	-4.91
17	-4.02
20	20.77
NET SYSTEM INFLOW = 20.77	
NET SYSTEM OUTFLOW = -20.77	
NET SYSTEM DEMAND = .00	

**** KTYPIPE SIMULATION COMPLETED ****

DATE: 9/11/1991
 TIME: 13:43:59

Table 3 (cont.) Results (case 3) - Example 3

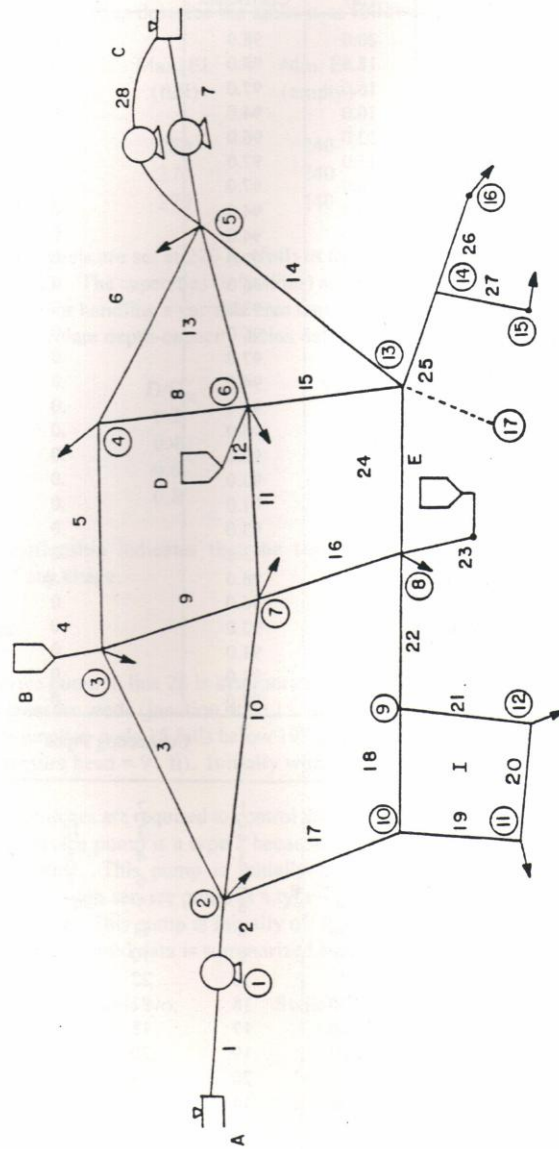


Figure 19 Example 4 - Twenty Eight Pipe System - EPS

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EPS DATA

TOTAL TIME FOR SIMULATION = 24.000
NORMAL TIME PERIOD = 2.000

VARIABLE HEAD TANK DATA

TANK NUMBER	PIPE NUMBER	MAXIMUM ELEVATION (ft)	MINIMUM ELEVATION (ft)	TANK CAPACITY (gal)	INITIAL VOLUME (gal)	EXTERNAL FLOW (mgd)
1-1	4	270.00	240.00	634562.	634562.	.00
2-1	12	270.00	240.00	634562.	634562.	.00
3-2	23	270.00	240.00	634562.	634562.	.00
VARIABLE AREA TANK DATA:						
			DEPTH RATIO	VOLUME RATIO		
			.000	.000		
			.200	.200		
			.400	.400		
			.600	.600		
			.800	.800		
			1.000	1.000		

* TANK TYPE: 1 - CONSTANT DIAMETER 2 - DEPTH/VOLUME DATA

FLOW METER SUMMARY

THE FOLLOWING PIPES CONTAIN FLOW METERS:
2 7 28 4 12 23

PRESSURE SWITCH DATA

REFERENCE PIPE	REFERENCE NODE	SWITCHING GRADES (ft)
7	15	197.00 & 226.00
28	15	197.00 & 226.00

SYSTEM CONFIGURATION

NUMBER OF PIPES(p) = 28
NUMBER OF JUNCTION NODES(j) = 16
NUMBER OF PRIMARY LOOPS(l) = 7
NUMBER OF FIXED GRADE NODES(f) = 6
NUMBER OF SUPPLY ZONES(z) = 1

**** SIMULATION TERMINATED ****
AN ERROR WAS DETECTED OR YOU REQUESTED A DATA CHECK OPTION (***)

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.300

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.540

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.580

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.550

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.550

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.200

Table 4 Tabulated Data Summary - Example 4

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES
DEMAND TYPE = 1 - GDF = 1.550

SIMULATION RESULTS

TIME FROM INITIATION OF EPS = 8.0000 HOURS
THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00000

PIPELINE RESULTS

PIPE NUMBER	PIPE NOS. #1 #2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	TK - STORAGE TANK	PU - PUMP LINE
1-FGPU	0 1	9.57	23.75	207.30	.00	6.79	11.87
7-FGPU	0 5	9.38	72.57	206.12	.00	10.39	34.55
10	2 7	3.43	40.39	.00	.00	4.32	7.34
20	11 12	-.06	-.65	.00	.00	-.50	-.44

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

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JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
11	Lakeview Rd.	.77	234.07	115.00	119.07	51.60
15	East Mall	.39	206.84	135.00	71.84	31.13
16-2	Central Hos.	.25	215.97	130.00	85.97	37.25

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (mgd)
-------------	----------------

1	9.57
4	1.42
7	9.38
12	1.42
23	1.82

NET SYSTEM INFLOW = 23.61
NET SYSTEM OUTFLOW = .00
NET SYSTEM DEMAND = 23.61

TANK STATUS REPORT (time = 8.0000 hours)

TANK NUMBER (*)	PIPE NUMBER	NET FLOW (mgd)	TANK ELEVATION (ft)	TANK DEPTH (ft)	TANK VOLUME (gal)	TANK STATUS (%)	TANK PROJECTED DEPTH (ft)
1-1	4	-1.42	255.87	15.87	335710.	52.9 DRAINING	10.27
2-1	12	-1.42	254.63	18.63	396541.	52.9 DRAINING	9.04
3-2	23	-1.82	248.44	8.44	178573.	28.1 DRAINING	1.28

* TANK TYPE: 1 - CONSTANT DIAMETER 2 - DEPTH/VOLUME DATA

FLOW METER REPORT (time = 8.0000 hours)

PIPE NUMBER	NODE #1	NODE #2	METERED FLOW (gal)
2	1	2	2970868.
7	0	5	2861357.
28	0	5	-298852.
12	0	6	325021.
23	0	8	455989.

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 1.550

Table 4 Tabulated Results - Example 4 (8 hours)

INPUT DATA FILENAME ----- EX5A.DAT
 TABULATED OUTPUT FILENAME ----- EX5A.OUT
 POSTPROCESSOR RESULTS FILENAME --- EX5A.RES

 SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE = million gallons/day
 HEAD (HGL) = feet
 PRESSURE = psig

CONSTRAINT DATA

CONSTRAINT NUMBER	PARAMETER TYPE	NODE NUMBER	SET HGL
1	7 - GLOBAL (R)	10	270.54
2	8 - GLOBAL (D)	15	250.38

PIPELINE DATA

PIPE NUMBER	STATUS CODE	XX - CLOSED PIPE	CV - CHECK VALVE	FG - FIXED GRADE	RV - REGULATING VALVE	PU - PUMP LINE
1-FGPU	0	1 *1	2000.0	20.0	98.70	.00
2	1	2 *1	800.0	18.0	97.00	.00
3	3	3 *1	5000.0	16.0	97.00	.00
4-FG	3	0 *1	3700.0	12.0	96.00	.00
5	6	4 *1	3900.0	12.0	96.00	.00
6	5	4 *1	3900.0	15.0	97.00	.00
7-FGPU	0	5 *1	2100.0	16.0	97.00	.00
8	6	4 *1	2500.0	10.0	94.00	.00
9	3	7 *1	3100.0	10.0	94.00	.00
10	2	7 *1	3500.0	15.0	97.00	.00
11	7	6 *1	3700.0	12.0	96.00	.00
12-FG	0	6 *1	900.0	8.0	93.00	.00
13	5	6 *1	2900.0	12.0	96.00	.00
14	5	13 *1	4500.0	15.0	97.00	.00
15	6	13 *1	2500.0	10.0	94.00	.00
16	7	8 *1	2700.0	10.0	94.00	.00
17	2	10 *1	3100.0	12.0	96.00	.00
18	10	17 *1	1900.0	8.0	93.00	.00
19	1	12 *1	1500.0	6.0	91.00	.00
20	19	12 *1	1500.0	8.0	93.00	.00
21	8	9 *1	2900.0	8.0	93.00	.00
22	0	8 *1	1900.0	12.0	96.00	7.00
23-FG	0	8 *1	3100.0	12.0	96.00	.00
24	8	13 *1	1600.0	8.0	93.00	.00
25	13	14 *1	1750.0	6.0	91.00	.00
26	14	16 *1	1750.0	6.0	91.00	.00
27	14	15 *1	1500.0	6.0	91.00	.00
28	13	17 *1	2100.0	10.0	120.00	.00

Table 5A

Tabulated Results - Example 5A

PUMP DATA

THERE IS A PUMP IN LINE 1 DESCRIBED BY THE FOLLOWING DATA:

HEAD (ft)	FLOWRATE (mgd)
270.00	.00
240.00	8.00
195.00	10.00

THERE IS A PUMP IN LINE 7 DESCRIBED BY THE FOLLOWING DATA:

HEAD (ft)	FLOWRATE (mgd)
250.00	.00
225.00	8.00
195.00	10.00

JUNCTION NODE DATA

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	JUNCTION ELEVATION (ft)	CONNECTING PIPES
1		.00	90.00	1 2
2		1.00	110.00	2 3 10 17
3		1.00	95.00	3 4 5 9
4		3.00	105.00	5 6 8
5		1.00	100.00	6 11 13 14
6		3.50	103.00	9 10 11 12 15
7		3.00	107.00	16 22 23 24
8		1.50	107.00	18 21 22
9		.00	112.00	17 18 19
10		.50	115.00	19 20 21
11		.00	112.00	20 21
12		.00	110.00	14 15 24 25 28
13		.00	120.00	25 26 27
14		.25	135.00	27
15		.25	130.00	26
16		.00	115.00	28
17		.00	115.00	

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
 MAXIMUM AND MINIMUM PRESSURES = 6

SYSTEM CONFIGURATION

NUMBER OF PIPES(p) = 28
 NUMBER OF JUNCTION NODES(j) = 17
 NUMBER OF PRIMARY LOOPS(l) = 7
 NUMBER OF FIXED GRADE NODES(f) = 5
 NUMBER OF SUPPLY ZONES(z) = 1

PARAMETER CALCULATIONS

PIPE NO.	PARAMETER TYPE	CALCULATED VALUE
1	7 - ROUGHNESS	102.13
2	7 - ROUGHNESS	101.49
3	7 - ROUGHNESS	100.27
4	7 - ROUGHNESS	99.34
5	7 - ROUGHNESS	100.37
6	7 - ROUGHNESS	97.27
7	7 - ROUGHNESS	100.37
8	7 - ROUGHNESS	97.27
9	7 - ROUGHNESS	100.37
10	7 - ROUGHNESS	99.34
11	7 - ROUGHNESS	96.23
12	7 - ROUGHNESS	99.34
13	7 - ROUGHNESS	97.27
14	7 - ROUGHNESS	99.34
15	7 - ROUGHNESS	97.27
16	7 - ROUGHNESS	99.34
17	7 - ROUGHNESS	96.23
18	7 - ROUGHNESS	99.34
19	7 - ROUGHNESS	96.23
20	7 - ROUGHNESS	99.34
21	7 - ROUGHNESS	96.23
22	7 - ROUGHNESS	99.34
23	7 - ROUGHNESS	96.23
24	7 - ROUGHNESS	99.34
25	7 - ROUGHNESS	96.23
26	7 - ROUGHNESS	99.34
27	7 - ROUGHNESS	96.23
28	7 - ROUGHNESS	124.17

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		.00	300.98	90.00	210.98	91.43
2		.90	287.62	110.00	177.62	76.97
3		.90	261.13	95.00	166.13	71.99
4		2.71	260.20	105.00	155.20	67.25
5		.90	280.75	100.00	180.75	78.33
6		3.16	255.46	103.00	152.46	66.07
7		2.71	256.37	97.00	159.37	69.06
8		1.36	251.16	103.00	152.16	67.20
9		.00	269.60	112.00	151.54	70.46
10		.00	268.79	115.00	150.79	65.34
11		.45	265.07	112.00	153.07	66.33
12		.00	262.90	110.00	152.90	66.26
13		.00	256.93	120.00	136.93	59.34
14		.23	250.38	135.00	115.38	50.00
15		.00	249.29	130.00	119.29	51.69
16		.23	262.90	115.00	147.90	64.09

PIPELINE RESULTS

STATUS CODE: KX - CLOSED PIPE FG - FIXED GRADE NODE PU - PUMP LINE
CV - CHECK VALVE RV - REGULATING VALVE TK - STORAGE TANK

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00004

Example 5A - Field pressures: node 10 - 70 psig, node 15 - 50 psig

Illustrates the calculation of calibration parameters:

Global roughness and global demand factors

PIPELINE RESULTS

PIPE NUMBER	PIPE NOS. #1 #2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/1000 (ft/s)
1-FGPU	0 1 *1	9.03	19.74	220.72	.00	6.90	9.87
2	1 2 *1	9.03	13.36	.00	.00	7.90	16.70
3	2 3 *1	3.53	26.49	.00	.00	3.91	5.30
4-FG	3 0 *1	1.80	11.93	.00	.00	5.10	15.30
5	3 4 *1	2.32	20.55	.00	.00	.62	.25
6	4 1	2.56	57.50	218.25	.00	3.74	5.27
7-FGPU	0 5 *1	8.57	4.74	.00	.00	9.49	27.38
8	5 1	3.09	31.25	.00	.00	1.44	1.90
9	1 7 *1	.51	4.76	.00	.00	3.90	5.68
10	7 6 *1	.31	.91	.00	.00	.61	.24
11	6 1	.59	5.46	.00	.00	2.61	6.07
12-FG	0 6 *1	2.14	25.29	.00	.00	4.22	8.72
13	5 13 *1	2.55	17.85	.00	.00	3.21	3.37
14	6 13 *1	.73	7.44	.00	.00	2.06	2.87
15	7 8 *1	1.51	14.08	.00	.00	1.94	4.54
16	2 10 *1	.99	3.94	.00	.00	2.31	4.85
17	10 9 *1	.52	7.75	.00	.00	.54	.48
18	10 11 *1	.07	.64	.00	.00	1.70	2.75
19	11 12 *1	.20	18.45	.00	.00	2.67	6.36
20	12 9 *1	.19	5.56	.00	.00	2.34	2.93
21	9 8 *1	1.37	11.74	.00	.00	2.69	3.79
22	8 13 *1	.45	5.97	.00	.00	2.00	3.73
23-FG	0 13 *1	.23	6.55	.00	.00	1.78	4.37
24	13 16 *1	.00	.00	.00	.00	.00	.00
25	16 11 *1	.23	6.55	.00	.00	.00	.00
26	11 17 *1	.00	.00	.00	.00	.00	.00

Table 5A Tabulated Results - Example 5A

INPUT DATA FILENAME ----- EXSB.DAT
 TABULATED OUTPUT FILENAME ----- EXSB.OUT
 POSTPROCESSOR RESULTS FILENAME ----- EXSB.RES

 SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE = million gallons/day
 HEAD (HGL) = feet
 PRESSURE = psig

CONSTRAINT DATA

CONSTRAINT NUMBER	PARAMETER	NODE NUMBER	SET HGL
1	3 - FGN SETTING	15	273.46
2	1 - PUMP SPEED	2	294.62

PIPELINE DATA

PIPE NUMBER	PIPE NOS. #1 #2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	FGN-HGL (ft)
1-FGPU	0 1	2000.0	20.0	98.00	.00	100.00
2	1 2	800.0	18.0	98.00	.00	
3	2 3	5000.0	16.0	97.30	.00	
4-FG	3 0 *1	700.0	10.0	94.00	.00	250.00
5	4 3	3700.0	12.0	96.00	.00	
6	5 4	3900.0	15.0	97.00	.00	
7-FGPU	0 5 *2	2100.0	16.0	94.00	.00	120.00
8	6 4	2500.0	10.0	94.00	.00	
9	3 7	3100.0	10.0	97.00	.00	
10	2 7	5500.0	12.0	96.00	.00	
11	6 7	3700.0	12.0	93.00	.00	
12-FG	6 0 *1	2900.0	12.0	96.00	.00	
13	5 13	4500.0	15.0	97.00	.00	
14	5 13	2500.0	10.0	94.00	.00	
15	7 8	2700.0	10.0	94.00	.00	
16	2 10	3100.0	12.0	96.00	.00	
17	10 9	1900.0	8.0	93.00	.00	
18	10 11	1600.0	8.0	93.00	.00	
19	11 12	1500.0	6.0	91.00	.00	
20	11 12	1650.0	8.0	93.00	.00	
21	9 12	2900.0	8.0	93.00	.00	
22	9 8	2900.0	8.0	93.00	.00	
23-FG	8 0 *1	1900.0	12.0	96.00	.00	250.00
24	13 8	3100.0	12.0	98.00	.00	
25	13 14	1600.0	8.0	91.00	.00	
26	14 16	1750.0	6.0	91.00	.00	
27	14 15	1500.0	6.0	91.00	.00	
28	13 17	2100.0	10.0	120.00	.00	

Table 5B Tabulated Results - Example 5B

PUMP DATA

THERE IS A PUMP IN LINE 1 DESCRIBED BY THE FOLLOWING DATA:

HEAD (ft)	FLOWRATE (mgd)
270.00	.00
240.00	8.00
195.00	10.00

THERE IS A PUMP IN LINE 7 DESCRIBED BY THE FOLLOWING DATA:

HEAD (ft)	FLOWRATE (mgd)
250.00	.00
225.00	8.00
195.00	10.00

JUNCTION NODE DATA

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	JUNCTION ELEVATION (ft)	CONNECTING PIPES
1		.00	90.00	1 2
2		1.00	110.00	2 3 10 17
3		1.00	95.00	3 4 5 9
4		3.00	105.00	5 6 8
5		1.00	100.00	6 7 13 14 15
6		3.50	103.00	8 11 12 13 14 15
7		3.00	97.00	9 10 11 16 21 22 24
8		1.50	103.00	16 22 23 24
9		.00	107.00	18 19 21 22 24
10		.00	112.00	19 20 21
11		.50	115.00	20 21
12		.00	112.00	14 15 24 25 28
13		.00	120.00	25 26 27
14		.00	135.00	27
15		.25	130.00	26
16		.00	115.00	28
17		.00		

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
 MAXIMUM AND MINIMUM PRESSURES = 6

SYSTEM CONFIGURATION

NUMBER OF PIPES (p) = 28
 NUMBER OF JUNCTION NODES (j) = 17
 NUMBER OF PRIMARY LOOPS (f) = 5
 NUMBER OF FIXED GRADE NODES (f) = 5
 NUMBER OF PRESSURE ZONES (z) = 1

PARAMETER CALCULATIONS

PIPE NO.	PARAMETER TYPE	CALCULATED VALUE
4	3 - FGN SETTING	239.48
7	1 - PUMP SPEED	1.34
12	3 - FGN SETTING	239.48
23	3 - FGN SETTING	239.48

***** SIMULATION RESULTS *****

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00016

SIMULATION DESCRIPTION (LABEL)

Example 5B

Illustrates the calculation of operating parameters:

pump speed (pipe 1 and 7), pressures: 80 psig (node 2), 60 psig (node 15)

PIPELINE RESULTS

STATUS CODE:		XX - CLOSED PIPE		FG - FIXED GRADE NODE		RV - REGULATING VALVE		PU - PUMP LINE	
PIPE NUMBER	NODE NOS.	CV	CHECK VALVE	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELOCITY (ft/s)	HL/1000 (ft/ft)
1-FGPU	0	1		8.69	19.87	227.77	.00	6.17	9.94
2	1	2		8.69	13.28	.00	.00	7.61	16.60
3	2	3		3.32	25.85	.00	.00	3.68	5.01
4-FG	3	0	*1	2.97	30.09	.00	.00	8.43	42.98
5	4	3		1.85	9.07	.00	.00	2.06	2.45
6	5	4		1.85	54.40	.00	.00	6.12	13.95
7-FGPU	0	5	*2	13.25	137.56	350.59	.00	14.68	65.50
8	6	4		.81	9.60	.00	.00	2.29	3.84
9	7	7		2.82	3.09	.00	.00	1.10	1.00
10	8	7		1.56	28.14	.00	.00	3.56	5.12
11	9	6		1.41	29.56	.00	.00	1.04	3.49
12-FG	6	0	*1	3.42	63.99	.00	.00	6.27	32.49
13	5	6		3.98	43.50	.00	.00	5.74	22.07
14	5	13		-1.21	-20.49	.00	.00	3.02	9.67
15	6	13		.74	8.82	.00	.00	2.10	8.20
16	7	8		1.56	15.59	.00	.00	3.06	5.13
17	2	10		.99	8.42	.00	.00	1.95	2.22
18	10	9		.07	9.42	.00	.00	2.51	6.01
19	10	11		.07	70	.00	.00	.51	.47
20	11	12		.43	6.10	.00	.00	1.93	3.70
21	9	12		.56	16.86	.00	.00	2.46	5.81
22	8	0	*1	2.06	16.38	.00	.00	4.06	8.62
23-FG	0	0		2.26	31.88	.00	1.79	4.46	10.28
24	13	14		.50	7.66	.00	.00	2.22	4.79
25	14	16		1.25	9.81	.00	.00	1.97	5.61
26	14	15		.25	8.41	.00	.00	1.97	5.61
27	14	15		.25	8.41	.00	.00	1.97	5.61
28	13	17		.00	.00	.00	.00	.00	.00

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psig)
1		.00	307.90	90.00	217.90	94.42
2		1.00	294.62	110.00	184.62	80.00
3		1.00	269.57	95.00	174.57	75.65
4		3.00	278.64	105.00	173.64	75.24
5		1.00	333.03	100.00	233.03	100.98
6		3.50	269.04	103.00	166.04	71.95
7		3.00	266.48	97.00	169.48	73.44
8		1.50	257.65	103.00	154.65	67.02
9		.00	274.51	107.00	166.51	72.59
10		.50	278.73	110.00	166.73	72.59
11		.50	268.41	112.00	156.41	67.78
12		.00	289.53	110.00	179.53	77.80
13		.00	281.87	120.00	161.87	70.14
14		.25	273.46	135.00	138.46	60.00
15		.25	272.06	130.00	142.06	61.56
16		.00	289.53	115.00	174.53	75.63
17		.00	289.53	115.00	174.53	75.63

MAXIMUM AND MINIMUM VALUES

location (node or pipe) and value

MAXIMUM PRESSURES		MINIMUM PRESSURES	
5	100.98	15	60.00
1	94.42	16	61.56
2	80.00	11	66.02
13	77.80	9	67.78
17	75.63	12	70.14

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE FLOWRATE

PIPE NUMBER	FLOWRATE (mgd)
1	8.69
4	-2.97
7	13.25
12	-1.41
23	-2.06

NET SYSTEM INFLOW = 21.94
NET SYSTEM OUTFLOW = -6.44
NET SYSTEM DEMAND = 15.50

Table 5B Tabulated Results - Example 5B

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES
DEMAND TYPE = 1 - GDF = 1.580

SIMULATION RESULTS

TIME FROM INITIATION OF EPS = 6.0000 HOURS
THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00000

PIPELINE RESULTS

STATUS CODE:		XX - CLOSED PIPE	FG - FIXED GRADE NODE	FU - PUMP LINE		
		CV - CHECK VALVE	RV - REGULATING VALVE	TK - STORAGE TANK		
PIPE NUMBER	NODE NOS. #1 #2	FLOWRATE (mgd)	HEAD LOSS (ft)	MINOR LOSS (ft)	LINE VELO. (ft./sec.)	HL/ 1000 (ft./ft.)
1-FGPU	0 1	11.45	33.07	247.95	.00	8.12
7-FGPU	0 5	9.18	69.78	209.28	.00	10.18
10	2 7	4.03	54.55	.00	.00	9.92
20	11 12	-.05	-.43	.00	.00	-.30

PARAMETER CALCULATIONS

PIPE NO. PARAMETER TYPE CALCULATED VALUE
1 1 - PUMP SPEED 1.14

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

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JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
11	Lakeview Rd.	.79	253.66	115.00	138.46	60.00
15	East Wall	.40	212.98	135.00	77.98	33.79
16-2	Central Hos.	.25	222.79	130.00	92.79	40.21

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER FLOWRATE (mgd)

1	11.45
4	.55
7	9.18
12	1.30
23	1.57

NET SYSTEM INFLOW = 24.05
NET SYSTEM OUTFLOW = .00
NET SYSTEM DEMAND = 24.06

TANK STATUS REPORT (time = 6.0000 hours)

TANK NUMBER	PIPE NUMBER	NET FLOW (mgd)	WATER ELEVATION (ft)	TANK DEPTH (ft)	TANK VOLUME (gal)	TANK STATUS (%)	PROJECTE DEPTH (ft)
1-1	4	-.55	259.93	19.93	421619.	66.4 DRAINING	17.77
2-1	12	-1.30	257.71	17.71	371561.	98.0 DRAINING	12.57
3-2	23	-1.57	252.89	12.89	272890.	43.0 DRAINING	6.70

* TANK TYPE: 1 - CONSTANT DIAMETER 2 - DEPTH/VOLUME DATA

FLOW METER REPORT (time = 6.0000 hours)

PIPE NUMBER	NODE NUMBERS #1 #2	METERED FLOW (gal)
2	1 2	1912844.
7	0 5	2160022.
28	0 5	0.
4	3 0	-21294.
12	0 6	240023.
23	0 8	361872.

DATA CHANGES FOR NEXT SIMULATION

Table 5D Tabulated Results - Example 5D (6 hours)

