

ภาคผนวก

ภาคผนวก ก

โปรแกรม Hydraulic Analysis Software – Version : 1.3.2

รายการคำนวณระบบหัวกระจายน้ำดับเพลิง

โดยใช้ โปรแกรม Hydraulic Analysis Software – Version : 1.3.2

โดย บริษัท ไฟร์เทค อินโนเวชั่น จำกัด

Full Hydraulic Calculations Computer Printout Page No 1	
Submitted by user number 0403 Firetech Innovation Co., Ltd 30th Floor, Fortune Town Office Bldg 1 Ratchadaphisek Road Dindaeng Bangkok 10400 Thailand Tel: +662 6411991- 2 Fax: +662 6411993	Project: Hitech Zippermax Address: Samutprakarn Number: --- Area ref: Most Remorted Area Hazard: Extra Hazard Group2 Authority: National Fire Protection Association Source: 5980.1 l/min @ 5.300 bar Printout: 20-April-06 at 15:07
Project Data and Design Parameters	
Project name : Hitech Zippermax Area reference : Most Remorted Area Address / location : Samutprakarn Project number : --- Installation number(s) : 1 Drawing number(s) : FP-01 Issue no / date : 20.03.2006 Designers reference : Firetech Innovation Co..Ltd. Project Data File : H:\...\...\LAYOUT_REV1.FHC Hazard classification : Extra Hazard Group2 Design authority : National Fire Protection Association Insurance company : --- Specified density of discharge : 16.30 mm/min (l/min/m2) Assumed maximum area of operation : 234.00 m2 Number of operating sprinkler heads : 26 + 2 hydrant(s) Maximum area covered per head : 9.00 m2 Highest head / nozzle above source : 10.14 m Number of pipes in system : 290 from 50 to 150 mm Pressuer loss equation used : Hazen-Williams Fluid : Water Pipe Data Table : STD_PIPE.PDT Maximum fluid velocity : 6.04 m/s in pipe 253 254 Volume of pipework and fittings : 4.37 m3 Elbows are welded for : 65 mm and above Comment : --- Checked by & Date : Source duty = 5980.1 l/min @ 5.300 bar at node no 1	
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Full Hydraulic Calculations Computer Printout Page No 2												
Submitted by user number 0403 Firetech Innovation Co., Ltd 30th Floor, Fortune Town Office Bldg 1 Ratchadaphisek Road Dindaeng Bangkok 10400 Thailand Tel: +662 6411991- 2 Fax: +662 6411993						Project: Hitech Zippermax Address: Samutprakarn Number: --- Area ref: Most Remorted Area Hazard: Extra Hazard Group2 Authority: National Fire Protection Association Source: 5980.1 l/min @ 5.300 bar Printout: 20-April-06 at 15:07						
Operating Sprinkler Heads, Nozzles and Hydrants												
Head no	Node no	Size mm	'K' factor	Flow l/min	Area m2	Density Req.d	mm/min Actual	Pressure bar Min	Actual	Heights m	Pipe no	
171	248	20.0	115.00	194.0	9.000	16.30	21.55	0.50	2.845	8.238	247	
176	255	20.0	115.00	168.9	9.000	16.30	18.77	0.50	2.157	8.238	254	
177	256	20.0	115.00	160.6	9.000	16.30	17.85	0.50	1.951	8.713	255	
178	257	20.0	115.00	154.9	9.000	16.30	17.21	0.50	1.814	9.188	256	
179	258	20.0	115.00	151.1	9.000	16.30	16.79	0.50	1.726	9.663	257	
180	259	20.0	115.00	148.5	9.000	16.30	16.50	0.50	1.668	10.138	258	
181	262	20.0	115.00	168.1	9.000	16.30	18.68	0.50	2.136	8.238	261	
182	263	20.0	115.00	159.9	9.000	16.30	17.76	0.50	1.932	8.713	262	
183	264	20.0	115.00	154.1	9.000	16.30	17.12	0.50	1.796	9.188	263	
184	265	20.0	115.00	150.3	9.000	16.30	16.70	0.50	1.708	9.663	264	
185	266	20.0	115.00	147.7	9.000	16.30	16.41	0.50	1.650	10.138	265	
186	269	20.0	115.00	167.5	9.000	16.30	18.61	0.50	2.122	8.238	268	
187	270	20.0	115.00	159.3	9.000	16.30	17.70	0.50	1.920	8.713	269	
188	271	20.0	115.00	153.6	9.000	16.30	17.07	0.50	1.784	9.188	270	
189	272	20.0	115.00	149.8	9.000	16.30	16.64	0.50	1.696	9.663	271	
190	273	20.0	115.00	147.2	9.000	16.30	16.35	0.50	1.638	10.138	272	
191	276	20.0	115.00	167.2	9.000	16.30	18.58	0.50	2.114	8.238	275	
192	277	20.0	115.00	159.0	9.000	16.30	17.67	0.50	1.912	8.713	276	
193	278	20.0	115.00	153.3	9.000	16.30	17.03	0.50	1.776	9.188	277	
194	279	20.0	115.00	149.4	9.000	16.30	16.60	0.50	1.689	9.663	278	
195	280	20.0	115.00	146.9	9.000	16.30	16.32	0.50	1.631	10.138	279	
196	283	20.0	115.00	167.0	9.000	16.30	18.56	0.50	2.110	8.238	282	
197	284	20.0	115.00	158.8	9.000	16.30	17.65	0.50	1.908	8.713	283	
198	285	20.0	115.00	153.1	9.000	16.30	17.01	0.50	1.773	9.188	284	
199	286	20.0	115.00	149.3	9.000	16.30	16.59	0.50	1.685	9.663	285	
200	287	20.0	115.00	146.7	9.000	16.30	16.30	0.50	1.627	10.138	286	
	289			947.0		Hydrant			4.465	0.500	288	
	291			947.0		Hydrant			3.252	0.500	290	
0 heads are under the required density / minimum pressures												
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Hydraulically Significant Pipes in System											
NUMBERS		P I P E		F L O W		DIMENSIONS		ANGLE	VALUES	HEIGHT M	PRESSURES BARS
Pipe no	Start	Size	Type	L/min	Length	VJ	Dir.	Eq.len	Start	Start	Frict
no	End	Bore	'C'	Vel m/s	EL T	VT	Slope	mbar/m	End	End	Static
1	1	150mm	S40	5980.1	1.500		0	1.50	0.000	5.300	-0.028
2	154.08	120		5.3	0 0		0.0	18.5	0.000	5.272	+0.000
2	2	150mm	S40	5980.1	2.000		Up	5.66	0.000	5.272	-0.105
3	154.08	120		5.3	1 0	GV	90.0	18.5	2.000	4.972	-0.196
3	3	150mm	S40	5980.1	0.500		Up	10.25	2.000	4.972	-0.190
4	154.08	120		5.3	0 0	SV	90.0	18.5	2.500	4.733	-0.049
4	4	150mm	S40	5980.1	3.000		Up	3.00	2.500	4.733	-0.056
5	154.08	120		5.3	0 0		90.0	18.5	5.500	4.383	-0.294
5	5	150mm	S40	5980.1	0.850		0	3.59	5.500	4.383	-0.067
6	154.08	120		5.3	1 0		0.0	18.5	5.500	4.317	+0.000
6	6	150mm	S40	5033.1	30.000		270	39.14	5.500	4.317	-0.527
7	154.08	120		4.5	0 1		0.0	13.5	5.500	3.789	+0.000
7	6	150mm	S40	947.0	1.500		0	1.50	5.500	4.317	-0.001
8	154.08	120		0.8	0 0		0.0	0.6	5.500	4.316	+0.000
14	8	150mm	S40	947.0	3.000		0	3.00	5.500	4.316	-0.002
15	154.08	120		0.8	0 0		0.0	0.6	5.500	4.314	+0.000
21	15	150mm	S40	947.0	3.000		0	3.00	5.500	4.314	-0.002
22	154.08	120		0.8	0 0		0.0	0.6	5.500	4.312	+0.000
28	22	150mm	S40	947.0	3.000		0	3.00	5.500	4.312	-0.002
29	154.08	120		0.8	0 0		0.0	0.6	5.500	4.310	+0.000
35	29	150mm	S40	947.0	3.000		0	3.00	5.500	4.310	-0.002
36	154.08	120		0.8	0 0		0.0	0.6	5.500	4.308	+0.000
42	36	150mm	S40	947.0	3.000		0	3.00	5.500	4.308	-0.002
43	154.08	120		0.8	0 0		0.0	0.6	5.500	4.306	+0.000
49	43	150mm	S40	947.0	3.000		0	3.00	5.500	4.306	-0.002
50	154.08	120		0.8	0 0		0.0	0.6	5.500	4.305	+0.000
56	50	150mm	S40	947.0	3.000		0	3.00	5.500	4.305	-0.002
57	154.08	120		0.8	0 0		0.0	0.6	5.500	4.303	+0.000
63	57	150mm	S40	947.0	3.000		0	3.00	5.500	4.303	-0.002
64	154.08	120		0.8	0 0		0.0	0.6	5.500	4.301	+0.000
70	64	150mm	S40	947.0	3.000		0	3.00	5.500	4.301	-0.002
71	154.08	120		0.8	0 0		0.0	0.6	5.500	4.299	+0.000
77	71	150mm	S40	947.0	3.000		0	3.00	5.500	4.299	-0.002
78	154.08	120		0.8	0 0		0.0	0.6	5.500	4.297	+0.000
84	78	150mm	S40	947.0	3.000		0	3.00	5.500	4.297	-0.002
85	154.08	120		0.8	0 0		0.0	0.6	5.500	4.295	+0.000
91	85	150mm	S40	947.0	3.000		0	3.00	5.500	4.295	-0.002
92	154.08	120		0.8	0 0		0.0	0.6	5.500	4.294	+0.000
98	92	150mm	S40	947.0	3.000		0	3.00	5.500	4.294	-0.002
99	154.08	120		0.8	0 0		0.0	0.6	5.500	4.292	+0.000
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Hydraulically Significant Pipes in System											
NUMBERS		P I P E		F L O W		DIMENSIONS		ANGLE	VALUES	HEIGHT M	PRESSURES BARS
Pipe no	Start	Size	Type	L/min	Length VJ	Dir.	Eq.len	Start	Start	Fric	Static
no	End	Bore	'C'	Vel m/s	EL T	VT	Slope	mbar/m	End	End	
105	99	150mm	S40	947.0	3.000	0	3.00	5.500	4.292	-0.002	
	106	154.08	120	0.8	0 0	0.0	0.6	5.500	4.290	+0.000	
112	106	150mm	S40	947.0	3.000	0	3.00	5.500	4.290	-0.002	
	113	154.08	120	0.8	0 0	0.0	0.6	5.500	4.288	+0.000	
119	113	150mm	S40	947.0	3.000	0	3.00	5.500	4.288	-0.002	
	120	154.08	120	0.8	0 0	0.0	0.6	5.500	4.286	+0.000	
126	120	150mm	S40	947.0	3.000	0	3.00	5.500	4.286	-0.002	
	127	154.08	120	0.8	0 0	0.0	0.6	5.500	4.284	+0.000	
133	127	150mm	S40	947.0	3.000	0	3.00	5.500	4.284	-0.002	
	134	154.08	120	0.8	0 0	0.0	0.6	5.500	4.283	+0.000	
140	134	150mm	S40	947.0	3.000	0	3.00	5.500	4.283	-0.002	
	141	154.08	120	0.8	0 0	0.0	0.6	5.500	4.281	+0.000	
147	7	150mm	S40	5033.1	1.500	0	4.24	5.500	3.789	-0.057	
	148	154.08	120	4.5	1 0	0.0	13.5	5.500	3.732	+0.000	
154	148	150mm	S40	5033.1	3.000	0	3.00	5.500	3.732	-0.040	
	155	154.08	120	4.5	0 0	0.0	13.5	5.500	3.692	+0.000	
161	155	150mm	S40	5033.1	3.000	0	3.00	5.500	3.692	-0.040	
	162	154.08	120	4.5	0 0	0.0	13.5	5.500	3.651	+0.000	
168	162	150mm	S40	5033.1	3.000	0	3.00	5.500	3.651	-0.040	
	169	154.08	120	4.5	0 0	0.0	13.5	5.500	3.611	+0.000	
175	169	150mm	S40	5033.1	3.000	0	3.00	5.500	3.611	-0.040	
	176	154.08	120	4.5	0 0	0.0	13.5	5.500	3.570	+0.000	
182	176	150mm	S40	5033.1	3.000	0	3.00	5.500	3.570	-0.040	
	183	154.08	120	4.5	0 0	0.0	13.5	5.500	3.530	+0.000	
189	183	150mm	S40	5033.1	3.000	0	3.00	5.500	3.530	-0.040	
	190	154.08	120	4.5	0 0	0.0	13.5	5.500	3.490	+0.000	
196	190	150mm	S40	5033.1	3.000	0	3.00	5.500	3.490	-0.040	
	197	154.08	120	4.5	0 0	0.0	13.5	5.500	3.449	+0.000	
203	197	150mm	S40	5033.1	3.000	0	3.00	5.500	3.449	-0.040	
	204	154.08	120	4.5	0 0	0.0	13.5	5.500	3.409	+0.000	
210	204	150mm	S40	5033.1	3.000	0	3.00	5.500	3.409	-0.040	
	211	154.08	120	4.5	0 0	0.0	13.5	5.500	3.368	+0.000	
217	211	150mm	S40	5033.1	3.000	0	3.00	5.500	3.368	-0.040	
	218	154.08	120	4.5	0 0	0.0	13.5	5.500	3.328	+0.000	
224	218	150mm	S40	5033.1	3.000	0	3.00	5.500	3.328	-0.040	
	225	154.08	120	4.5	0 0	0.0	13.5	5.500	3.288	+0.000	
231	225	150mm	S40	5033.1	3.000	0	3.00	5.500	3.288	-0.040	
	232	154.08	120	4.5	0 0	0.0	13.5	5.500	3.247	+0.000	
238	232	150mm	S40	5033.1	3.000	0	3.00	5.500	3.247	-0.040	
	239	154.08	120	4.5	0 0	0.0	13.5	5.500	3.207	+0.000	
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Hydraulically Significant Pipes in System												
NUMBERS		P I P E		F L O W		DIMENSIONS		ANGLE	VALUES	HEIGHT M	PRESSURES BARS	
Pipe no	Start	Size	Type	L/min	Length	VJ	Dir.	Eq.len	Start	Start	Frict	Static
no	End	Bore	'C'	Vel m/s	EL T	VT	Slope	mbar/m	End	End	End	Static
245	239	150mm	S40	5033.1	3.000		0	3.00	5.500	3.207	-0.040	
	246	154.08	120	4.5	0 0		0.0	13.5	5.500	3.166	+0.000	
246	246	50mm	S40	193.9	2.500		Up	5.55	5.500	3.166	-0.034	
	247	52.48	120	1.5	0 1		90.0	6.2	8.000	2.887	-0.245	
247	247	50mm	S40	193.9	1.519		90	3.04	8.000	2.887	-0.019	
	248	52.48	120	1.5	1 0		9.0	6.2	8.238	2.845	-0.023	
252	246	150mm	S40	4839.2	3.000		0	3.00	5.500	3.166	-0.038	
	253	154.08	120	4.3	0 0		0.0	12.5	5.500	3.129	+0.000	
253	253	50mm	S40	784.0	2.500		Up	5.55	5.500	3.129	-0.454	
	254	52.48	120	6.0	0 1		90.0	81.9	8.000	2.429	-0.245	
254	254	50mm	S40	784.0	1.519		90	3.04	8.000	2.429	-0.249	
	255	52.48	120	6.0	1 0		9.0	81.9	8.238	2.157	-0.023	
255	255	50mm	S40	615.1	3.037		90	3.04	8.238	2.157	-0.159	
	256	52.48	120	4.7	0 0		9.0	52.3	8.713	1.952	-0.047	
256	256	50mm	S40	454.5	3.037		90	3.04	8.713	1.952	-0.091	
	257	52.48	120	3.5	0 0		9.0	29.9	9.188	1.814	-0.047	
257	257	50mm	S40	299.6	3.037		90	3.04	9.188	1.814	-0.042	
	258	52.48	120	2.3	0 0		9.0	13.8	9.663	1.726	-0.047	
258	258	50mm	S40	148.5	3.037		90	3.04	9.663	1.726	-0.011	
	259	52.48	120	1.1	0 0		9.0	3.8	10.138	1.668	-0.047	
259	253	150mm	S40	4055.2	3.000		0	3.00	5.500	3.129	-0.027	
	260	154.08	120	3.6	0 0		0.0	9.0	5.500	3.102	+0.000	
260	260	50mm	S40	780.1	2.500		Up	5.55	5.500	3.102	-0.450	
	261	52.48	120	6.0	0 1		90.0	81.1	8.000	2.407	-0.245	
261	261	50mm	S40	780.1	1.519		90	3.04	8.000	2.407	-0.247	
	262	52.48	120	6.0	1 0		9.0	81.1	8.238	2.136	-0.023	
262	262	50mm	S40	612.0	3.037		90	3.04	8.238	2.136	-0.157	
	263	52.48	120	4.7	0 0		9.0	51.8	8.713	1.932	-0.047	
263	263	50mm	S40	452.1	3.037		90	3.04	8.713	1.932	-0.090	
	264	52.48	120	3.5	0 0		9.0	29.6	9.188	1.796	-0.047	
264	264	50mm	S40	298.0	3.037		90	3.04	9.188	1.796	-0.042	
	265	52.48	120	2.3	0 0		9.0	13.7	9.663	1.708	-0.047	
265	265	50mm	S40	147.7	3.037		90	3.04	9.663	1.708	-0.011	
	266	52.48	120	1.1	0 0		9.0	3.7	10.138	1.650	-0.047	
266	260	150mm	S40	3275.1	3.000		0	3.00	5.500	3.102	-0.018	
	267	154.08	120	2.9	0 0		0.0	6.1	5.500	3.083	+0.000	
267	267	50mm	S40	777.4	2.500		Up	5.55	5.500	3.083	-0.447	
	268	52.48	120	6.0	0 1		90.0	80.6	8.000	2.391	-0.245	
268	268	50mm	S40	777.4	1.519		90	3.04	8.000	2.391	-0.245	
	269	52.48	120	6.0	1 0		9.0	80.6	8.238	2.123	-0.023	
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Hydraulically Significant Pipes in System												
NUMBERS		P I P E		F L O W		DIMENSIONS		ANGLE	VALUES	HEIGHT M	PRESSURES BARS	
Pipe no	Start	Size	Type	L/min	Length	VJ	Dir.	Eq.len	Start	Start	Frict	Static
no	End	Bore	'C'	Vel m/s	EL T	VT	Slope	mbar/m	End	End	End	Static
269	269	50mm	S40	609.9	3.037		90	3.04	8.238	2.123	-0.156	
	270	52.48	120	4.7	0 0		9.0	51.5	8.713	1.920	-0.047	
270	270	50mm	S40	450.5	3.037		90	3.04	8.713	1.920	-0.089	
	271	52.48	120	3.5	0 0		9.0	29.4	9.188	1.784	-0.047	
271	271	50mm	S40	296.9	3.037		90	3.04	9.188	1.784	-0.041	
	272	52.48	120	2.3	0 0		9.0	13.6	9.663	1.696	-0.047	
272	272	50mm	S40	147.2	3.037		90	3.04	9.663	1.696	-0.011	
	273	52.48	120	1.1	0 0		9.0	3.7	10.138	1.638	-0.047	
273	267	150mm	S40	2497.7	3.000		0	3.00	5.500	3.083	-0.011	
	274	154.08	120	2.2	0 0		0.0	3.7	5.500	3.072	+0.000	
274	274	50mm	S40	775.8	2.500		Up	5.55	5.500	3.072	-0.446	
	275	52.48	120	6.0	0 1		90.0	80.3	8.000	2.382	-0.245	
275	275	50mm	S40	775.8	1.519		90	3.04	8.000	2.382	-0.244	
	276	52.48	120	6.0	1 0		9.0	80.3	8.238	2.114	-0.023	
276	276	50mm	S40	608.6	3.037		90	3.04	8.238	2.114	-0.156	
	277	52.48	120	4.7	0 0		9.0	51.3	8.713	1.912	-0.047	
277	277	50mm	S40	449.6	3.037		90	3.04	8.713	1.912	-0.089	
	278	52.48	120	3.5	0 0		9.0	29.3	9.188	1.776	-0.047	
278	278	50mm	S40	296.3	3.037		90	3.04	9.188	1.776	-0.041	
	279	52.48	120	2.3	0 0		9.0	13.5	9.663	1.689	-0.047	
279	279	50mm	S40	146.9	3.037		90	3.04	9.663	1.689	-0.011	
	280	52.48	120	1.1	0 0		9.0	3.7	10.138	1.631	-0.047	
280	274	150mm	S40	1722.0	3.000		0	3.00	5.500	3.072	-0.006	
	281	154.08	120	1.5	0 0		0.0	1.9	5.500	3.067	+0.000	
281	281	50mm	S40	775.0	2.500		Up	5.55	5.500	3.067	-0.445	
	282	52.48	120	6.0	0 1		90.0	80.2	8.000	2.377	-0.245	
282	282	50mm	S40	775.0	1.519		90	3.04	8.000	2.377	-0.244	
	283	52.48	120	6.0	1 0		9.0	80.2	8.238	2.110	-0.023	
283	283	50mm	S40	607.9	3.037		90	3.04	8.238	2.110	-0.155	
	284	52.48	120	4.7	0 0		9.0	51.2	8.713	1.908	-0.047	
284	284	50mm	S40	449.1	3.037		90	3.04	8.713	1.908	-0.089	
	285	52.48	120	3.5	0 0		9.0	29.2	9.188	1.773	-0.047	
285	285	50mm	S40	296.0	3.037		90	3.04	9.188	1.773	-0.041	
	286	52.48	120	2.3	0 0		9.0	13.5	9.663	1.685	-0.047	
286	286	50mm	S40	146.7	3.037		90	3.04	9.663	1.685	-0.011	
	287	52.48	120	1.1	0 0		9.0	3.7	10.138	1.627	-0.047	
287	141	150mm	S40	947.0	1.500		0	1.50	5.500	4.281	-0.001	
	288	154.08	120	0.8	0 0		0.0	0.6	5.500	4.280	+0.000	
288	288	65mm	S40	947.0	5.000		Dn	6.22	5.500	4.280	-0.304	
	289	62.68	120	5.1	1 0		-90.0	48.9	0.500	4.465	+0.490	
Continued on the next page												
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 Tel: +662 6411991- 2 Fax: +662 6411993

Project: Hitech Zippermax
 Address: Samutprakarn
 Number: ---
 Area ref: Most Remorted Area
 Hazard: Extra Hazard Group2
 Authority: National Fire Protection Association
 Source: 5980.1 l/min @ 5.300 bar
 Printout: 20-April-06 at 15:07

Hydraulically Significant Pipes in System

NUMBERS		P I P E		F L O W		DIMENSIONS		ANGLE	VALUES	HEIGHT M	PRESSURES BARS	
Pipe no	Start	Size	Type	L/min	Length	VJ	Dir.	Eq.len	Start	Start	Frict	Static
no	End	Bore	'C'	Vel m/s	EL	T	VT	Slope	mbar/m	End	End	Static
289	281	150mm	S40	947.0	1.500		0	1.50	5.500	3.067	-0.001	
	290	154.08	120	0.8	0	0		0.0	5.500	3.066	+0.000	
290	290	65mm	S40	947.0	5.000		Dn	6.22	5.500	3.066	-0.304	
	291	62.68	120	5.1	1	0	-90.0	48.9	0.500	3.252	+0.490	

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