

# Pipe2.0 User Manual

## A 、 Symbols :

C : roughness factor of pipe	EL : equivalent straight length (m, ft)	pcs : pieces (quantities)
D <sub>n</sub> : nominal pipe diameter (mm, in)	F <sub>d</sub> : design head loss (mAq/m, ftAq/100ft)	Q : specified flow rate (Lps, gpm)
D <sub>i</sub> : internal diameter based on D <sub>n</sub> (mm, in)	F <sub>n</sub> : nominal head loss (mAq/m, ftAq/100ft)	Q <sub>d</sub> : design flow rate (Lps, gpm)
D <sub>c</sub> : D <sub>i</sub> calculated by formula (mm, in)	F <sub>s</sub> : pipe section head loss (mAq/m, ftAq/100ft)	S <sub>g</sub> : specific gravity
D <sub>nd</sub> : D <sub>n</sub> for D <sub>i</sub> lower than D <sub>c</sub> (mm, in)	F <sub>1</sub> : total head loss (mAq/m, ftAq/100ft)	V <sub>d</sub> : design flow velocity (m/s, fps)
D <sub>nu</sub> : D <sub>n</sub> for D <sub>i</sub> higher than D <sub>c</sub> (mm, in)	H : specified pump head (mAq, ftAq)	V <sub>n</sub> : nominal flow velocity (m/s, fps)
D <sub>id</sub> : internal diameter based on D <sub>nd</sub> (mm, in)	H <sub>c</sub> : calculated pump head (mAq, ftAq)	θ <sub>m</sub> : motor & mechanical efficiency
D <sub>iu</sub> : internal diameter based on D <sub>nu</sub> (mm, in)	HP <sub>c</sub> : calculated pump motor power (HP&kw)	θ <sub>p</sub> : pump efficiency

## B 、 Operating Steps :

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

Water System	Cooling Water open, steel	45%wt Ethy. Glycol (-22°C), closed, steel	30%wt Ethy. Glycol (-10°C), closed, steel	Open pipe PVC · ABS...	Chilled Water closed, steel	70°C(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 adopts Hazen-Williams Equation, the reasonable C Value is between 80 and 160.

- Select Pipe Diameter(D<sub>n</sub>)** : Select 1.Q<sub>d</sub>+F<sub>d</sub>, 2.Q<sub>d</sub>+V<sub>d</sub> or 3.Q<sub>d</sub>+D<sub>n</sub> and input. One Pipe No. at a time (Max. 21). Basically, for Q<sub>d</sub>≤50Lps (or 800gpm), take F<sub>d</sub>=0.05mAq/m(5ftAq/100ft); otherwise, take V<sub>d</sub>=3m/s(10fps). Click Calculate and check the recommended values below for selecting D<sub>nu</sub> or D<sub>nd</sub>(**fig.8**) ; the default selection depends on which D<sub>i</sub> is closer to D<sub>c</sub>. The recommended V<sub>n</sub> and F<sub>n</sub> are :

D <sub>n</sub> , mm (in)	≤25 (1")	≤65 (2.5")	≤125 (5")	≤250 (10")	≥300 (12")
V <sub>n</sub> , 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 <sub>n</sub> , mAq/m(ftAq/100ft)	(5~10)×10 <sup>-2</sup> (5~10)	(3~8)×10 <sup>-2</sup> (3~8)	(3~6)×10 <sup>-2</sup> (3~6)	(0.5~5)×10 <sup>-2</sup> (0.5~5)	

※This software is suitable for 0.5"~40" D<sub>n</sub> pipes. For D<sub>n</sub>≤20", D<sub>i</sub> bases on steel pipe SCH40; for D<sub>n</sub>≥22", D<sub>i</sub> bases on steel pipe SCH20.

- Calculate Piping Total Head Loss (F<sub>1</sub>, Aq)** : (**fig.9~10**)

The Q<sub>d</sub>, D<sub>n</sub>, V<sub>n</sub> and F<sub>n</sub> in item II will be transferred to item III automatically. Input straight pipe length and the quantities of valves and fittings. Then, click Calculate, and the Equivalent Length (EL), Section Head Loss (F<sub>s</sub>) and Total Head Loss (F<sub>1</sub>) shall be shown in Item III.

- Calculate Pump Head (H<sub>c</sub>, Aq)** : (**fig.11**)

Input the suitable values for F<sub>1</sub>~F<sub>7</sub>, and H<sub>c</sub> shall be shown in item IV. Although there are recommended values for F<sub>2</sub>~F<sub>6</sub> as bellow, **the maker's data are preferred.**

- F<sub>1</sub> : Piping Total Head Loss, mAq (ftAq)
- F<sub>2</sub> : Condenser or Evaporator Head Loss, 6~9mAq (20~30ftAq)
- F<sub>3</sub> : Fan Coil or Air Handling Unit Head Loss, 3~6mAq (10~20ftAq)
- F<sub>4</sub> : Heat Exchanger Head Loss, 4.6~7.6mAq (15~25ftAq)
- F<sub>5</sub> : Adjusting or Balancing Valve Head Loss@1/4 closed, 1.5~4.0mAq (5~13ftAq)
- F<sub>6</sub> : 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)
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F<sub>7</sub> : Others : suction head, other valve,etc. ,m (ft)

- Calculate Pump Motor Power Required (HP<sub>c</sub>)** : (**fig.12**)

Input suitable Q, H, S<sub>g</sub>, θ<sub>p</sub> and θ<sub>m</sub> and click Calculate to obtain HP<sub>c</sub>.

★1 : Recommended θ<sub>p</sub> & θ<sub>m</sub> : (**maker's data are preferred.**)

D <sub>n</sub> , mm	≤50(2")	65(2.5")	80(3")	100(4")	125(5")	150(6")	≥200(8")
θ <sub>p</sub>	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 <sub>m</sub>	0.6~0.7		0.7~0.85			0.8~0.9	

★2 : S<sub>g</sub> : specific gravity ※1.00 for 4.4~37.8°C (40~100°F) water (**maker's data are preferred.**)

30%wt Ethy. Glycol : 1.05	45%wt Ethy. Glycol : 1.08	70°C(160°F) water : 0.978
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- Specify pump specifications** : Input suitable data in item VI. (**fig.13**)
- Save before Print, End, or Restart (**fig.13**). (**fig.14~15** are printouts)

## C 、 Disclaimer :

We (Tempace, Inc., developer and the distributors of this software) have done our best to avoid any 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 is with you. In no event shall we be liable to you for any damages and losses, arising out of using this software.

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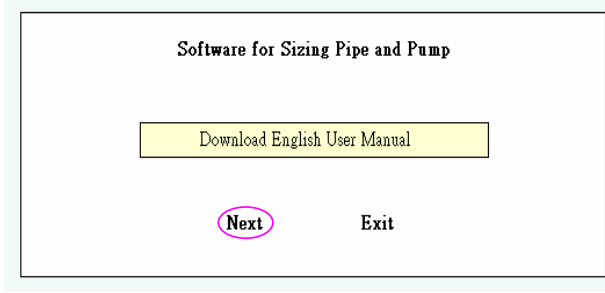


fig.1

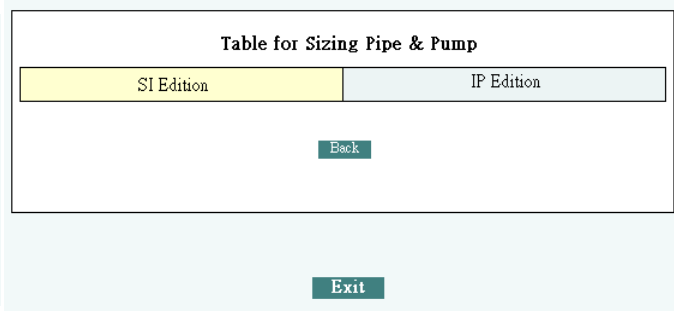


fig.2

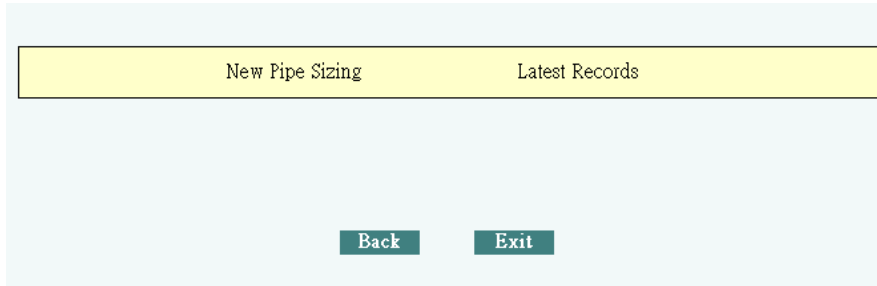


fig.3

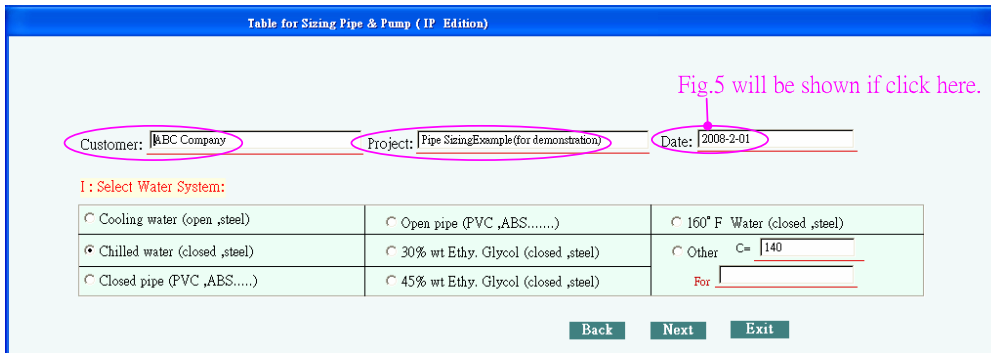


fig.4 (Input customer 、Project and Date if new Pipe Sizing is selected)

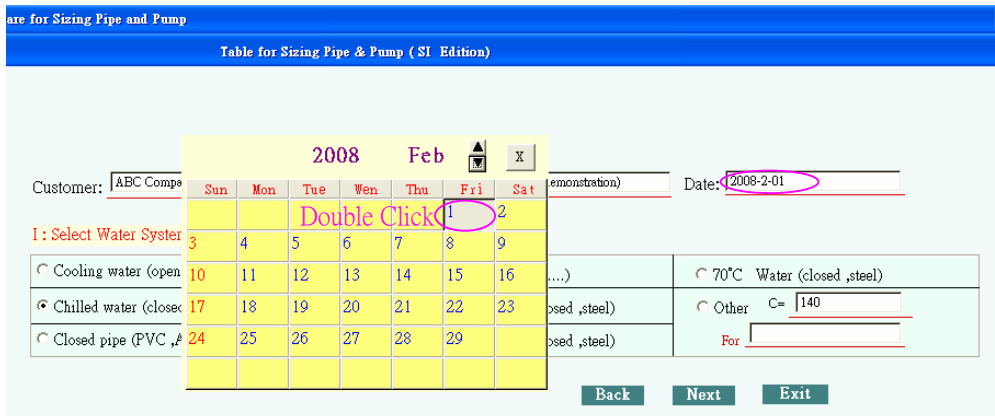


fig.5



Software for Sizing Pipe and Pump

Table for Sizing Pipe & Pump (IP Edition)

III: Calculate Piping Total Head Loss(F1,ftAq) (X)ILps=60Lpm=3.6cmh=15.852gpm; 1mAq/m=10 kpa/m=0.1 bar/m; 1m=3.28 ft)

Back Calculate Exit

Pipe No	Qd gpm	Dn in	Vn fps	Fn ft/100'	straight pipe length ft	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	EL (ft)	section head loss Fs, RAq
1	240	4.000	6.050	3.212	130	4 pos	pos	pos	pos	pos	pos	1 pos	7 pos	pos	2 pos	pos	1 pos	1 pos		
2	480	5.000	7.700	3.856	120	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos		
3	720	6.000	8.00	3.339	90	pos	2 pos	pos	pos	pos	pos	pos	2 pos	pos	2 pos	pos	1 pos	1 pos		
4	1200	8.000	7.700	2.258	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	1 pos	
5	1680	8.000	10.770	4.210	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	pos	
6	2160	10.000	8.79	2.214	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	1 pos	
7	2640	10.000	10.740	3.210	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	pos	
8	3120	12.000	8.940	1.864	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	1 pos	
9	3600	12.000	10.32	2.429	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	pos	
10	4080	14.000	9.680	1.991	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	1 pos	
11	4560	14.000	10.810	2.373	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	pos	
12	5280	16.000	9.59	1.624	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	0 pos	1 pos	1 pos	1 pos	
13	5760	16.000	10.460	1.908	30	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	pos	pos	1 pos	
14	5760	24.000	4.350	0.226	10	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	pos	
15	1920	10.000	7.81	1.780	180	pos	3 pos	pos	pos	pos	1 pos	1 pos	9 pos	pos	1 pos	pos	pos	pos	pos	
16	3840	12.000	11.010	2.738	16	pos	0 pos	pos	pos	pos	pos	pos	pos	pos	1 pos	pos	pos	pos	1 pos	
17	5760	16.000	10.460	1.908	150	pos	pos	pos	pos	pos	pos	pos	1 pos	pos	pos	1 pos	pos	pos	1 pos	
18						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	
19						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	
20						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	
21						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	

Total Head Loss(F1,ftAq):

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

Software for Sizing Pipe and Pump

Table for Sizing Pipe & Pump (IP Edition)

III: Calculate Piping Total Head Loss(F1,ftAq) (X)ILps=60Lpm=3.6cmh=15.852gpm; 1mAq/m=10 kpa/m=0.1 bar/m; 1m=3.28 ft)

Back Next Exit

Pipe No	Qd gpm	Dn in	Vn fps	Fn ft/100'	straight pipe length ft	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	EL (ft)	section head loss Fs, RAq	Edit
1	240	4.000	6.050	3.212	130	4 pos	pos	pos	pos	pos	pos	1 pos	7 pos	pos	2 pos	pos	pos	pos	151.6	9.0	Delete
2	480	5.000	7.700	3.856	120	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	1 pos	25.9	5.6	Delete
3	720	6.000	8.00	3.339	90	pos	2 pos	pos	pos	pos	pos	pos	2 pos	pos	2 pos	pos	1 pos	1 pos	107.7	6.6	Delete
4	1200	8.000	7.700	2.258	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	1 pos	43.1	1.6	Delete
5	1680	8.000	10.770	4.210	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	26.6	2.4	Delete
6	2160	10.000	8.79	2.214	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	1 pos	54.1	1.9	Delete
7	2640	10.000	10.740	3.210	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	33.4	2.0	Delete
8	3120	12.000	8.940	1.864	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	1 pos	66.3	1.8	Delete
9	3600	12.000	10.32	2.429	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	39.8	1.7	Delete
10	4080	14.000	9.680	1.991	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	1 pos	72.9	2.0	Delete
11	4560	14.000	10.810	2.373	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	pos	43.8	1.8	Delete
12	5280	16.000	9.59	1.624	30	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	0 pos	1 pos	1 pos	83.4	1.8	Delete
13	5760	16.000	10.460	1.908	30	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	pos	1 pos	pos	1 pos	169.6	3.8	Delete
14	5760	24.000	4.350	0.226	10	pos	pos	pos	pos	pos	pos	pos	pos	pos	2 pos	pos	1 pos	pos	100.6	0.2	Delete
15	1920	10.000	7.81	1.780	180	pos	3 pos	pos	pos	pos	1 pos	1 pos	9 pos	pos	1 pos	pos	pos	pos	621.0	14.3	Delete
16	3840	12.000	11.010	2.738	16	pos	0 pos	pos	pos	pos	pos	pos	pos	pos	1 pos	pos	pos	1 pos	35.5	1.4	Delete
17	5760	16.000	10.460	1.908	150	pos	pos	pos	pos	pos	pos	pos	1 pos	pos	pos	1 pos	pos	1 pos	132.1	5.4	Delete
18						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	0	0	Delete
19						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	0	0	Delete
20						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	0	0	Delete
21						pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	pos	0	0	Delete

Total Piping Head Loss Total Head Loss(F1,ftAq): 63.30

fig.10

IV : Calculate Pump Head(Hc,ftAq)

$$H_c = F1 + F2 + F3 + F4 + F5 + F6 + F7$$

$$= 63.30 + 20 + 10 + \quad + 8 + \quad + 6$$

$$= 107.30 \quad \text{ftAq}$$

Calculate

- F 1 : Piping Total Head Loss(ftAq) \* Maker's data are preferred.
- F 2 : Condenser or Evaporator Head Loss(20 ~ 30ftAq) \*
- F 3 : Fan Coil or Air Handling Unit Head Loss(10~20ftAq) \*
- F 4 : Heat Exchanger Head Loss(15~ 25 ftAq) \*
- F 5 : Adjusting or Balancing Valve Head Loss (5 ~ 13 ftAq@1/4 closed) \*
- F 6 : Cooling Tower Head Loss(ftAq) \*
- |                    |                          |                        |                      |
|--------------------|--------------------------|------------------------|----------------------|
| circle:<br>10 ~ 23 | counter flow:<br>20 ~ 30 | cross flow:<br>12 ~ 20 | fan-free:<br>50 ~ 65 |
|--------------------|--------------------------|------------------------|----------------------|
- F 7 : Other(ftAq) ◦ for 2 way valve

※Input any descriptions if necessary.

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Next

Exit

fig.11

V : Calculate Pump Motor Power Required(HPc )

$$HP_c = \frac{Q \times H \times S_g}{3960 \theta_p \times \theta_m} = \frac{1920 \times 108 \times 1.00}{3960 \times 0.8 \times 0.9} = 72.73 \text{ HP} = 54.55 \text{ KW}$$

Calculate

★1 : Recommended  $\theta_p$  &  $\theta_m$  : \*

Dn, mm	≦ 50(2")	65(2.5")	80(3")	100(4")	125(5")	150(6")	≧ 200(8")
$\theta_p$	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
$\theta_m$	0.6-0.7		0.7-0.85			0.8-0.9	

★2 : Sg \*: specific gravity ※ 1.00 for 4.4 ~ 37.8 °C (40~100 °F) water

30% wt Ethy. Glycol : 1.05	45% wt Ethy. Glycol : 1.08	160 °F water : 0.978
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\* Maker's data are preferred.

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Exit

fig.12

VI: Specify Pump's Specifications

Pump Job	flow rate Q, gpm	head H, ftAq	pump eff. $\theta_p$	motor eff. $\theta_m$	motor power Hp/Kw	phase/volt	pole	suct./disch. size,in	pump type	remarks
FP1-CP3&SP1	1920	108	0.8	0.9	75 / 55	3 / 380	4	8 / 6	Centrifugal Volute	TEPC Motor

Designer: Andy Ho Tel: +886-7-5571755 Co: Tempaco, Inc.

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Save

Print

End

Restart

Exit

fig.13



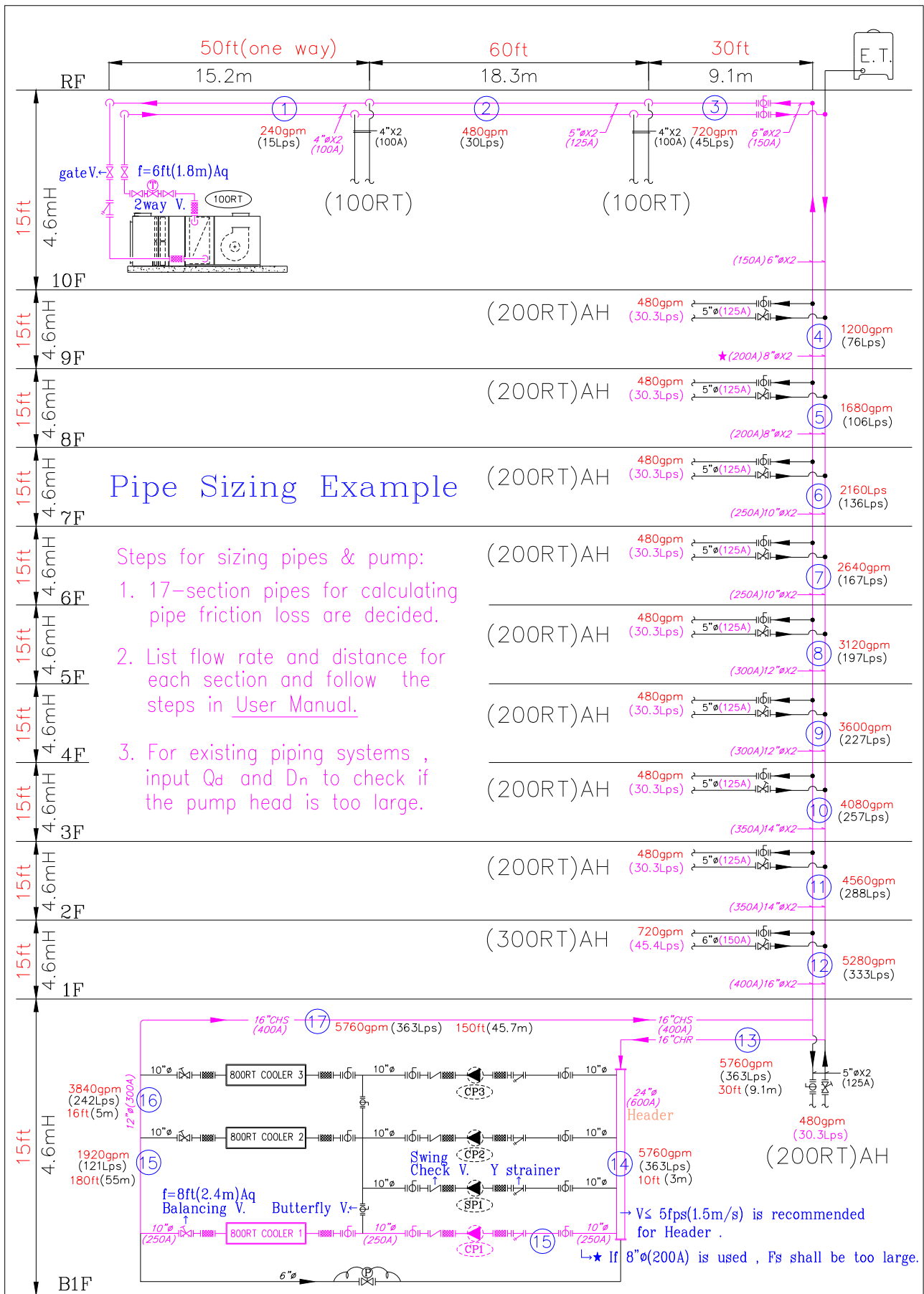


fig.16 (refer to fig.14&15)

## Appendix : Installation for Pipe 2.0

※ This package of **Software Pipe 2.0** includes one CD-ROM and one USB Key.

### A、Install software into your computer

- (1) This CD-ROM includes *InstDrv.exe*、*Pipe En\_Setup.exe* and *Installation.pdf*、
- (2) Click *InstDrv.exe* and follow the steps shown on the screen (fig.1~3).
- (3) Click *Pipe En-setup.exe* and follow the steps shown on the screen(fig 4~6).
- (4)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 shut-cut.

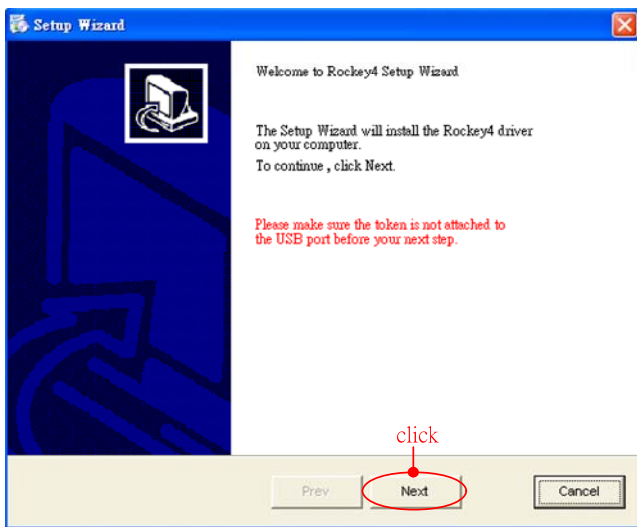


fig.1

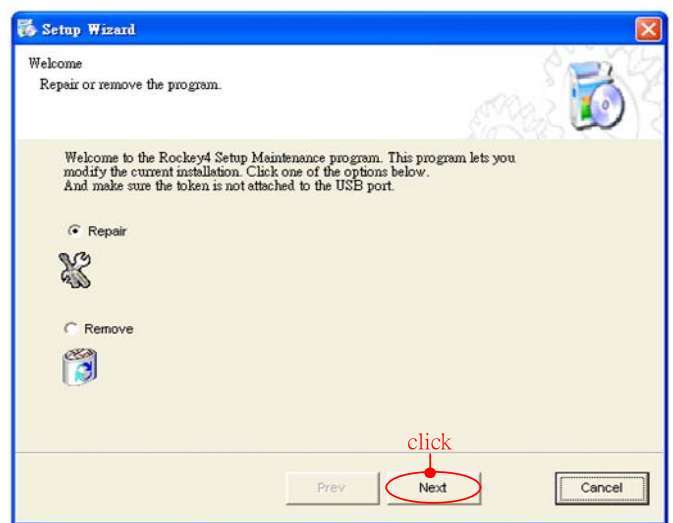


fig.1' (for repair if necessary)

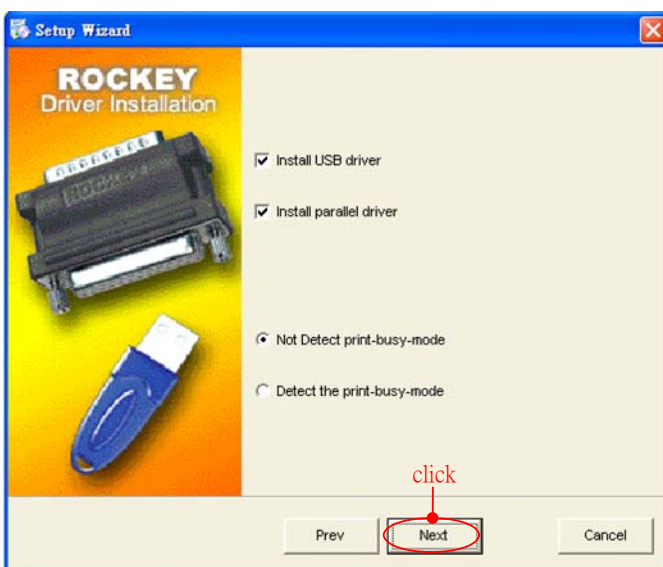


fig.2

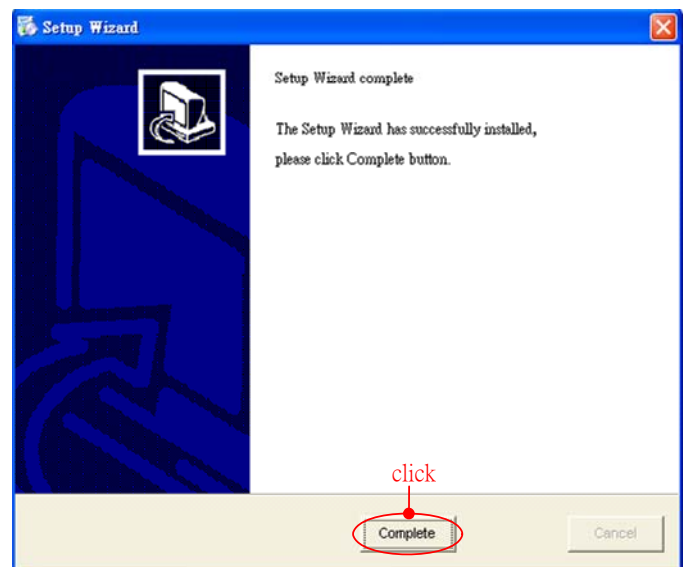


fig.3

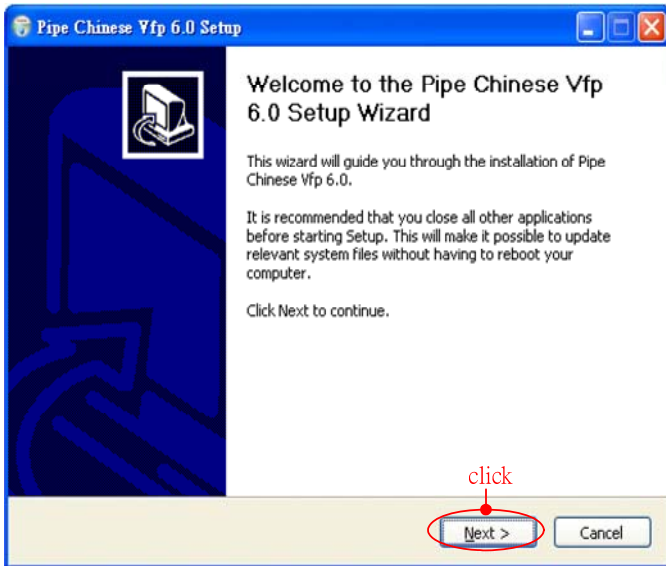


fig.4

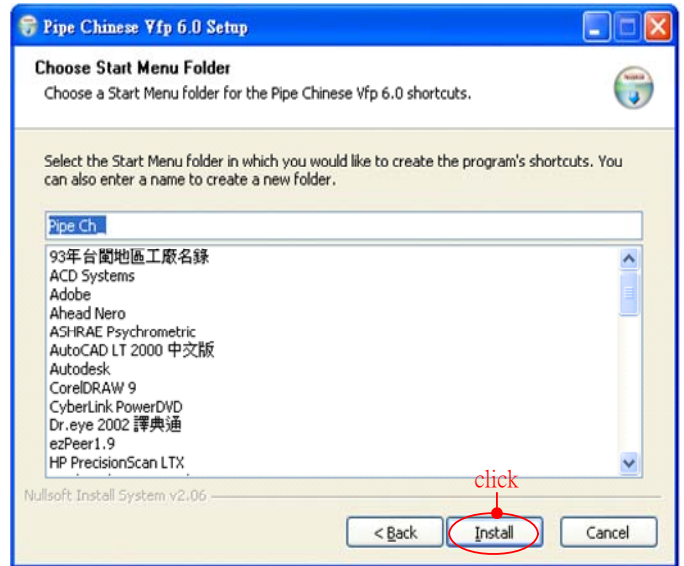


fig.5

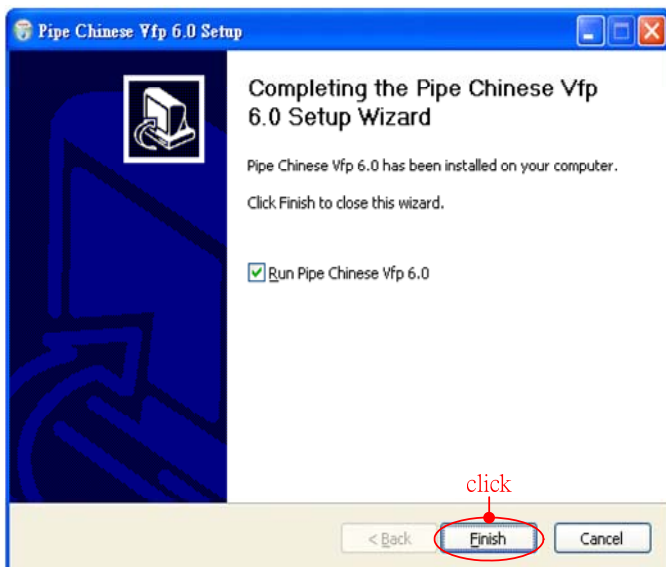


fig.6

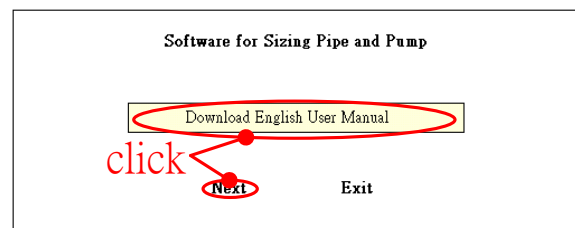


fig.7

## B 、 Operate the program

- (1) Plug Key into USB port.
- (2) Double click shut-cut 「Pipe English」 on the Desk Top , and fig.7 will be shown on screen.  
Click Download English User Manual if necessary.

**Note1** : If the screen shows warning message “No Key ! ” , that means Key Driver has not been installed completely , or has been removed , please follow step A(2)above , install or repair again.

**Note2** : During operation , key can not be pull out ; otherwise pipe sizing can not be proceeded.

**Note3** : 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 3times , this software could be out of order forever.