



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/ 235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax : 0-2196-2144

1

1.1

8 4 1 (

 300)

 109 1

 8 22.84 (

) 1 139 2

 1 2-1-44 (3,776)

(. . 2539) 22 2539 80³

1.2

1

 22.84 1 139 2 8

 2-1-44 (3,776) 1

 4

1.3

12

1.4

3 (. . 2539)

80

(1-1)

1

139

. . 2535

1)

2)

3)

4)

5)

1.5

“

”

. . 2535 (1-2)

. . 2535

4

1)

2)

3)

4)

1.6

4

8

/



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax: 0-2196-2144

2

21

		8		4		4	
	8		22.84	()	1
	139			2	9.30	(
)	1			2
	2-1-44	(3,776)		(2.1-1	2-1
)							
1)	32421	3803		1-0-80	(1,920)	
2)	8652	3804		1-0-64	(1,856)	
		4					1
-			1				42
			BTS	()	
	880						-
		-		(2.1-2)	
1)							
(1.1)		4		42	165		
		230			1		100

(1.2) 4 1 50

(1.3) 40 () 1
4 (42) 300
1 50

(1) 4 42 250
2 370
150 1 100
(2) 4 42 1
180 2 170
150 1
100

2)
(21) 1 100
230 42 (
4) 560

(22) 1 50
4

(23) 1 50
4

(1) 150 42 1 2 100 370

(2) 150 4 1 2 100 170

2 2
 2 1
 8
 4 ()
) 4 4 17
 4 30
 2 8
 1 8
 11
 ()

. . 2549

. . 2518

. 9-29

, , ,

: 2

21-1

21-2

21-3 1 : 50,000

21-4

21-5

21

21-5

22

1 8 1 2

1) 8 22.84 ()
2.2-1) 9,173 ()

2 19 (Studio
1 1 18),
,

38 20 / 120 (Studio 1 / 1 19 /),
,

2) 2 9.30 ()
) 254
,

21-1

	(. .)			, , , , (. .)	(. .)
		..			
	1,147	-	-	148	1,295
2	-	953	19	169	1,122
3-8	-	5,742 (957 x 6)	120 (20 x 6)	1,014 (169 x 6)	6,756 (1,126 x 6)
	1,147	6,695	139	1,331	9,173

:

: 2

2 - 1 - 44 (3,776) (2.2-2)

$$1) \quad (\quad + \quad) = 1,549$$

$$2) \quad = 1,445$$

$$3) \quad = 782$$

22- 2

	(. .)
1. (+)	1,549
2.	1,445
3.	782
	3,776

(OSR)

(FAR)

1)

(FAR)

$$\begin{aligned}
 &= 3,776 \\
 &= 9,427 \\
 &= 9,427 / 3,776 \\
 &= 2.5 : 1
 \end{aligned}$$

(7:1

.. 2549

.. 2518)

2)

(OSR)

$$\begin{aligned}
 &= 3,776 \\
 &= 1,549 \\
 &= 3,776 - 1,549 \\
 &= 2,227 \\
 &= (2,227 \times 100) / 3,776 \\
 &= 59
 \end{aligned}$$

(30 100
.. 2544)

3)

= 2,227

() = 9,427

= (2,227 x 100)/9,427

= 23.6

(45 . . 2549

. . 2518

22 ,

23

1) 55 (. . 2543) . . 2522

4

2.3-1

2) . . 2544

5

2.3-2

231

55 (. . 2543)

55 (. . 2543)		
4		
48		48
	9	1 22.84
	4	1
9	23	2
6		6 (2.1-5)
50		50
		8 22.84 1
(1)	9	9.30 1 2
	2	
(2)	9	
	23	3
	3	(2.1-5)

: 2

232 (1)

		. . 2544			
5					
1.		10			
			6		
2		10			
	20				
	1	10			
3		20			
			2		
52				52	
					59
1.		30	100		30
2					
	10	100			
			1		
3			3		
				6	
3			12		

: 2

232(2)

<p style="text-align: right;">..2544</p> <p style="text-align: center;">5</p>	
<p>4</p> <p>3</p> <p>5</p> <p>6</p> <p>12</p> <p>5</p> <p>7</p> <p>2</p> <p>2</p> <p>2</p> <p>3</p> <p>6</p> <p>3</p> <p>1 6</p> <p>6</p>	<p>6</p> <p>15</p> <p>8</p>

232(3)

<p>. . 2544 5</p>	
<p>54 2 9 3 3 9 55 300 1 15 2</p>	<p>54 2 3 , 3 (2.1-5) 55 8 22.84 1 2 9.30 1 2 (2.1-5)</p>

231 Set Back

: 2

231 Set Back (1 3)

24

“

1

1

50

50

”

681

(

2.6.1)

681

341

171

782

1.15

/

(

681

)

-

2.41

2.41

2.42

: 2

241

		(.)
A	$(5.73 \times 6.5) + (0.73 \times 65.5) + (5 \times 1.6) + (5 \times 0.05) + (5 \times 0.05) + (5 \times 0.05)$	93.81
B	$(6.6 \times 1.4) + (7.4 \times 0.8) + (6.6 \times 1.4) + (10.5 \times 1.3) + (3.7 \times 4.9) + (1.2 \times 5.5)$	62.78
C	$(0.5 \times 27 \times 1.2) + (0.5 \times 22.4 \times 1.4) + (4 \times 5.2) + (17.2 \times 1.23) + (0.65 \times 5) + (0.5 \times 5) + (0.4 \times 5) + (1.9 \times 5) + (0.8 \times 5)$	95.08
D	$(0.5 \times 15.62 \times 0.55) + (0.5 \times 2.64 \times 40.84) + (40.29 \times 6.1) + (5.99 \times 10) + (8.05 \times 10)$	444.37
E	$(0.5 \times 0.53 \times 17.05) + (4.75 \times 17.05)$	85.51
		≈ 782

241**242****23**

: 2

241

()

242

()

25

251

12

(2.5.1-1)

1)

3

2)

10

3)

8

4)

6

5)

2

241-1 Bar Chart

1)

198

3

3,226

0.6 (1) 22 199 1,733

$$\begin{aligned}
 & 1 = 6.22 \dots \\
 & \text{Safety Factor 1.4} = 6.22 \times 1.4 \\
 & = 8.708 \dots \\
 & = 199 \\
 & = 8.708 \times 199 \\
 & \approx 1,733 \dots
 \end{aligned}$$

(2)

- F2 9

$$\begin{aligned}
 & \text{F2} = 1.36 \dots \\
 & \text{Safety Factor 1.4} = 1.36 \times 1.4 \\
 & = 1.904 \dots \\
 & = 9 \\
 & = 1.904 \times 9 \\
 & \approx 17 \dots
 \end{aligned}$$

- **F6 6**

$$\begin{aligned}
 F6 &= 6.72 \dots \\
 \text{Safety Factor 1.4} &= 6.72 \times 1.4 \\
 &= 9.408 \dots \\
 &= 11 \\
 &= 9.408 \times 11 \\
 &\approx 103 \dots \\
 &= 17+88+38+49+103 \\
 &= 295 \dots
 \end{aligned}$$

(3)

$$\begin{aligned}
 &= 326 \dots \\
 \text{Safety Factor 1.4} &= 326 \times 1.4 \\
 &= 457 \dots
 \end{aligned}$$

(4)

$$\begin{aligned}
 &= 413 \dots \\
 \text{Safety Factor 1.4} &= 413 \times 1.4 \\
 &\approx 578 \dots
 \end{aligned}$$

(5)

$$\begin{aligned}
 &= 105 \dots \\
 \text{Safety Factor 1.4} &= 105 \times 1.4 \\
 &\approx 147 \dots
 \end{aligned}$$

(6)

Safety Factor 1.4

$$\begin{aligned}
&= 12 \dots \\
&= 12 \times 1.4 \\
&\approx 17 \dots
\end{aligned}$$

$$\begin{aligned}
&= 1,732+295+457+578 \\
&\quad +147+17 \\
&= 3,226 \dots
\end{aligned}$$

968

(30)
2,258

0.2

1 0.2) 1 0.4 (

$$\begin{aligned}
&= 3,776 \dots \\
&= 968 \dots \\
&= 20 \% \\
&= 968 \times (20/100) \\
&= 194 \dots \\
&= 968-194 \\
&= 774 \dots \\
&= (774 / 3,776) \\
&= 0.2 \dots
\end{aligned}$$

: 2

2,258 5
 2 30
 2 4
 20 (2.5.1-1)
 10.00-16.00 .

(1)

(2)

2 -

(3)

(4)

(5)

-

(6)

(7)

30 /

(8)

(9)

-

(10)

: 2

(11)

-

(12)

(13)

(14)

(15)

(Sheet Pile) (Bracing)
(2.5.1-2)

251-1

251-2 Sheet Pile

251-1

251-1 Sheet Pile

: 2

2)

8

1

2

1

(1)

(2)

(3)

10

3)

8

4)

6

5)

2

252

100

5 ()

(. . . 1010-30)

(

2.5.2-1)

1)

50

9

2)

3)

- 1

4)

- , ,

1.

2.

-

-

-

-

-

: 2

1)

20 /

$$= 100$$

$$= 200 \quad . /$$

(: . 2541. _____

()

_____.

.)

$$= (100 \times 200) / 1,000$$

$$= 20 \quad . /$$

20

1

2)

(1 20 ...)

5

80%

$$= 20 \quad . /$$

$$= 80\%$$

$$= (20 \times 80) / 100$$

$$= 16 \quad . /$$

: 2

BOD 20 / 16 /

3)

300 /

$$= 100$$

$$= 3 \quad / \quad /$$

$$\left(\quad : \quad \right) \quad . \quad 2541. \quad \underline{\hspace{2cm}}$$

$$\underline{\hspace{1cm}} \quad . \quad \left(\quad \right)$$

$$= 100 \times 3$$

$$= 300 \quad /$$

$$200 \quad 2$$

4)

5)

1 / ...

2521

2521

(1 36)

253

) (

2

1)

$$\begin{aligned}
&= 100 \\
&= 50 \quad . / \quad / \quad (\quad 2-1) \\
&= (100 \times 50) / 1,000 \\
&= 5 \quad . /
\end{aligned}$$

2)

$$\begin{aligned}
&5 \quad / \\
&10 \quad /
\end{aligned}$$

254

-

$$(\quad 2.5.41 \quad) \quad 5 \quad 4$$

$$/ \quad (\quad 80 \quad \% \quad)$$

$$/ \quad 1 \quad 4$$

2541

255

1.92 / 2 (1 1)
1

1

(2.5.1-2)

2541

: 2

256

6 /

1)

2 /

2)

4 /

257

2

1)

2)

200

2

= 100

= 3 / / (2-1)

= 100x3

= 300 /

258

26

261

1)

2

	(1)		1			3.8
26.4		2.4		240		
-		150			90	
		2	(1	1)		0.3
/	TDH 32					
		(Fire Pump)		1		2.8
/	TDH 75			(Jockey Pump)	1	
0.19	/	TDH 79				
	(2)		1			
4.6	6.8	1.55		48		
-		Booster Pump	1		0.5	/
TDH 16						

: 2

(2)

$$\begin{aligned}
 &= 10 \\
 (2-1) &= 50 \text{ / /} \\
 &= (10 \times 50)/1,000 \\
 &= 0.5 \text{ . /}
 \end{aligned}$$

(3)

$$\begin{aligned}
 &= 1,782.5 \text{ /} \\
 &= 4.88 \text{ /} \\
 &= 60 \text{ . .} \\
 &= 60 \times 4.88 \times 10^3 \\
 &= 0.29 \text{ . /} \\
 &\approx 1 \text{ . /}
 \end{aligned}$$

$$\begin{aligned}
 &= \mathbf{137+05+1} \\
 &= \mathbf{1385} \text{ . /} \\
 &\approx \mathbf{139} \text{ . /}
 \end{aligned}$$

$$\begin{aligned}
 &2.25 \quad (2-2) \\
 &= 2.25 \times \\
 (10 \text{ / }) &= 13.9 \text{ . / .} \\
 \therefore &= 2.25 \times 13.9 \\
 &\approx \mathbf{32} \text{ . / .}
 \end{aligned}$$

3)

(1)

-

= 139 . /

-

= 1

-

= 139 x 1

= 139 . .

-

= 150 . .

-

= 48 . .

-

= 150 + 48

= 198 . .

> 139 . . (OK.)

(2)

= 2.8 . /

= 30

= 2.8 x 30

= 84 . .

= 90 . .

> 84 . . (OK.)

-

: 2

(4)

24

262

1)

80 % () 111 /

$$(2.61) = 137 . /$$

$$(2.61) = 0.5 . /$$

$$= 137 + 0.5$$

$$= 137.5 . /$$

$$\approx 138 . /$$

$$80 \% = 138 \times 0.8$$

$$= 111 . /$$

: 2

	(3)	(Aeration Tank)	1	3.8	6
	1.7	39			
	4 - 8				
		Floc			Floc
		Sludge	1		2
/		(Air Diffuser)			
	(4)	(Sedimentation Tank)	1	3.8	3.8
		14		(Floc)	
				Submersible Centrifugal Pump	
2	()		0.12	/	
	(5)	(Sludge Storage Tank)	1	3.8	6
	2.7	62			
(Excess Sludge)					
	(6)	(Chlorine Contact Tank)	1	1.8	
3.8	0.7	5			
			1	/	
15		1.6			

: 2

(7) (Effluent Tank) 1 1.8 3.8
 1.8 12
 Submersible Centrifugal Pump 2 (
 Peak Flow) 0.19 / TDH 14

(Percolation Rate)
 1 / Rate of Wastewater Application 0.1 / /
 (2-3)
 = 782 . .
 (2-3) = 0.1 . / . /
 = 782 x 0.1
 ≈ 78 . /
 111 /
 78 / 33 /
 1
 12 1
 2 0.09 / TDH 23

2621

25 ,

26

: 2

2621

()

263

1)

(RD)

3

(RL)

3

2)

(1)

(Waste Pipe)

3, 4

6

(2)

(Soil Pipe)

4

6

2

4

: 2

3

300

1 : 200

1

3.6

7.5

2

54

(1 1)
/)

1.92 / (0.032²)
1 (2.6.3-1)

1

(4)

2631

2-7

2-8

Hydraulic Profile

2631

264

1)

21 /

(1)

$$\begin{aligned}
 (2.6.1) &= 681 \\
 (2-1) &= 3 \quad / \quad / \\
 &= 681 \times 3 \\
 &= 2,043 \quad /
 \end{aligned}$$

(2)

$$\begin{aligned}
 &= 10 \\
 (2-1) &= 3 \quad / \quad / \\
 &= 10 \times 3 \\
 &= 30 \quad / \\
 &= 2,043 + 30 \\
 &= 2,073 \quad / \\
 &\approx 21 \quad . \quad /
 \end{aligned}$$

: 2

) 2.21 2.71 9 (1.5
 / 2.1

(Hazardous Waste)

100 1

“ ” “ ”

1 15

01.00 - 02.00 .

1

(2.6.4-2)

: 2

(4)

2641

2642

2641

2642

265

1)

24 KVA 380 V	Transformer Load	1,000 KVA	1	24 KV 625 KVA
-----------------	---------------------	-----------	---	------------------

2)

2	Battery	12 V
---	---------	------

3P 30/100 A	1	Load
30 KVA		
2	Battery	12 V

(4)

2-9 Main Single Line Diagram

: 2

(Fire Hose Cabinet : FHC)

14 (2)

2

A-B-C 10 1

2)

(1) (Fire Alarm Control Panel : FCP)

(

)

(2) (Smoke Detector)

72

-

2

- 2-8

70

(10)

(3) (Heat Detector)

268

-

2

- 2-8

266

(38)

: 2

(4) (Alarm Bell)

24

- 3
 - 2-8 21 (3)

(5) (Alarm Manual Station)

Alarm Bell 24

3)

33 (. . 2535) 50 (. . 2540)

90

30

= 90 . .

= 2.8 . ./

= 90/2.8

≈ 32

> 30 (OK.)

4

	(1)	(ST-1)		- 8	
	1.5		0.25	0.17 - 0.18	
1.35	1				1.4

	(2)	(ST-2)		- 8	
		0.9		0.22	0.17-0.18
	1	1			
1.4					

	(3)	(ST-3)		- 8	
		0.9		0.22	0.17-0.18
	1	1			
1.4					

” “ ” 10 “

			2	-	
	1		1.2		0.25
0.18		1.4			
		1.4			
			1		

5)

1

2-10

(

2-11)

6)

180
0.25

(2.6.6-1) 1
720

681

1

2661

2-10

2-11

2-12

2661

267

(1) (Split Type Air Conditioner)
 543 527 16

(2)

1.4 /

268

1)

1 - 4 1 42
 BTS ()

880 -

(1)

(1.1) 4 42 165
 230 1

100

(1.2) 4 1 50

(1.3) 40 ()
 1 4 (42)

300

1 50

: 2

	(1)	4	42	250
	2	370		
	150		1	100
	(2)	4	42	1
180		2		170
		150		
1	100			
	(2)			
	(21)		1	100
		230		42 (
	4)	560	
	(22)		1	50
		4		
	(23)		1	50
		4		
	(1)		1	100
	150			2
370		42		

: 2



(2)

1

100

150

2

170

4

2)

-

1

6

1

6

2

41-6

2

(2.1-5)

94

1

(

4)

-





thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax : 0-2196-2144

3



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/ 235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax : 0-2196-2144

4



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax: 0-2196-2144

5



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax: 0-2196-2144

6



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax: 0-2196-2144



thai thai engineers co., ltd.

Environmental Engineers - Consultants

5/235 Tesaban Songkloe Road, Ladyao, Jatujak, Bangkok 10900
Tel. 0-2196-2140-3 Fax: 0-2196-2144