Reviewed for Code Compliance
Inspections Division
Approved with Conditions
Date: 11/12/14

. . . Fire Protection by Computer Design

HIGH TECH FIRE PROTECTION
84 HACKETT MILLS ROAD
P.O. BOX 156
POLAND, ME 04274
207-998-2551

Job Name	:	660 CONGRESS STREET 1ST FLOOR COMMERCIAL SPACE
Drawing	:	FP-01
Location	:	1ST FLOOR COMMERCIAL / RETAIL SPACE 104
Remote Area	:	#1
Contract	:	
Data File	:	1ST FLOOR COM.WXF

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HYDRAULIC CALCULATIONS
for

Project name: 660 CONGRESS STREET 3RD FLOOR RESIDENTIAL
Location: 1ST FLOOR COMMERCIAL / RETAIL SPACE 104
Drawing no: FP-01
Date: 8-12-14

Design

Remote area number: #1
Remote area location: 1ST FLOOR COMMERCIAL / RETAIL SPACE 104
Occupancy classification: COMMERCAIL / ORDINARY HAZARD GROUP 2
Density: .2 - Gpm/SqFt
Area of application: 900 - SqFt
Coverage per sprinkler: 120 - SqFt
Type of sprinklers calculated: COMMERCIAL PENDENTS AND HSW
No. of sprinklers calculated: 11
In-rack demand: N/A - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 551 - GPM @ 58 - Psi
Type of system: WET SYSTEM NFPA 13
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 8-8-2014
Location: TEST HYDRANT ACROSS THE STREET FROM SITE
Source: PORTLAND WATER DISTRICT

Name of contractor: HIGH TECH FIRE PROTECTION
Address: 84 HACKETT MILLS ROAD / P.O. BOX 156 / POLAND, ME 04274
Phone number: 207-998-2551
Name of designer: ED POULIN
Authority having jurisdiction: STATE OF MAINE / CITY OF PORTLAND
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

HIGH TECH FIRE PROTECTION
660 CONGRESS STREET 1ST FLOOR COMMERCIAL SPACE

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Date 8

Date: 11/12/14

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CITY OF PORTLAND, MAINE

City Water Supply:
- C1 - Static Pressure : 66
- C2 - Residual Pressure: 64
- C2 - Residual Flow : 1164

Demand:

D1 - Elevation	:	6.063
D2 - System Flow	:	301.065
D2 - System Pressure	:	57.441
Hose (Demand)	:	250
D3 - System Demand	:	551.065
Safety Margin	:	8.057

Fittings Used Summary

HIGH TECH FIRE PROTECTION
660 CONGRESS STREET 1ST FLOOR COMMERCIAL SPACE

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CITY OF PORTLAND, MAINE

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18		
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zia	Wilkins 350	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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Flow Summary - STANDARD

FIRE PROTECTION
SS STREET 1ST FLOOR COMMERCIAL SPACE

Date 8-12-14

	levation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	5.6	18.37	na	24.0	0.2	120	7.0
DP2	-1.0	5.6	18.37	na	24.0	0.2	120	7.0
100	20.0	5.6	17.3	na	23.29	0.2	100	7.0
101	20.0	K = K @ EQ01	19.03	na	24.0			
102	20.0	K = K @ EQ01	20.31	na	24.79			
105	20.0	K = K @ EQ01	24.28	na	27.11			
106	20.0		24.55	na				
110	20.0	K = K @ EQ02	24.1	na	27.41			
111	20.0		25.68	na				
120	20.0	K = K @ EQ02	20.49	na	25.27			
121	20.0		25.9	na				
125	20.0	K = K @ EQ01	26.31	na	28.22			
126	20.0	K = K @ EQ02	28.78	na	29.95			
131	20.0	K = K @ EQ01	31.05	na	30.66			
132	20.0		32.07	na				
135	20.0	K = K @ EQ02	28.58	na	29.84			
136	20.0		32.12	na				
140	20.0		32.49	na				
141	20.0		32.63	na				
142	20.0		33.14	na				
127	20.0		33.29	na				
150	20.0	K = K @ EQ02	29.89	na	30.52			
151	20.0		33.88	na				
152	20.0		37.22	na				
153	8.0		43.89	na				
TO1	8.0		45.84	na				
BO1	3.0		53.88	na				
BASE	0.0		59.22	na				
H1	0.0		59.74	na				
H2	0.0		59.75	na	250.0			
TEST	6.0		57.44	na				

The maximum velocity is 12.36 and it occurs in the pipe between nodes 126 and 127

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lations - Hazen-Williams

:IRE PROTECTION
:SS STREET 1ST FLOOR COMMERCIAL SPACE

Date 8-12-14

Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
DP1	24.00	1.049	1T	5.0	1.000	18.367		K Factor = 5.60
to		120.0		0.0	5.000	-0.433		
EQ01	24.0	0.1823		0.0	6.000	1.094		Vel = 8.91
	0.0							
	24.00					19.028		K Factor = 5.50
DP2	24.00	1.049	1E	2.0	1.000	18.367		K Factor = 5.60
to		120.0		0.0	2.000	-0.433		
EQ02	24.0	0.1823		0.0	3.000	0.547		Vel = 8.91
	0.0							
	24.00					18.481		K Factor = 5.58
100	23.29	1.049	3E	6.0	4.000	17.303		K Factor = 5.60
to		120.0		0.0	6.000	0.0		
101	23.29	0.1725		0.0	10.000	1.725		Vel = 8.65
101	24.00	1.38		0.0	7.600	19.028		K Factor @ node EQ01
to		120.0		0.0	0.0	0.0		
102	47.29	0.1683		0.0	7.600	1.279		Vel = 10.14
102	24.80	1.61	1E	4.0	12.500	20.307		K Factor @ node EQ01
to		120.0	1T	8.0	12.000	0.0		
106	72.09	0.1731		0.0	24.500	4.242		Vel = 11.36
	0.0							
	72.09					24.549		K Factor = 14.55
105	27.11	1.38		0.0	4.500	24.279		K Factor @ node EQ01
to		120.0		0.0	0.0	0.0		
106	27.11	0.0600		0.0	4.500	0.270		Vel = 5.82
106	72.09	2.067	1T	10.0	2.200	24.549		
to		120.0		0.0	10.000	0.0		
111	99.2	0.0925		0.0	12.200	1.129		Vel = 9.48
	0.0							
	99.20					25.678		K Factor = 19.58
110	27.41	1.049	1T	5.0	1.750	24.105		K Factor @ node EQ02
to		120.0		0.0	5.000	0.0		
111	27.41	0.2330		0.0	6.750	1.573		Vel = 10.18
111	99.20	2.635		0.0	5.000	25.678		
to		120.0		0.0	0.0	0.0		
121	126.61	0.0446		0.0	5.000	0.223		Vel = 7.45
	0.0							
	126.61					25.901		K Factor = 24.88
120	25.27	1.049	3E	6.0	16.000	20.486		K Factor @ node EQ02
to		120.0	1T	5.0	11.000	0.0		
121	25.27	0.2006		0.0	27.000	5.415		Vel = 9.38
121	126.60	2.635		0.0	6.500	25.901		
to		120.0		0.0	0.0	0.0		
125	151.87	0.0625		0.0	6.500	0.406		Vel = 8.94
125	28.22	2.635	1T	16.474	12.400	26.307		K Factor @ node EQ01
to		120.0		0.0	16.474	0.0		
126	180.09	0.0855		0.0	28.874	2.469		Vel = 10.60
126	29.95	2.635	2T	32.948	6.750	28.776		K Factor @ node EQ02
to		120.0		0.0	32.948	0.0		
127	210.04	0.1137		0.0	39.698	4.514		Vel = 12.36

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Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
	0.0 210.04					33.290		K Factor = 36.40
131 to 132	30.66 30.66	1.38 120.0 0.0754	2E	6.0 0.0 0.0	7.500 6.000 13.500	31.049 0.0 1.018		K Factor @ node EQ01 Vel = 6.58
132 to 136	0.0 30.66	2.157 120.0 0.0086		0.0 0.0 0.0	6.500 0.0 6.500	32.067 0.0 0.056		 Vel = 2.69
	0.0 30.66					32.123		K Factor = 5.41
135 to 136	29.84 29.84	1.049 120.0 0.2728	1T 1E	5.0 2.0 0.0	6.000 7.000 13.000	28.576 0.0 3.547		K Factor @ node EQ02 Vel = 11.08
136 to 140	30.66 60.5	2.157 120.0 0.0301	2V	8.615 0.0 0.0	3.500 8.615 12.115	32.123 0.0 0.365		 Vel = 5.31
140 to 141	0.0 60.5	2.157 120.0 0.0300	1V	4.307 0.0 0.0	0.500 4.307 4.807	32.488 0.0 0.144		 Vel = 5.31
141 to 142	0.0 60.5	2.157 120.0 0.0302	1V	4.307 0.0 0.0	12.500 4.307 16.807	32.632 0.0 0.507		 Vel = 5.31
	0.0 60.50					33.139		K Factor = 10.51
142 to 127	60.50 60.5	2.157 120.0 0.0302		0.0 0.0 0.0	5.000 0.0 5.000	33.139 0.0 0.151		 Vel = 5.31
127 to 151	210.04 270.54	3.26 120.0 0.0644		0.0 0.0 0.0	9.100 0.0 9.100	33.290 0.0 0.586		 Vel = 10.40
	0.0 270.54					33.876		K Factor = 46.48
150 to 151	30.52 30.52	1.049 120.0 0.2845	1E 1T	2.0 5.0 0.0	7.000 7.000 14.000	29.893 0.0 3.983		K Factor @ node EQ02 Vel = 11.33
151 to 152	270.54 301.06	3.26 120.0 0.0785	2V 1X	13.44 17.471 0.0	11.700 30.911 42.611	33.876 0.0 3.344		 Vel = 11.57
152 to 153	0.0 301.06	3.26 120.0 0.0785	1V	6.72 0.0 0.0	12.000 6.720 18.720	37.220 5.197 1.470		 Vel = 11.57
153 to TO1	0.0 301.06	3.26 120.0 0.0785	2V	13.44 0.0 0.0	11.500 13.440 24.940	43.887 0.0 1.957		 Vel = 11.57
TO1 to BO1	0.0 301.06	3.26 120.0 0.0785	1Fsp 1B 1T	0.0 13.44 20.159	3.000 33.599 36.599	45.844 5.166 2.872		 * Fixed loss = 3 Vel = 11.57

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Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BO1	0.0	4.26	1Zia	0.0	2.000	53.882		
to		120.0	1E	13.167	13.167	5.012		* Fixed loss = 3.713
BASE	301.06	0.0214		0.0	15.167	0.324		Vel = 6.78
BASE	0.0	6.16	2F	20.084	130.000	59.218		
to		140.0	1G	4.304	67.425	0.0		
H1	301.06	0.0027	1T	43.037	197.425	0.526		Vel = 3.24
H1	0.0	16.32	1T	87.173	20.000	59.744		
to		100.0		0.0	87.174	0.0		
H2	301.06	0.0		0.0	107.174	0.004		Vel = 0.46
H2	250.01	6.16	1G	4.304	10.000	59.748		Qa = 250
to		140.0	1E	20.084	25.823	-2.599		
TEST	551.07	0.0082	1Eql	1.435	35.823	0.292		Vel = 5.93
	0.0							
	551.07					57.441		K Factor = 72.71

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. . . Fire Protection by Computer Design

HIGH TECH FIRE PROTECTION
84 HACKETT MILLS ROAD
P.O. BOX 156
POLAND, ME 04274
207-998-2551

Job Name	:	660 CONGRESS STREET 3RD FLOOR RESIDENTIAL
Drawing	:	FP-01
Location	:	3RD FLOOR RESIDENTIAL
Remote Area	:	#3
Contract	:	
Data File	:	3RD FLOOR RES.WXF

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HYDRAULIC CALCULATIONS
for

Project name: 660 CONGRESS STREET 3RD FLOOR RESIDENTIAL
Location: 3RD FLOOR RESIDENTIAL
Drawing no: FP-01
Date: 8-12-14

Design

Remote area number: #3
Remote area location: 3RD FLOOR LIVING AND DINING AREA 309
Occupancy classification: RESIDENTIAL / LIGHT HAZARD
Density: .1 - Gpm/SqFt
Area of application: 4 HEAD - SqFt
Coverage per sprinkler: 256 - SqFt
Type of sprinklers calculated: RESIDENTIAL PENDENTS AND HSW
No. of sprinklers calculated: 4
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 207 - GPM @ 60 - Psi
Type of system: WET SYSTEM NFPA 13
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 8-8-2014
Location: TEST HYDRANT ACROSS THE STREET FROM SITE
Source: PORTLAND WATER DISTRICT

Name of contractor: HIGH TECH FIRE PROTECTION
Address: 84 HACKETT MILLS ROAD / P.O. BOX 156 / POLAND, ME 04274
Phone number: 207-998-2551
Name of designer: ED POULIN
Authority having jurisdiction: STATE OF MAINE / CITY OF PORTLAND
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

HIGH TECH FIRE PROTECTION
660 CONGRESS STREET 3RD FLOOR RESIDENTIAL

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City Water Supply:

C1 - Static Pressure	:	66
C2 - Residual Pressure:		64
C2 - Residual Flow	:	1164

Demand:

D1 - Elevation	:	14.725
D2 - System Flow	:	106.654
D2 - System Pressure	:	59.547
Hose (Demand)	:	100
D3 - System Demand	:	206.654
Safety Margin	:	6.372

Fittings Used Summary

HIGH TECH FIRE PROTECTION
660 CONGRESS STREET 3RD FLOOR RESIDENTIAL

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CITY OF PORTLAND, MAINE

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18		
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
Zia	Wilkins 350	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

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Flow Summary - STANDARD

FIRE PROTECTION
SS STREET 3RD FLOOR RESIDENTIAL

Date 8-12-14

	levation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	5.8	19.48	na	25.6	0.1	256	7.6
300	40.0	5.8	19.48	na	25.6	0.1	256	11.9
301	40.0	5.8	20.67	na	26.37	0.1	256	11.9
302	40.0		21.39	na				
303	41.0		22.06	na				
310	41.5	K = K @ EQ01	21.07	na	26.34			
311	41.5		22.38	na				
312	41.0		23.45	na				
305	41.0		24.36	na				
320	41.0	K = K @ EQ01	24.41	na	28.35			
321	41.0		25.67	na				
322	41.0		27.69	na				
323	41.0		32.0	na				
324	21.0		43.19	na				
325	21.0		43.52	na				
326	8.0		49.63	na				
TO2	8.0		50.85	na				
BO2	3.0		56.96	na				
BASE	0.0		62.02	na				
H1	0.0		62.1	na				
H2	0.0		62.1	na	100.0			
TEST	6.0		59.55	na				

The maximum velocity is 12.53 and it occurs in the pipe between nodes 305 and 321

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Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
DP1	25.60	1.101	1N	7.0	1.000	19.482		K Factor = 5.80
to		150.0		0.0	7.000	-0.433		
EQ01	25.6	0.1074		0.0	8.000	0.859		Vel = 8.63
	0.0							
	25.60					19.908		K Factor = 5.74
300	25.60	1.101	1O	5.0	12.750	19.482		K Factor = 5.80
to		150.0		0.0	5.000	0.0		
302	25.6	0.1074		0.0	17.750	1.906		Vel = 8.63
	0.0							
	25.60					21.388		K Factor = 5.54
301	26.37	1.101	1O	5.0	1.300	20.673		K Factor = 5.80
to		150.0		0.0	5.000	0.0		
302	26.37	0.1135		0.0	6.300	0.715		Vel = 8.89
302	25.60	1.394	1N	8.0	0.750	21.388		
to		150.0		0.0	8.000	-0.433		
303	51.97	0.1262		0.0	8.750	1.104		Vel = 10.92
303	0.0	1.394	1O	6.0	12.200	22.059		
to		150.0		0.0	6.000	0.0		
305	51.97	0.1262		0.0	18.200	2.297		Vel = 10.92
	0.0							
	51.97					24.356		K Factor = 10.53
310	26.34	1.101	1N	7.0	4.600	21.071		K Factor @ node EQ01
to		150.0		0.0	7.000	0.0		
311	26.34	0.1132		0.0	11.600	1.313		Vel = 8.88
311	0.0	1.101	1N	7.0	0.500	22.384		
to		150.0		0.0	7.000	0.217		
312	26.34	0.1132		0.0	7.500	0.849		Vel = 8.88
312	0.0	1.101	1N	7.0	1.000	23.450		
to		150.0		0.0	7.000	0.0		
305	26.34	0.1132		0.0	8.000	0.906		Vel = 8.88
305	51.97	1.598		0.0	9.500	24.356		
to		150.0		0.0	0.0	0.0		
321	78.31	0.1385		0.0	9.500	1.316		Vel = 12.53
	0.0							
	78.31					25.672		K Factor = 15.46
320	28.35	1.101	1O	5.0	4.750	24.407		K Factor @ node EQ01
to		150.0		0.0	5.000	0.0		
321	28.35	0.1297		0.0	9.750	1.265		Vel = 9.55
321	78.30	2.003	1O	10.0	14.750	25.672		
to		150.0		0.0	10.000	0.0		
322	106.65	0.0816		0.0	24.750	2.020		Vel = 10.86
322	0.0	2.003	2N	22.0	30.700	27.692		
to		150.0		0.0	22.000	0.0		
323	106.65	0.0817		0.0	52.700	4.303		Vel = 10.86
323	0.0	2.003	1N	11.0	20.000	31.995		
to		150.0		0.0	11.000	8.662		
324	106.65	0.0816		0.0	31.000	2.531		Vel = 10.86
324	0.0	2.635	1N	12.0	3.500	43.188		
to		150.0		0.0	12.000	0.0		
325	106.65	0.0215		0.0	15.500	0.333		Vel = 6.27

Reviewed for Code Compliance
Inspections Division
Approved with Conditions
Date: 11/12/14

Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
325	0.0	2.635	1E	12.447	10.000	43.521		
to		150.0		0.0	12.446	5.630		
326	106.65	0.0215		0.0	22.446	0.482		Vel = 6.27
326	0.0	2.635	4V	23.613	14.000	49.633		
to		120.0		0.0	23.613	0.0		
TO2	106.65	0.0325		0.0	37.613	1.221		Vel = 6.27
TO2	0.0	2.635	1Fsp	0.0	3.000	50.854		
to		120.0	1B	9.61	26.084	5.166		* Fixed loss = 3
BO2	106.65	0.0324	1T	16.474	29.084	0.943		Vel = 6.27
BO2	0.0	4.26	1Zia	0.0	2.000	56.963		
to		120.0	1E	13.167	13.167	5.011		* Fixed loss = 3.712
BASE	106.65	0.0032		0.0	15.167	0.048		Vel = 2.40
BASE	0.0	6.16	2F	20.084	130.000	62.022		
to		140.0	1G	4.304	67.425	0.0		
H1	106.65	0.0004	1T	43.037	197.425	0.077		Vel = 1.15
H1	0.0	16.32	1T	87.173	20.000	62.099		
to		100.0		0.0	87.174	0.0		
H2	106.65	0.0		0.0	107.174	0.001		Vel = 0.16
H2	100.00	6.16	1G	4.304	10.000	62.100		Qa = 100
to		140.0	1E	20.084	24.388	-2.599		
TEST	206.65	0.0013		0.0	34.388	0.046		Vel = 2.22
	0.0 206.65					59.547		K Factor = 26.78