Pipe 2.0 User Manual (2026/04/02)

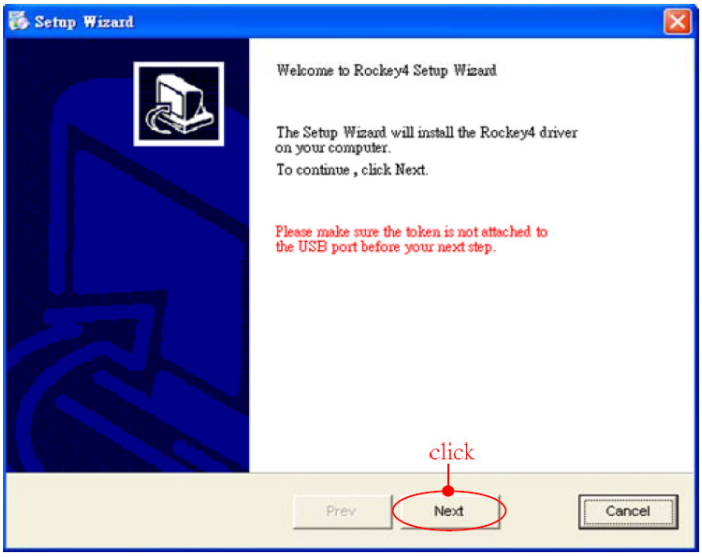
A. Appendix: Installation for Pipe 2.0

※This package of Software Pipe 2.0 includes one CD-ROM and one USB Key. This CD-ROM includes InstDrv.exe, Pipe En_Setup.exe and Installation.pdf. 64-bit computers: Please select InstDrv64 (for 64-bit systems) from the USB driver on the CD.

(I) Install software into your computer:

1. Click "InstDrv.exe" and follow the steps shown on the screen (fig.a~c).
2. Click "Pipe En-setup.exe" and follow the steps shown on the screen (fig.d~f).
3. After completing installation, all contents shall be copied into disc C with file name "Pipe En_", and program "Pipe English" will be shown on the Desk Top as a short-cut.

fig.a



or fig.a' (for repair if necessary)

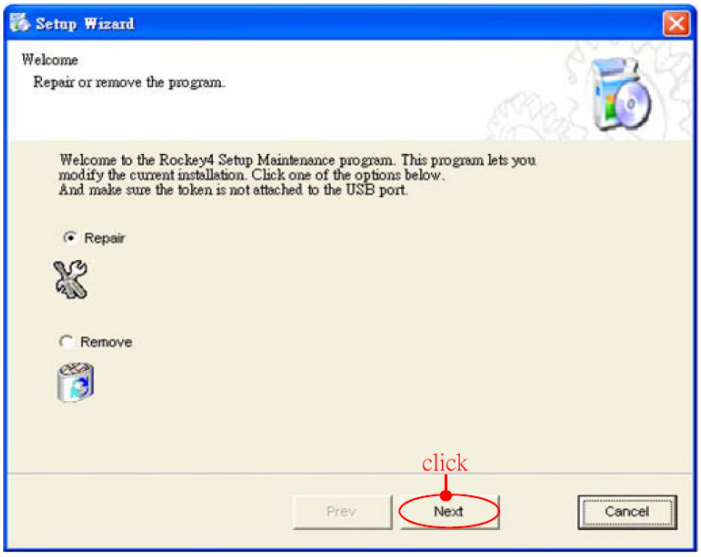


fig.b

fig.c

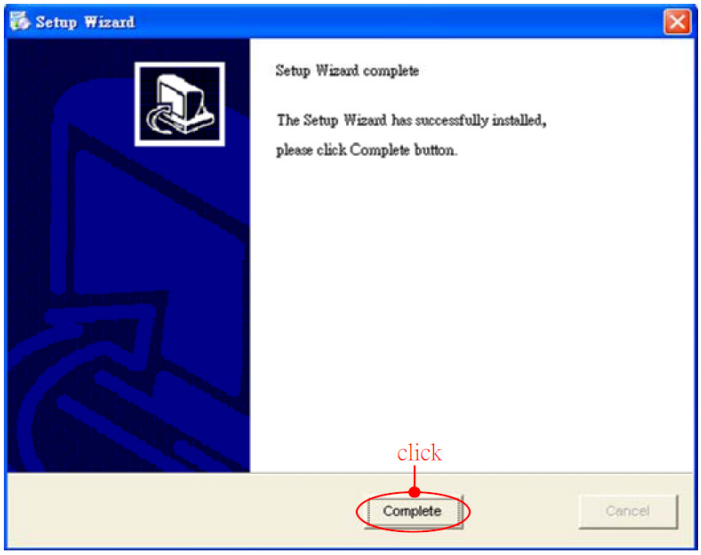


fig.d

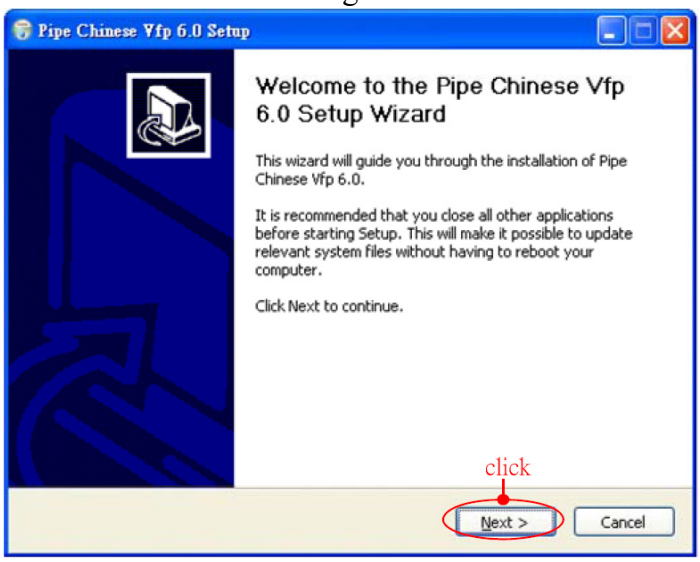


fig.e

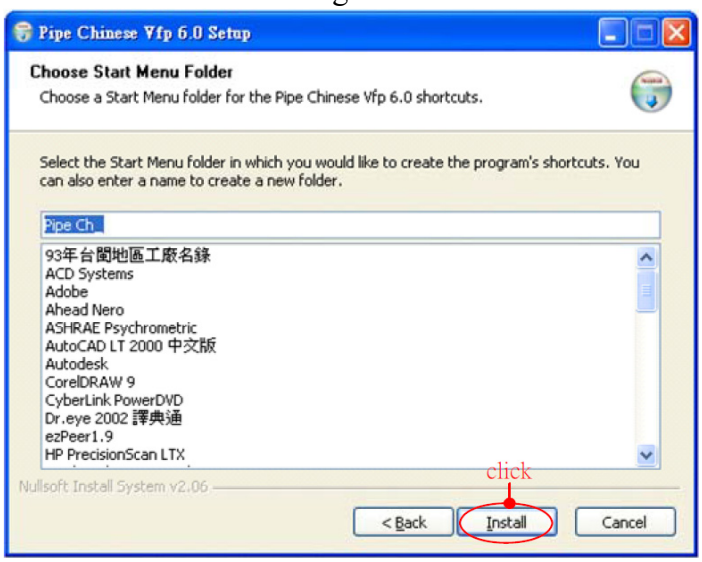


fig.f

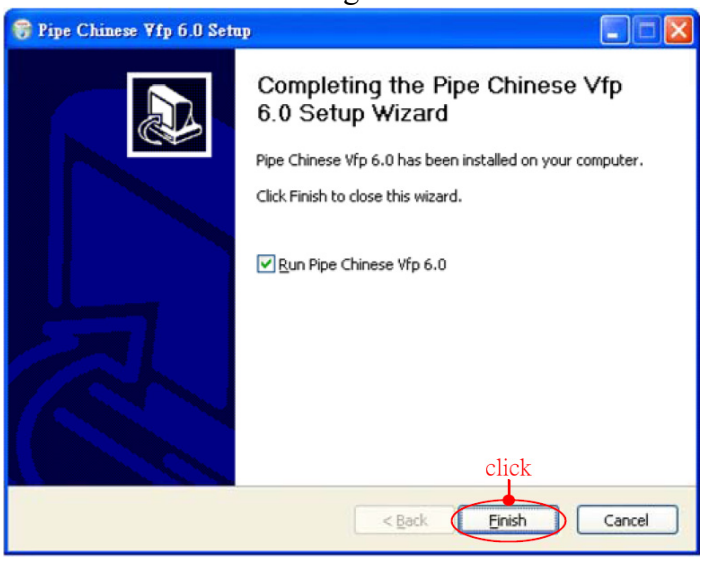
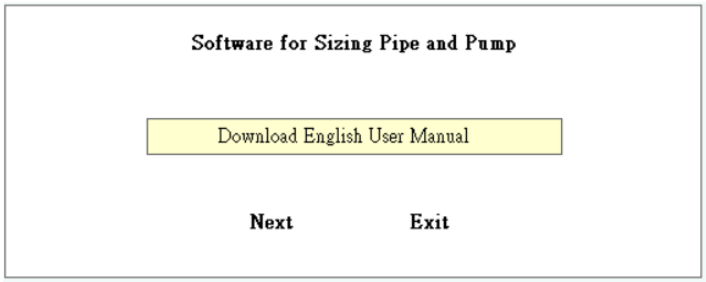


fig.g (Start Screen)



(II) Operate the program:

1. Plug Key into USB port.
2. Double click short-cut "Pipe English" on the Desk Top, and fig.g will be shown on screen. Click "Download English User Manual" if necessary.

Note 1. If the screen shows warning message "No Key!", it means Key Driver has not been installed completely, or has been removed, please follow step A(I) above, install or repair again.

Note 2. If the key is removed during operation, the error message "No Key!" will be displayed. Reinsert the key before resuming use.

Note 3. In this software, file "Pipe En_", program "Pipe English.exe" is for pipe sizing operation, and "InstDrv.exe" is for installing or repairing key driver program. Others are protected. If you try to open these protected files/programs without success for 5 times, this software could be out of order forever.

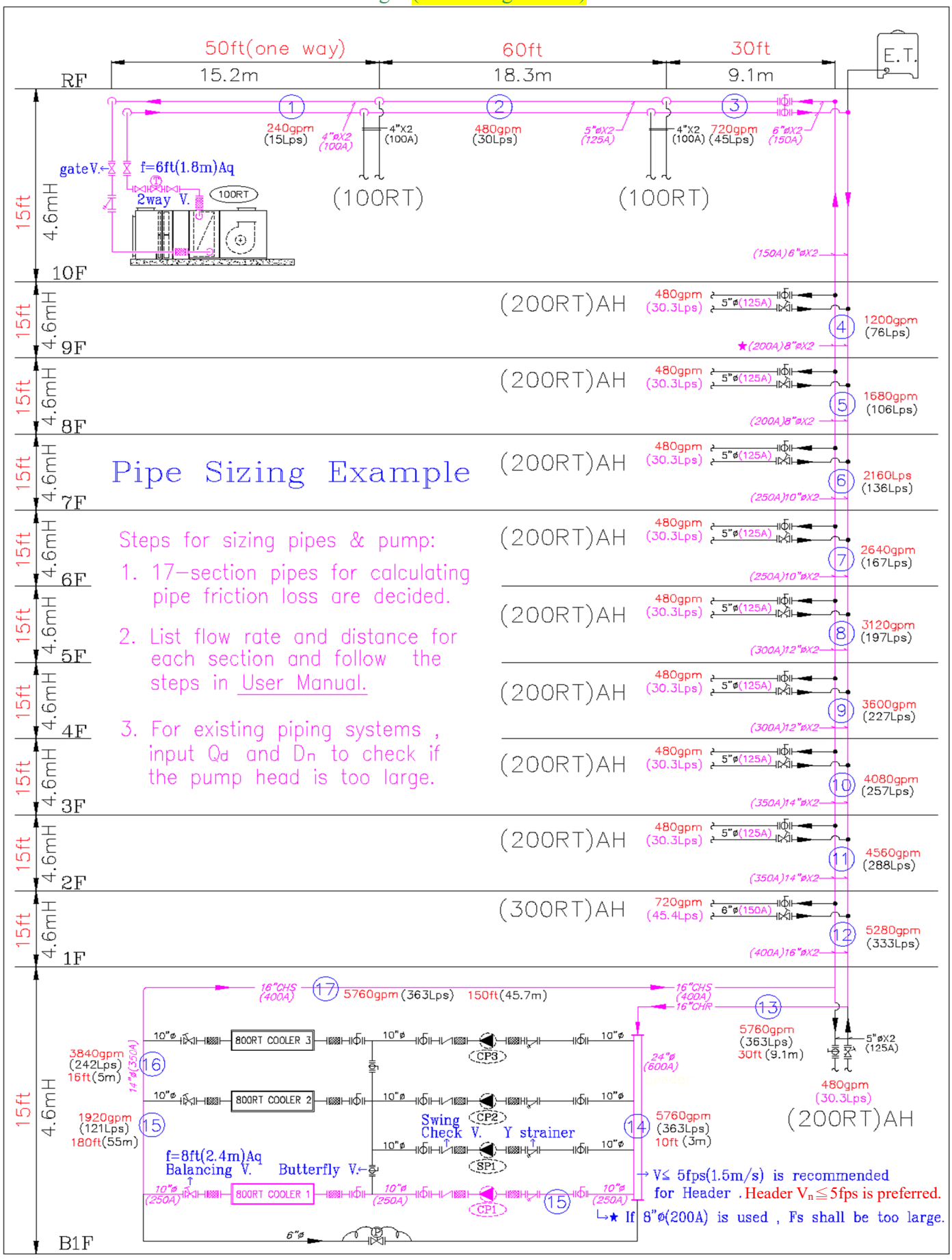
B. Symbols:

C: roughness factor of pipe
D_n: nominal pipe diameter (mm, in)
D_i: internal diameter based on D_n (mm, in)
D_c: D_i calculated by formula (mm, in)
D_{nd}: D_n for D_i lower than D_c (mm, in)
D_{nu}: D_n for D_i higher than D_c (mm, in)
D_{id}: internal diameter based on D_{nd} (mm, in)
D_{iu}: internal diameter based on D_{nu} (mm, in)
EL: equivalent straight length (m, ft)
F_d: design head loss (mAq/m, ftAq/100ft)
F_n: nominal head loss (mAq/m, ftAq/100ft)
F_s: pipe section head loss (mAq/m, ftAq/100ft)
F_1: total head loss (mAq, ftAq)
H: specified pump head (mAq, ftAq)
H_c: calculated pump head (mAq, ftAq)
HP_c: calculated pump motor power (HP & kW)
pcs: pieces (quantities)
Q: specified flow rate (Lps, gpm)
Q_d: design flow rate (Lps, gpm)
Sg: specific gravity
V_d: design flow velocity (m/s, fps)
V_n: nominal flow velocity (m/s, fps)
θ_m: motor & mechanical efficiency
θ_p: pump efficiency

C. Pipe section description:

As shown in fig.1, begin at the farthest AHU and divide the piping at each branch (①, ②, ...). There are 17 sections in this example.

fig.1 (refer to fig.14&15)



D. Operating Steps:

1. The first screen is shown in fig.2. Click Download English User Manual if necessary.
2. Click SI Edition or IP Edition (fig.3). Then, click New Piping Sizing or Latest Records. (fig.4~6)
3. (I) Select Water System: (★If "other" is selected, input C value) (fig.7)

Water System	Cooling Water open, steel	45%wt Ethy. Glycol (-22℃), closed, steel	30%wt Ethy. Glycol (-10℃), closed, steel	Open pipe PVC、ABS…	Chilled Water closed, steel	70℃(160°F)Water closed, steel	Closed pipe PVC、ABS…	other
C value	① 100	⑥ 105	⑤ 120	④ 130	② 140	⑦ 145	③ 150	⑧ input

※This software is based on the Hazen–Williams equation, with a reasonable C value ranging from 80 to 160.

4. (II) Determine Pipe Nominal Diameter (D_n, mm): Select ☐1.Q_d+F_d, ☐2.Q_d+V_d or ☐3.Q_d+D_n (for calculating pressure loss in existing piping)(fig.8). Basically, for $Q_d \leqq$ 50Lps (or 800gpm), take F_d=0.05mAq/m (5ftAq/100ft). For $Q_d >$ 50Lps (or 800gpm), take V_d=3m/s (10fps). Click Calculate after inputting Q_d and F_d (or V_d or D_n), then refer to the table below for recommended V_n and F_n values. This software selects the D_i value closest to D_c by default, which can be changed. Recommended V_n and F_n values below: ※ASHRAE recommendations: $F_n \leqq$0.04mAq/m (4ftAq/100ft), $V_n \leqq$3m/s (10fps).

D_n, mm (in)	≦25 (1")	≦65 (2.5")	≦125 (5")	≦250 (10")	≧300 (12")
V_n, m/s (fps)	0.8~1.2 (2.5~4)	1.2~2.1 (4~7)	1.5~3 (5~10)	1.8~3.6 (6~12)	2.4~4 (8~13)
F_n, mAq/m (ftAq/100ft)	$(5\sim10)\times10^{-2}$ (5~10)		$(3\sim8)\times10^{-2}$ (3~8)	$(3\sim6)\times10^{-2}$ (3~6)	$(0.5\sim5)\times10^{-2}$ (0.5~5)

※This software is suitable for 0.5"~ 40" D_n pipes. For $D_n \leqq$20", D_i is based on SCH 40 steel pipe, for $D_n \geqq$22", SCH 20 steel pipe is used.

5. (III) Calculate Piping Total Head Loss (F_1, Aq): (fig.9~10)

   Q_d, D_{nu} (or D_{nd}), V_n, and F_n from item II are automatically transferred to item III. After inputting the straight pipe length and the quantities of valves and fittings (pcs), click Calculate to automatically compute Equivalent Length (EL), Section Head Loss (F_s), and Total Head Loss (F_1).

6. (IV) Calculate Pump Head (H_c, mAq): Input suitable values for F_1~F_7; H_c is shown in item IV. (fig.11)

   F_1: Piping Total Head Loss, mAq (ftAq) (★Automatically imported from item III, but can be modified.)

   F_2: Condenser or Evaporator Head Loss, 6~9mAq (20~30ftAq) ※F_2~F_6: Maker's data are preferred.

   F_3: Fan Coil or Air Handing Unit Head Loss, 3~6mAq (10~20ftAq)

   F_4: Heat Exchanger Head Loss, 4.6~7.6mAq, 4.6~7.6mAq (15~25ftAq)

   F_5: Adjusting or Balancing Valve Head Loss@1/4 closed, 1.5~4.0mAq (5~13ftAq)

   F_6: Cooling Tower Head Loss, mAq (ftAq):

circle: 3~7m (10~23)	counter flow: 6~9.1m (20~30)	cross flow: 3.6~6m (12~20)	fan-free: 15~20m (50~65)

   F_7: Others, mAq (ftAq) (★Suction Head, other valves, etc.)

7. (V) Calculate Pump Motor Power Required (HP_c): (fig.12)

   Input suitable Q, H, Sg, θ_p, and θ_m, then click Calculate to obtain HP_c.

   ★1: Recommended θ_p & θ_m:(※θ_p: Maker's data are preferred. θ_m: Selected from the Motor Efficiency Class Table.)

D_n, mm	≦50 (2")	65 (2.5")	80 (3")	100 (4")	125 (5")	150 (6")	≧200 (8")
θ_p	0.4~0.5	0.45~0.55	0.5~0.65	0.6~0.7	0.65~0.75	0.7~0.8	0.75~0.88
θ_m	0.6~0.7		0.7~0.85			0.8~0.9	

   ★2: Sg: specific gravity ※1.00 for 4.4~37.8℃ (40~100°F) water (※Maker's data are preferred.)

30%wt Ethy. Glycol : 1.05	45%wt Ethy. Glycol : 1.08	70℃ (160°F) water : 0.978

8. (VI) Specify Pump's Specifications: Input suitable data based on the calculated Q, H, θ_p, etc. (fig.13)
9. Save before Print, End, or Restart. (fig.13) ※fig.14 & fig.15 are printout tables of results.

E. Disclaimer:

We (Tempace, Inc., the developer and distributor of this software) have made every effort to avoid errors. However, we do not warrant that the information in this software is error-free. The entire risk as to the quality and performance of this software lies with you. In no event shall we be liable for any damages or losses arising from the use of this software.

fig.2

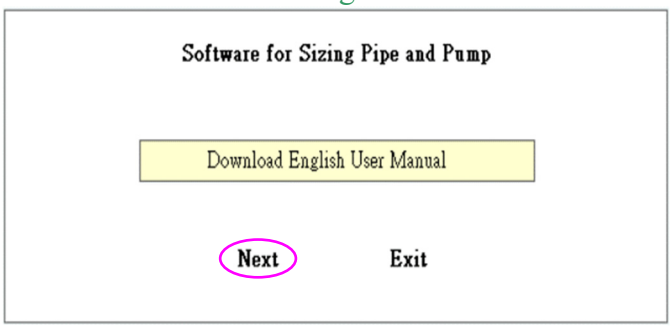


fig.3

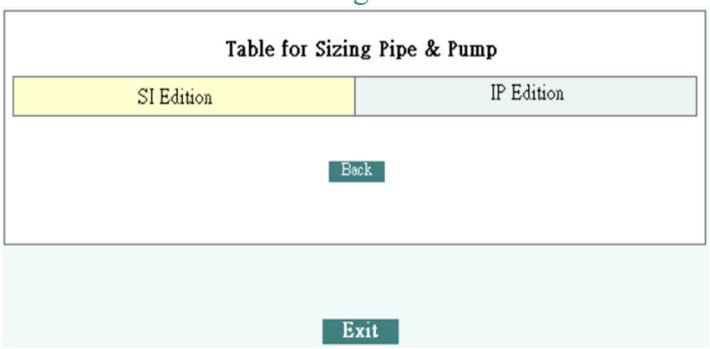


fig.4

fig.5 (Input the Customer, Project name, and Date if New Pipe Sizing is selected.)

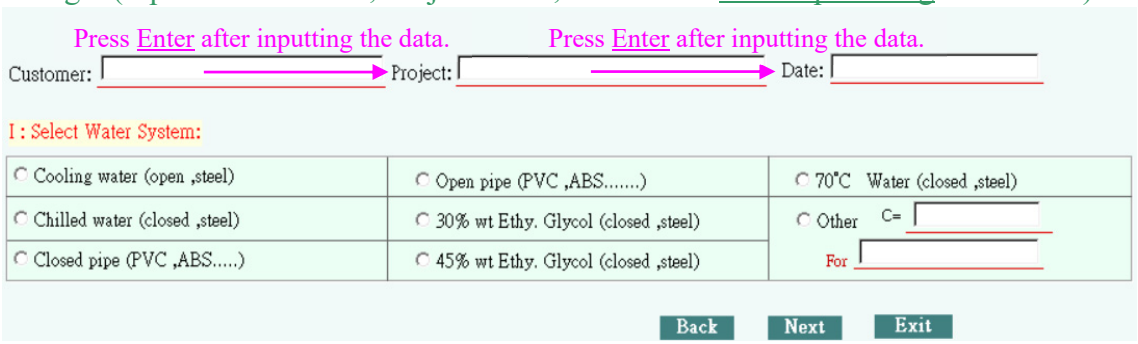


fig.6 (Click Modify for the desired file.)

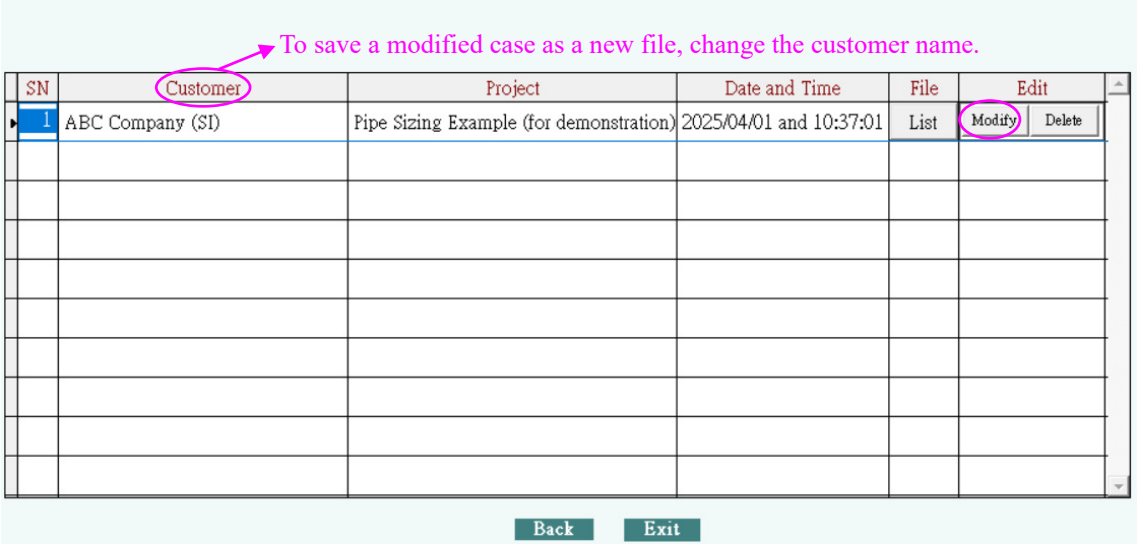


fig.7 (ABC Company is used as an example, refer to fig.1)

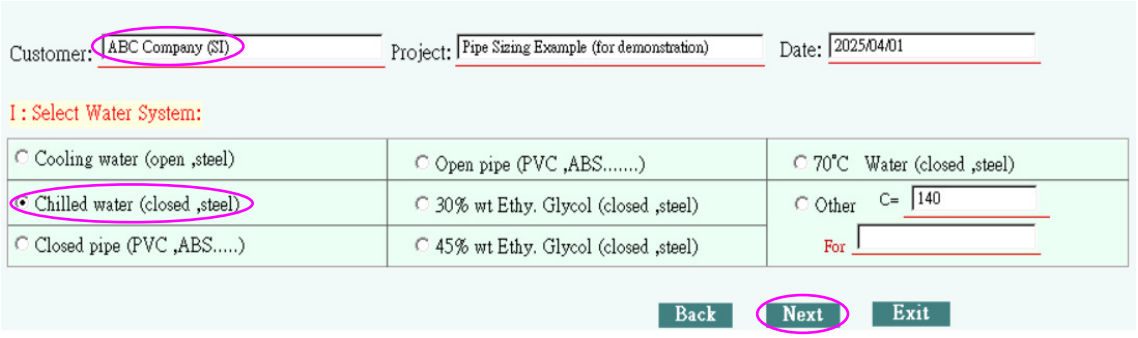


fig.8

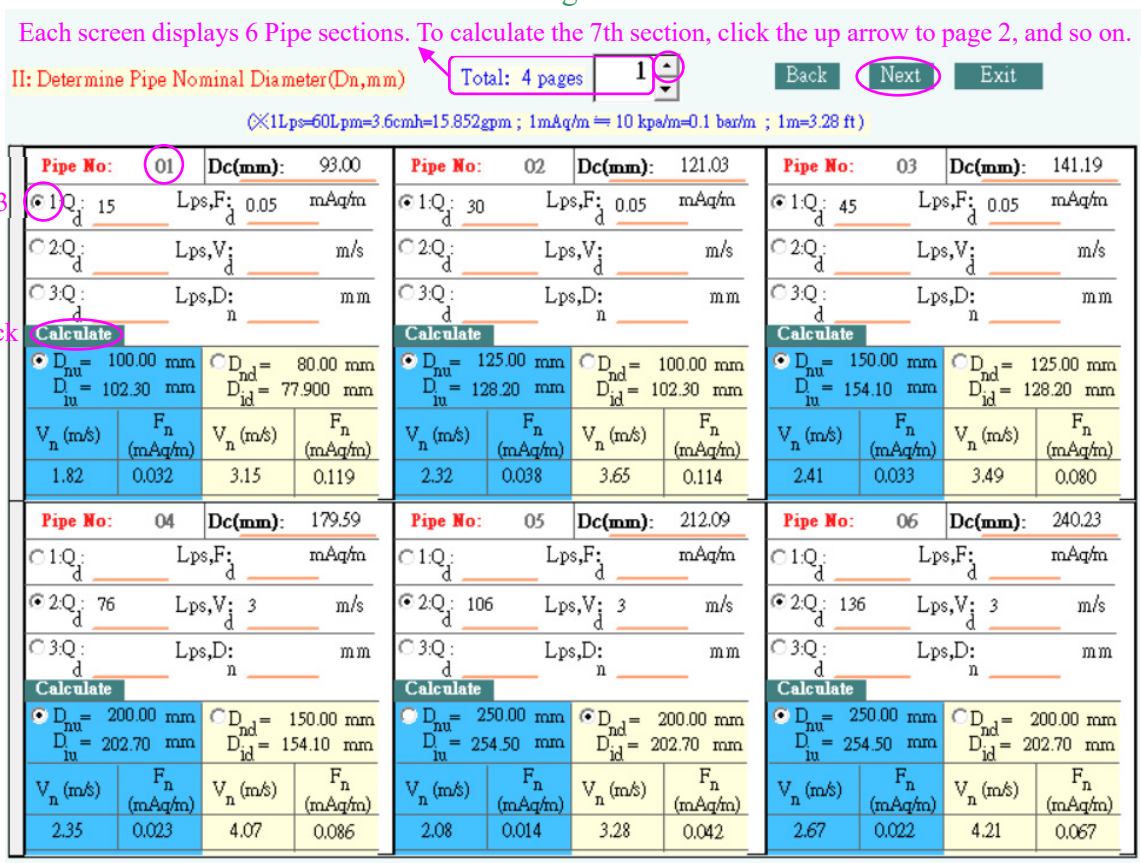


fig.9 (Input straight pipe length and the quantities of valves and fittings)

III: Calculate Piping Total Head Loss(F1 ,mAq) (※1Lps=60Lpm=3.6cmh=15.852gpm ; 1mAq/m ≒ 10 kpa/m=0.1 bar/m ; 1m=3.28 ft) Back click Calculate Exit

Pipe No	Q_d Lps	D_n mm	V_n m/s	F_n mAq/m	straight pipe length m	Head loss in valves & fittings in terms of equivalent length-EL (m)													EL (m)	section head loss Fs, mAq
						gate valve	butterfly valve	globe valve	angle valve	lift check valve	swing check valve	y type strainer	90° std elbow	90° long elbow	tee straight	tee branch	contract D/d=4/3	enlarge d/D=3/4		
1	15	100.000	1.820	0.032	39.6	4 pcs	pcs	pcs	pcs	pcs	pcs	1 pcs	7 pcs	pcs	pcs	pcs	pcs	pcs		
2	30	125.000	2.320	0.038	36.6	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
3	45	150.000	2.41	0.033	27.4	pcs	2 pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
4	76	200.000	2.350	0.023	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
5	106	200.000	3.280	0.042	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	pcs	pcs		
6	136	250.000	2.67	0.022	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
7	167	250.000	3.280	0.032	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	pcs	pcs		
8	197	300.000	2.730	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
9	227	300.000	3.14	0.024	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	pcs	pcs		
10	257	350.000	2.950	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
11	288	350.000	3.300	0.024	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	pcs	pcs		
12	333	400.000	2.92	0.016	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	1 pcs		
13	363	400.000	3.180	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	pcs	1 pcs	pcs	1 pcs		
14	363	600.000	1.320	0.002	3	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs	pcs	1 pcs	pcs		
15	121	250.000	2.38	0.018	54.9	pcs	3 pcs	pcs	pcs	pcs	1 pcs	1 pcs	9 pcs	pcs	1 pcs	pcs	pcs	pcs		
16	242	350.000	2.770	0.017	4.9	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	1 pcs	pcs	pcs	1 pcs		
17	363	400.000	3.180	0.019	45.7	pcs	pcs	pcs	pcs	pcs	pcs	pcs	1 pcs	pcs	pcs	1 pcs	pcs	1 pcs		
18						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs		
19						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs		
20						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs		
21						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs		

Total Head Loss(F1,mAq):

fig.10

III: Calculate Piping Total Head Loss(F1 ,mAq) (※1Lps=60Lpm=3.6cmh=15.852gpm ; 1mAq/m ≒ 10 kpa/m=0.1 bar/m ; 1m=3.28 ft) Back Next Exit

Pipe No	Q_d Lps	D_n mm	V_n m/s	F_n mAq/m	straight pipe length m	Head loss in valves & fittings in terms of equivalent length-EL (m)													EL (m)	section head loss Fs, mAq	Edit
						gate valve	butterfly valve	globe valve	angle valve	lift check valve	swing check valve	y type strainer	90° std elbow	90° long elbow	tee straight	tee branch	contract D/d=4/3	enlarge d/D=3/4			
1	15	100.000	1.820	0.032	39.6	4 pcs 3.200	pcs	pcs	pcs	pcs	pcs	1 pcs 21.500	7 pcs 21.700	pcs	pcs	pcs	pcs	pcs	46.4	2.8	Delete
2	30	125.000	2.320	0.038	36.6	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 5.200	pcs	1 pcs 1.140	1 pcs 1.630	8.0	1.7	Delete
3	45	150.000	2.41	0.033	27.4	pcs	2 pcs 13.800	pcs	pcs	pcs	pcs	pcs	2 pcs 9.200	pcs	2 pcs 6.200	pcs	1 pcs 1.470	1 pcs 2.100	32.8	2.0	Delete
4	76	200.000	2.350	0.023	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 8.200	pcs	1 pcs 2.070	1 pcs 2.950	13.2	0.5	Delete
5	106	200.000	3.280	0.042	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 8.200	pcs	pcs	pcs	8.2	0.7	Delete
6	136	250.000	2.67	0.022	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 10.200	pcs	1 pcs 2.600	1 pcs 3.710	16.5	0.6	Delete
7	167	250.000	3.280	0.032	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 10.200	pcs	pcs	pcs	10.2	0.6	Delete
8	197	300.000	2.730	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 12.200	pcs	1 pcs 3.330	1 pcs 4.760	20.3	0.6	Delete
9	227	300.000	3.14	0.024	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 12.200	pcs	pcs	pcs	12.2	0.5	Delete
10	257	350.000	2.950	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 13.400	pcs	1 pcs 3.660	1 pcs 5.230	22.3	0.6	Delete
11	288	350.000	3.300	0.024	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 13.400	pcs	pcs	pcs	13.4	0.5	Delete
12	333	400.000	2.92	0.016	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 15.200	pcs	1 pcs 4.190	1 pcs 5.980	25.4	0.6	Delete
13	363	400.000	3.180	0.019	9.2	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 22.800	pcs	pcs	1 pcs 22.900	pcs	1 pcs 5.980	51.7	1.2	Delete
14	363	600.000	1.320	0.002	3	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	2 pcs 23.600	pcs	1 pcs 7.030	pcs	30.6	0.1	Delete
15	121	250.000	2.38	0.018	54.9	pcs	3 pcs 26.700	pcs	pcs	pcs	1 pcs 19.000	1 pcs 69.800	9 pcs 68.400	pcs	1 pcs 5.100	pcs	pcs	pcs	189.0	4.4	Delete
16	242	350.000	2.770	0.017	4.9	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	1 pcs 6.700	pcs	pcs	1 pcs 5.230	11.9	0.3	Delete
17	363	400.000	3.180	0.019	45.7	pcs	pcs	pcs	pcs	pcs	pcs	pcs	1 pcs 11.400	pcs	pcs	1 pcs 22.900	pcs	1 pcs 5.980	40.3	1.6	Delete
18						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	0	0	Delete
19						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	0	0	Delete
20						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	0	0	Delete
21						pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	0	0	Delete

Total Head Loss(F1,mAq): 19.30

Total Piping Head Loss

fig.11

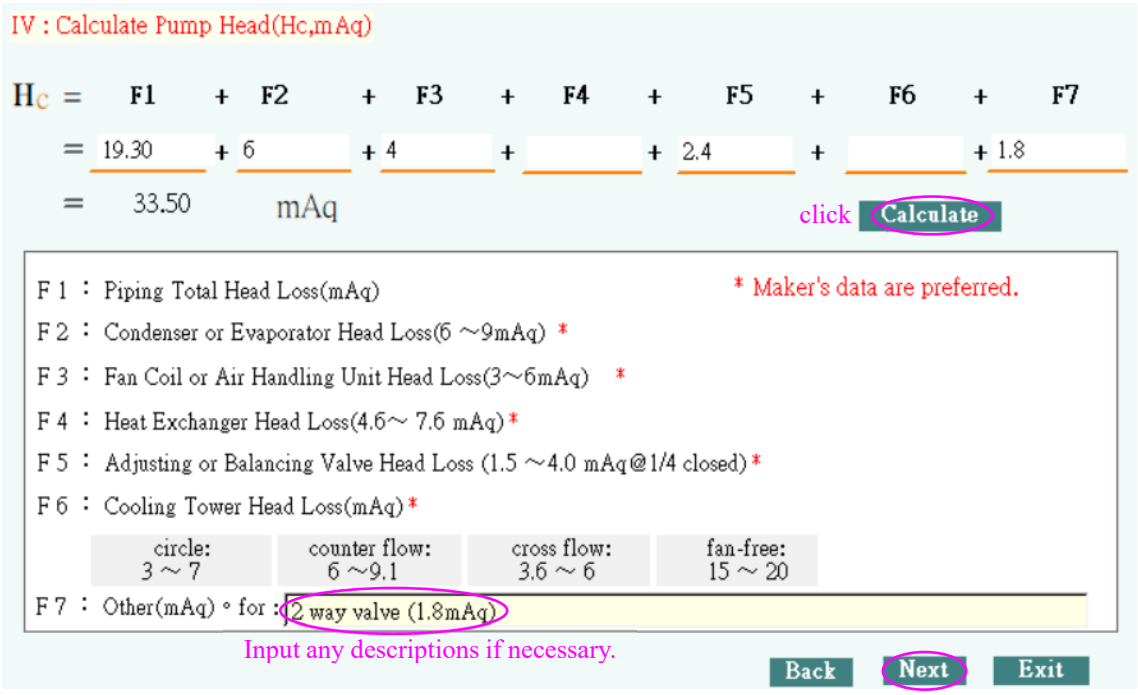


fig.12

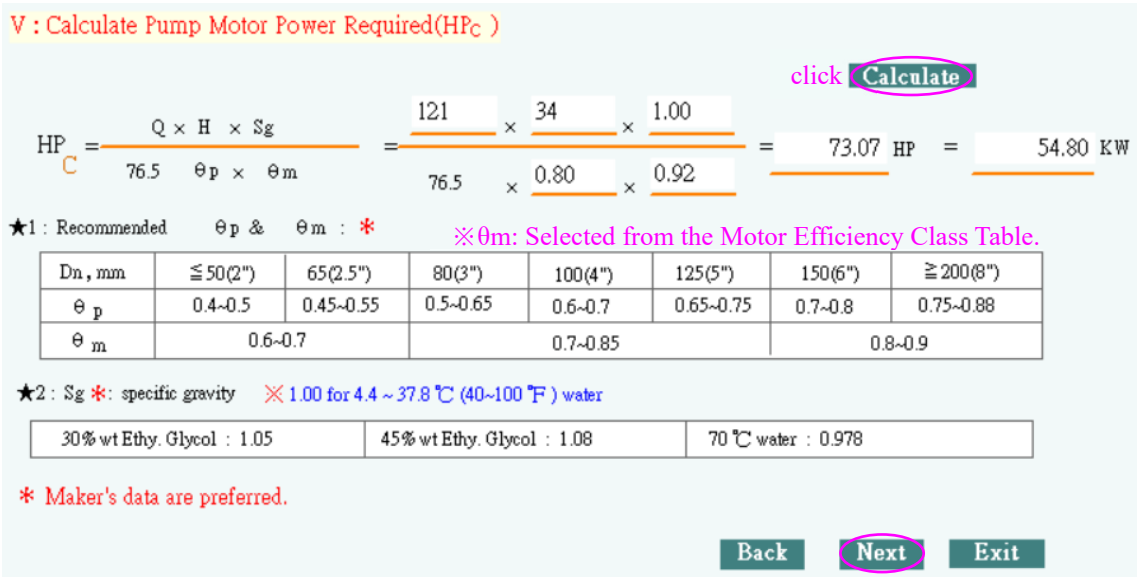


fig.13

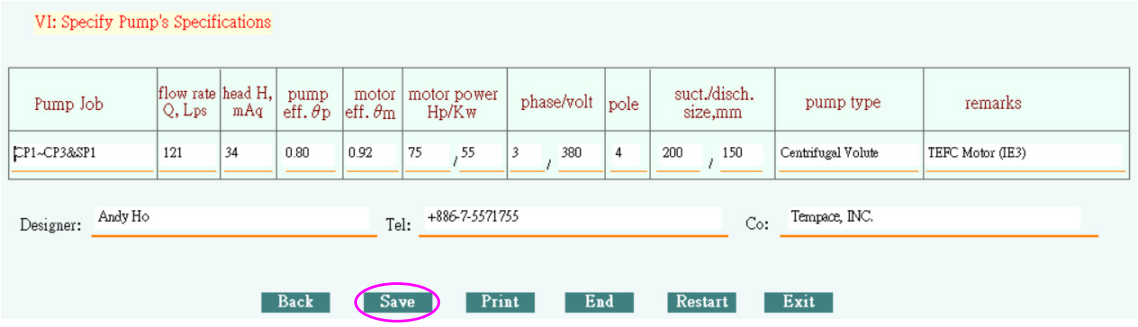


fig.14 (refer to fig.1)

Table for Sizing Pipe & Pump (SI Edition)

Customer: ABC Company (SI) Project: Pipe Sizing Example (for demonstration) Date: 2025/04/01

I : Select Water System

Cooling water (open , steel)	Closed pipe (PVC 、 ABS.....)	30%wt Ethy . Glycol (closed, steel)	70 ℃ Water (closed, steel)
⊙ Chilled water (closed, steel)	Open pipe (PVC 、 ABS.....)	45%wt Ethy . Glycol (closed, steel)	Other C= 140 For

III : Calculate Piping Total Head Loss (F 1 , mAq) (※1Lps=60Lpm=3.6cmh=15.852gpm ; 1mAq/m ≒ 10 kpa/m=0.1 bar/m ; 1m=3.28 ft)

Pipe No.	Q d Lps	D n mm	V n m/s	F n mAq/m	straight pipe length m	Head loss in valves & fittings in terms of equivalent length-EL(m)												EL(m)	section head loss Fs, mAq
						gate valve	butterfly valve	globe valve	angle valve	lift checkV.	swing checkV.	y type strainer	90 ° std. elbow	90 ° long elbow	tee straight	tee branch	contract D/d=4/3	enlarge d/D=3/4	
1	15	100.	1.82	0.032	39.6	4 pcs 3.200 m	pcs m	pcs m	pcs m	pcs m	pcs m	1 pcs 21.5 m	7 pcs 21.7 m	pcs m	pcs m	pcs m	pcs m	pcs m	46.4	2.8
2	30	125.	2.32	0.038	36.6	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 5.20 m	pcs m	1 pcs 1.14 m	1 pcs 1.63 m	8.0	1.7
3	45	150.	2.41	0.033	27.4	pcs m	2 pcs 13.8 m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 9.20 m	pcs m	2 pcs 6.20 m	pcs m	1 pcs 1.47 m	1 pcs 2.10 m	32.8	2.0
4	76	200.	2.35	0.023	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 8.20 m	pcs m	1 pcs 2.07 m	1 pcs 2.95 m	13.2	0.5
5	106	200.	3.28	0.042	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 8.20 m	pcs m	pcs m	pcs m	8.2	0.7
6	136	250.	2.67	0.022	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 10.2 m	pcs m	1 pcs 2.60 m	1 pcs 3.71 m	16.5	0.6
7	167	250.	3.28	0.032	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 10.2 m	pcs m	pcs m	pcs m	10.2	0.6
8	197	300.	2.73	0.019	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 12.2 m	pcs m	1 pcs 3.33 m	1 pcs 4.76 m	20.3	0.6
9	227	300.	3.14	0.024	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 12.2 m	pcs m	pcs m	pcs m	12.2	0.5
10	257	350.	2.95	0.019	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 13.4 m	pcs m	1 pcs 3.66 m	1 pcs 5.23 m	22.3	0.6
11	288	350.	3.30	0.024	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 13.4 m	pcs m	pcs m	pcs m	13.4	0.5
12	333	400.	2.92	0.016	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 15.2 m	pcs m	1 pcs 4.19 m	1 pcs 5.98 m	25.4	0.6
13	363	400.	3.18	0.019	9.2	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 22.8 m	pcs m	pcs m	1 pcs 22.9 m	pcs m	1 pcs 5.98 m	51.7	1.2
14	363	600.	1.32	0.002	3	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	2 pcs 23.6 m	pcs m	1 pcs 7.03 m	pcs m	30.6	0.1
15	121	250.	2.38	0.018	54.9	pcs m	3 pcs 26.7 m	pcs m	pcs m	pcs m	1 pcs 19.0 m	1 pcs 69.8 m	9 pcs 68.4 m	pcs m	1 pcs 5.10 m	pcs m	pcs m	pcs m	189.0	4.4

fig.15 (refer to fig.1)

16	242	350.	2.77	0.017	4.9	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	1 pcs 6.70 m	pcs m	pcs m	1 pcs 5.23 m	11.9	0.3
17	363	400.	3.18	0.019	45.7	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	1 pcs 11.4 m	pcs m	pcs m	1 pcs 22.9 m	pcs m	1 pcs 5.98 m	40.3	1.6
18						pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	0	0
19						pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	0	0
20						pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	0	0
21						pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	pcs m	0	0

Total Head Loss(F 1 , mAq) : 19.30

IV : Calculate Pump Head (Hc , mAq)

$H_c = F_1 + F_2 + F_3 + F_4 + F_5 + F_6 + F_7$

$= 19.30 + 6 + 4 + + 2.4 + + 1.8$

$= 33.50$ mAq

F 1 : Piping Total Head Loss(mAq) *Maker's data are preferred.
F 2 : Condenser or Evaporator Head Loss(6~9 mAq) *
F 3 : Fan Coil or Air Handling Unit Head Loss(3~6 mAq) *
F 4 : Heat Exchanger Head Loss(4.6~7.6 mAq) *
F 5 : Adjusting or Balancing Valve Head Loss(1.5~4.0 mAq@ 1/4 closed) *
F 6 : Cooling Tower Head Loss(mAq) *

circle:3~7	counter flow:6~9.1	cross flow:3.6~6	fan-free:15~20

F 7 : Other(mAq) ◦ for : 2 way valve (1.8mAq)

V : Calculate Pump Motor Power Required (HP c)

$HP_c = \frac{Q \times H \times Sg}{76.5 \times \theta p \times \theta m} = \frac{121 \times 34 \times 1.00}{76.5 \times 0.80 \times 0.92} = 73.07$ HP $=$ 54.80 KW

★ 1 : Recommended θp & θm : ∗

Dn , mm	≦50(2")	65(2.5 ")	80(3 ")	100(4 ")	125(5 ")	150(6 ")	≧200(8 ")
θp	0.4~0.5	0.45~0.55	0.5~0.65	0.6~0.7	0.65~0.75	0.7~0.8	0.75~0.88
θm	0.6~0.7		0.7~0.85			0.8~0.9	

★ 2 : Sg ∗ specific gravity ※ 1.00 for 4.4 ~37.8℃ (40 ~100°F) water

30%wt Ethy. Glycol : 1.05	45%wt Ethy. Glycol : 1.08	70℃ water : 0.978

*Maker's data are preferred.

VI : Specify Pump's Specifications

Pump Job	flow rate Q, Lps	head H, mAq	pump eff. θp	motor eff. θm	motor power Hp/Kw	phase/volt	pole	suct./disch. size,mm	pump type	remarks
CP1~CP3&SP1	121	34	0.80	0.92	75 / 55	3 / 380	4	200 / 150	Centrifugal Volute	TEFC Motor (IE3)

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