



Vendor Documentation

Usha Shadden Ethanolamines Project	
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Vendor Documentation

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 Description : B-004 Fire Fighting System Fire Code Co., Ltd.

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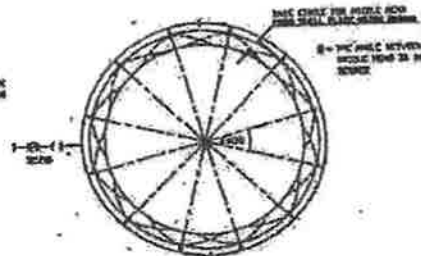


PART	
ITEM NO.	
REQ QTY.	

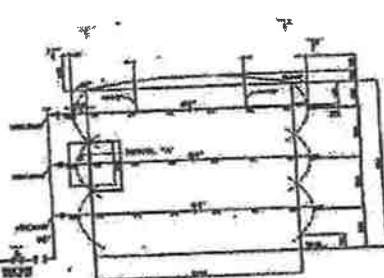
TESTING BY : FINE CODE, LTD.

WITNESS BY : USTL / TEA

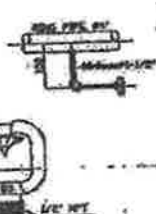
TESTING DATE :



SECTION 4



WATER SPRAY NOZZLE



DETAIL 5A

Tank No. (Jewel)	Hexose MPL	Hexose TYS	Ortho No.	Spiny Angle	Ring QTY	QTY/Spine	Spines Hexose	Acc. Heads
Q-218 (Wing Hexose)	HEX	HE	W0.32	110°	3	3	21	-
Q-220 (Wing Hexose)	HEX	HE	W0.34	110°	-	-	5	1

TANK NO. Q-3016
DIMENSION Ø9449x8534

WITNESS BY:		WITNESS BY:		TESTING BY:	
NAME :	TEA	NAME :	USTL	NAME :	FINE CODE CO. LTD.
SIGN :		SIGN :		SIGN :	MR. SINGH, MANAGER
DATE :		DATE :	16 April 07	DATE :	16 APR 07

THE VERITAS
WORLDWIDE OF THE

Thursday, July 22, 2005
Page: 172

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File Code 004, List

THAI ETHANOLAMINES (TEA)
FIRE CODE CO. LTD. LONDON E10 2018-18 WATER SUPPLY SYSTEM (TANK Q-2018 & 2019)

Node	Head m	Flow l/s	Pressure bar	Height m
120	12.0	103.7	10.00	12.00
1170	11.70	103.7	9.00	10.20
1240	12.40	103.7	10.00	10.20
1310	13.10	103.7	10.00	10.20
1380	13.80	103.7	10.00	10.20

Notes: Nozzle and Hydrant Data
TANK Q-2018 & 2019

Fire Code Co. Ltd.

Fire CODE		FIRE WATER SUPPRESSION TEST FORM	
PROJECT NAME: THE ETHANOLAMINES PROJECT		PART: _____	
CLIENT NAME: THAI ETHANOLAMINES COMPANY LIMITED		ITEM NO.: _____	
CONTRACT NO.: 30185-1000-2		REQ. QTY.: _____	
FIRE SUPPRESSION: WATER SPRAY SYSTEM		TESTING BY: FIRE CODE CO. LTD.	
TANK NO.: M-2014 A & M-2014 B		WITNESS BY: USTL / TEA	
TANK DIMENSION: DIA. 4.572 X L 23.165		TESTING DATE: _____	
VESSEL DETAILS			
VESSEL TYPE: BULLET		APPLICATION: STORAGE PRESSURE VESSEL	
PRODUCT NAME: AMMONIA STORAGE VESSEL		LOCATION: AMMONIA STORAGE AREA	
VESSEL DIMENSION: DIAMETER (M) 4.572		LENGTH (M) 23.165	AREA (M ²) Approx. 100
DESIGN DENSITY: 20.4 L/PM ²		WATER DEMAND (LPM) 8130.41 PER TANK	
WATER SPRAY NOZZLE DETAILS			
SHELL PROTECTION: BETA/NIW		Dished Head: BETA/NIW	
K-FACTOR / DISCHARGE ANGLE: 65.7 / 120 Degree		K-FACTOR / DISCHARGE ANGLE: 65.7 / 120 Degree	
K-FACTOR / DISCHARGE ANGLE: _____		K-FACTOR / DISCHARGE ANGLE: _____	
WORKING PRESSURE			
TIE-IN PRESSURE (BAR) P _{ti} 9.2		WATER DELIVERED VALVE PRESSURE (BAR) P _{val} 5.0-5.5 P _{val} 5.0-5.5	
NOZZLE PRESSURE (BAR) P _{no} 3.0 P _{no} 3.0			
AMMONIA STORAGE TANK No. M-2014A & M-2014B			
WITNESS BY: TEA		WITNESS BY: USTL	
NAME: PMA	NAME: _____	NAME: _____	NAME: _____
SIGN: _____	SIGN: _____	SIGN: _____	SIGN: _____
DATE: 17.2.09	DATE: 17.2.09	DATE: 17.2.09	DATE: 17.2.09



PROJECT NAME	THE ETHANOLAMINES PROJECT	PART :-	
LIGHT NAME :-	THW ETHANOLAMINES COMPANY LIMITED	ITEM NO. :-	
CONTRACT NO. :-	30705-1000-2	REQ. QTY. :-	
IRE SUPPRESSION	WATER SPRAY SYSTEM	TESTING BY :-	PIRE CODE CO. LTD.
ANK NO. :-	M - 2014 A	WITNESS BY :-	USTL / TEA
ANK DIMENSION :-	DIA. 4.672 X L 23.185	TESTING DATE :-	

VESSEL DETAILS

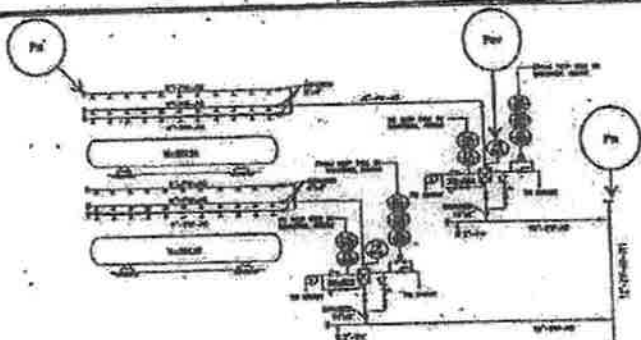
VESSEL TYPE > <u>BULLET</u>		APPLICATION > <u>STORAGE PRESSURE VESSEL</u>	
PRODUCT NAME > <u>AMMONIA STORAGE VESSEL</u>		LOCATION > <u>AMMONIA STORAGE AREA</u>	
VESSEL DIMENSION	DIAMETER (IN) <u>4.572</u>	LENGTH (L) <u>23.165</u>	AREA (M ²) <u>Approx 400</u>
DESIGN DENSITY > <u>20.4 LPM/M2</u>	WATER DEMAND (LPM)		<u>8130.41</u>

WATER SPRAY NOZZLE DETAILS

1. PROTECTION :- <u>BETANW</u> 2. FACTOR / DISCHARGE ANGLE :- <u>95.7 / 120 Degree</u> 3. FACTOR / DISCHARGE ANGLE :- <u> </u>	Dishd Head :- <u>BETANW</u> 4. FACTOR / DISCHARGE ANGLE :- <u>95.7 / 120 Degree</u> 5. FACTOR / DISCHARGE ANGLE :- <u> </u>
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WORKING PRESSURE

TIE-IN PRESSURE (BAR) (P_0)	0.2	INLET DELUGE VALVE (BAR) (P_{IN})	7.5 - 8.0
NOZZLE PRESSURE (BAR) (P_N)	5.2	PRESSURE (BAR)	



AMMONIA STORAGE TANK No. M-2014A & M-2014B

WITNESS BY:		WITNESS BY:		TESTING BY:		FIRE CODE CO. LTD.	
NAME :	TEA	NAME :	WEST	NAME :		NAME :	MR. JONATHAN HARRISON
IGN :	DATA	IGN :	[Signature]	IGN :		IGN :	[Signature]
DATE :	12-9-09	DATE :	12-MAY-09	DATE :		DATE :	12-MAY-09

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TOWNSHIP OF LAMAR, (T.C.)									
FILE: C:\L\AMERICAN\TALK\NO. 2014.PHO									
JAMES AMERICAN MOTORWORKS TALK RECORD									
No.	Head	Side	M	Flow	Area	Speed	Actual	Unit	Actual
No.	Grade	Run	Factor	Unit	Ac.	Feet	minutes	hr.	Sec.
1450	20	12.7	95.7	205.48	9.00	20.40	23.28	4.000	4.752
1650	20	12.7	95.7	204.74	9.00	20.40	22.75	4.000	4.571
1230	20	12.7	95.7	197.22	9.00	20.40	21.31	4.000	4.247
1230	20	12.7	95.7	203.05	9.00	20.40	22.56	4.000	4.503
1230	20	12.7	95.7	204.31	9.00	20.40	22.50	4.000	4.558
3025	20	12.7	95.7	202.51	9.00	20.40	22.50	4.000	4.515
3031	20	12.7	95.7	202.80	9.00	20.40	22.47	4.000	4.478
3051	20	12.7	95.7	201.20	9.00	20.40	22.36	4.000	4.446
3051	20	12.7	95.7	200.31	9.00	20.40	22.30	4.000	4.420
3071	20	12.7	95.7	200.11	9.00	20.40	22.28	4.000	4.399
3081	20	12.7	95.7	200.00	9.00	20.40	22.28	4.000	4.381
3091	20	12.7	95.7	199.70	9.00	20.40	22.20	4.000	4.358
3101	20	12.7	95.7	199.60	9.00	20.40	22.18	4.000	4.350
3111	20	12.7	95.7	199.19	9.00	20.40	22.17	4.000	4.345
3121	20	12.7	95.7	199.19	9.00	20.40	22.16	4.000	4.343
3131	20	12.7	95.7	199.19	9.00	20.40	22.16	4.000	4.341
3140	20	12.7	95.7	199.40	9.00	20.40	22.39	4.000	4.359
4015	20	12.7	95.7	210.55	9.00	20.40	23.28	4.000	4.754
4031	20	12.7	95.7	208.57	9.00	20.40	23.18	4.000	4.721
4041	20	12.7	95.7	207.64	9.00	20.40	23.04	4.000	4.683
4051	20	12.7	95.7	207.32	9.00	20.40	22.98	4.000	4.653
4061	20	12.7	95.7	206.82	9.00	20.40	22.93	4.000	4.632
4071	20	12.7	95.7	206.41	9.00	20.40	22.90	4.000	4.631
4081	20	12.7	95.7	206.03	9.00	20.40	22.87	4.000	4.627
4091	20	12.7	95.7	205.68	9.00	20.40	22.85	4.000	4.619
4101	20	12.7	95.7	205.50	9.00	20.40	22.84	4.000	4.615
4111	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.612
4121	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4131	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4141	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4151	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4161	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4171	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4181	20	12.7	95.7	205.41	9.00	20.40	22.83	4.000	4.610
4191	20	12.7	95.7	205.41	9.00				

Pharmacia Co., Ltd.

THAI ETHANOLAMINES (TEA)
FIRE CODE CO. LTD. AMMONIA STORAGE TANK NO. M-2014A, B, C

Head	Size	K-factor	Flow	Area	Height	Actual	Minimum	Actual	Height
2180	12.7	95.7	191.60	5.00	20.40	21.29	4.000	4.006	10.100
2182	12.7	95.7	191.45	5.00	20.40	21.28	4.000	4.004	10.100
2183	12.7	95.7	191.45	5.00	20.40	21.27	4.000	4.003	10.100
2184	12.7	95.7	191.40	5.00	20.40	21.27	4.000	4.000	10.100
2185	12.7	95.7	191.20	5.00	20.40	21.30	4.000	4.012	10.100

Head, Height and Weight Data
Area, Height and Weight Data
THAI ETHANOLAMINES (TEA) AMMONIA STORAGE TANK NO. M-2014A, B, C

Fire Code Co. Ltd.

FIRE WATER SUPPRESSION TEST FORM			
PROJECT NAME: THE ETHANOLAMINES PROJECT		PART: _____	
CLIENT NAME: THAI ETHANOLAMINES COMPANY LIMITED		ITEM NO.: _____	
CONTRACT NO.: 30185-1000-2		REQ. QTY.: _____	
FIRE SUPPRESSION: WATER SPRAY SYSTEM		TESTING BY: FIRE CODE CO., LTD.	
TANK NO.: M-2014 B		WITNESS BY: USTL / TEA	
TANK DIMENSION: DIA. 4.572 X L 23.165		TESTING DATE: _____	
VESSEL DETAILS			
VESSEL TYPE: BULLET		APPLICATION: STORAGE PRESSURE VESSEL	
PRODUCT NAME: AMMONIA STORAGE VESSEL		LOCATION: AMMONIA STORAGE AREA	
VESSEL DIMENSION: DIAMETER (M) 4.572		LENGTH (L) 23.165	AREA (M ²) Approx 400
DESIGN DENSITY: 20.4 LPM/M ²		WATER DEMAND (LPM) 8130.41	
WATER SPRAY NOZZLE DETAILS			
SHELL PROTECTION: BETA/NOV		Dished Head: BETA/NOV	
K-FACTOR / DISCHARGE ANGLE: 95.7 / 120 Degree		K-FACTOR / DISCHARGE ANGLE: 95.7 / 120 Degree	
K-FACTOR / DISCHARGE ANGLE: _____		K-FACTOR / DISCHARGE ANGLE: _____	
WORKING PRESSURE			
TIE-IN PRESSURE (BAR) (P _n) 9.2		INLET DELUGE VALVE (BAR) (P _n) 7.5 - 8.0	
NOZZLE PRESSURE (BAR) (P _n) 5.2			
<p>AMMONIA STORAGE TANK No. M-2014A & M-2014B</p>			
WITNESS BY: TEA		WITNESS BY: USTL	
NAME: _____	NAME: _____	NAME: _____	NAME: _____
SIGN: _____	SIGN: _____	SIGN: _____	SIGN: _____
DATE: 10.10.09	DATE: 10.10.09	DATE: _____	DATE: _____

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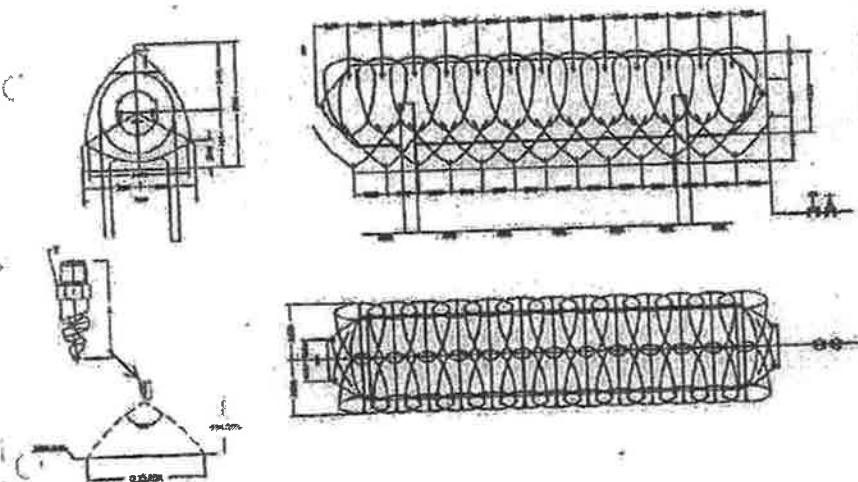
Pine-Cube, Inc., Ltd.



FIRE WATER SUPPRESSION TEST FORM

PROJECT NAME:	THE ETHANOLAMINES PROJECT	PART:	
CLIENT NAME:	THAI ETHANOLAMINES COMPANY LIMITED	ITEM NO.:	
JOB NO.:	30185-1080-2	REQ. QTY.:	
FIRE SUPPRESSION:	WATER SPRAY SYSTEM	TESTING BY:	FIRE CODE, LTD.
TANK NO.:	M-2014A	WITNESS BY:	USIL / TEA
TANK DIMENSION:	DIA. 4.572 X L 22.168	TESTING DATE:	

AMMONIA STORAGE TANK No. M-2014A



VESSEL PART	NOZZLE MFR	NOZZLE MODEL	K-FACTOR	SPRAY ANGLE	Ring QTY	QTY/Ring	Require Nozzle
Cylindrical Shell	DATE	BNW	56.7 K	120	3	13	39
Conical Head	DATE	BNW	56.7 K	120	2	2	4
TOTAL REQUIRE NOZZLE							43

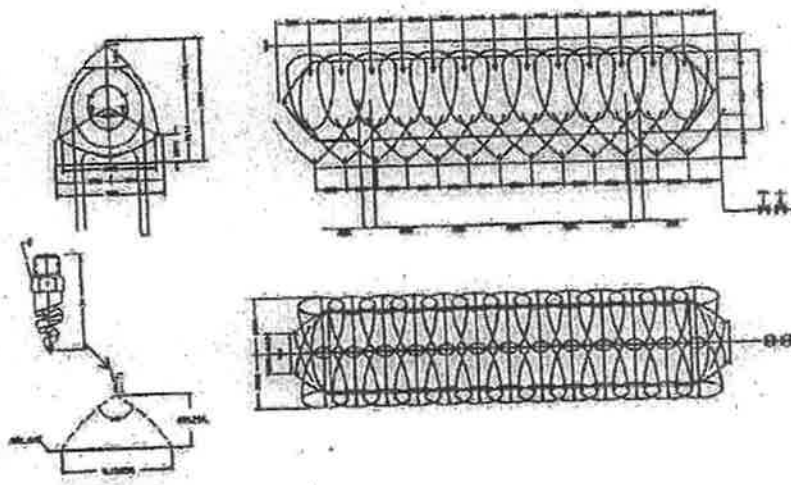
WITNESS BY:	TEA	WITNESS BY:	USIL	TESTING BY:	FIRE CODE CO. LTD.
NAME:	FWA	NAME:	PR	NAME:	MR. SINGHAT THIRASRI
SIGN:		SIGN:		SIGN:	PR
DATE:	17-7-09	DATE:	18 MAY 09	DATE:	18 MAY 09



FIRE WATER SUPPRESSION TEST FORM

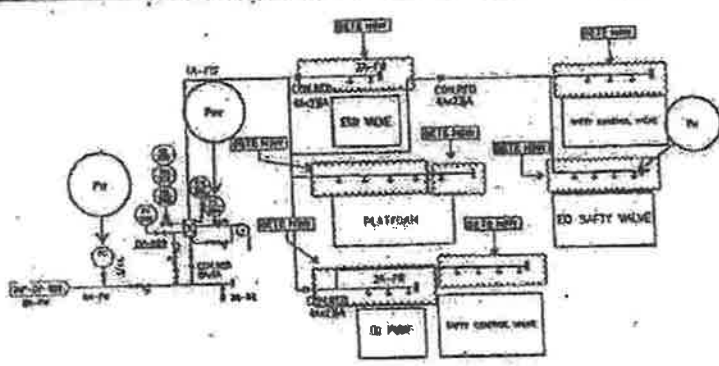
PROJECT NAME:	THE ETHANOLAMINES PROJECT	PART:	
CLIENT NAME:	THAI ETHANOLAMINES COMPANY LIMITED	ITEM NO.:	
JOB NO.:	30185-1080-2	REQ. QTY.:	
FIRE SUPPRESSION:	WATER SPRAY SYSTEM	TESTING BY:	FIRE CODE, LTD.
TANK NO.:	M-2014B	WITNESS BY:	USIL / TEA
TANK DIMENSION:	DIA. 4.572 X L 22.168	TESTING DATE:	

AMMONIA STORAGE TANK No. M-2014B

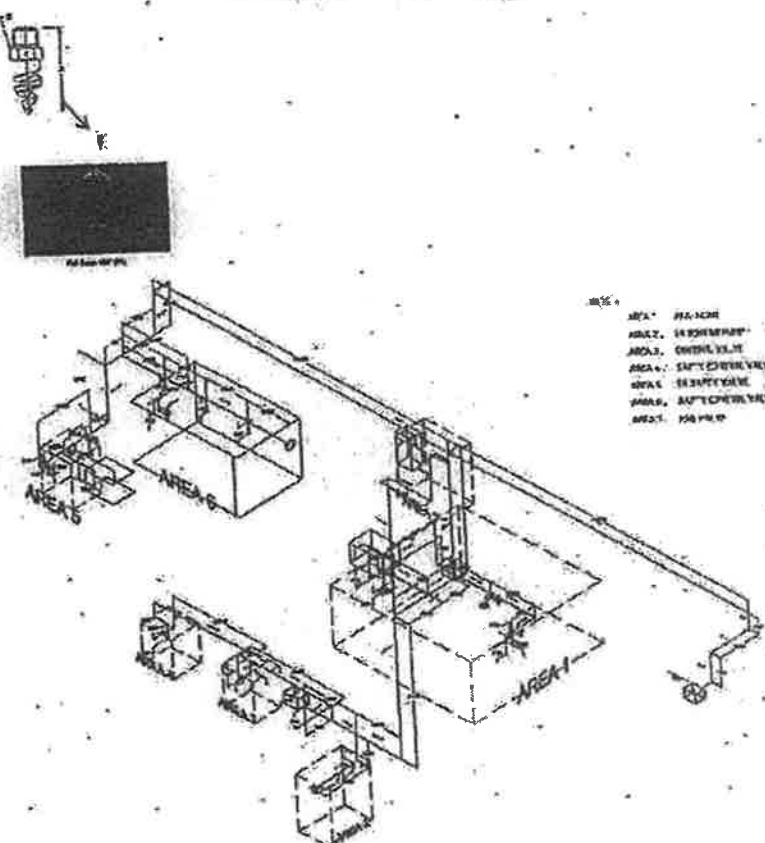


VESSEL PART	NOZZLE MFR	NOZZLE MODEL	K-FACTOR	SPRAY ANGLE	Ring QTY	QTY/Ring	Require Nozzle
Cylindrical Shell	DATE	BNW	56.7 K	120	3	13	39
Conical Head	DATE	BNW	56.7 K	120	2	2	4
TOTAL REQUIRE NOZZLE							43

WITNESS BY:	TEA	WITNESS BY:	USIL	TESTING BY:	FIRE CODE CO. LTD.
NAME:	FWA	NAME:	PR	NAME:	MR. SINGHAT THIRASRI
SIGN:		SIGN:		SIGN:	PR
DATE:	18-2-09	DATE:	17 MAY 09	DATE:	18 MAY 09

Fire code				FIRE WATER SUPPRESSION TEST FORM			
PROJECT NAME > THE ETHANOLAMINES PROJECT		PART >		ITEM NO. >		REQ. QTY. >	
CLIENT NAME > THAI ETHANOLAMINES COMPANY LIMITED		ITEM NO. >		REQ. QTY. >			
CONTRACT NO. > 30185-1080-2							
FIRE SUPPRESSION > WATER SPRAY SYSTEM		TESTING BY > FIRE CODE CO., LTD.		TESTING BY > USTL / TEA			
AREA NAME > EO PROCESS LINE AREA		TESTING DATE >					
PROTECTED AREA DETAILS							
APPLICATION TYPE > PROCESS PIPING		APPLICATION > PROCESS LINE		PRODUCT NAME > ETHYLENE OXIDE		LOCATION > PROCESS AREA 2	
		LENGTH (L) >		AREA (M ²) >			
DESIGN DENSITY > 20.4 (LPM / M ²)		WATER DEMAND (LPM) >					
WATER SPRAY NOZZLE DETAILS							
EO PUMP / ESD VALVE > RETENSW		EO PROCESS LINE > RETENSW		K-FACTOR / DISCHARGE ANGLE > 37.9 / 120 Degree		K-FACTOR / DISCHARGE ANGLE > 35.7 / 120 Degree	
				K-FACTOR / DISCHARGE ANGLE >		K-FACTOR / DISCHARGE ANGLE >	
WORKING PRESSURE							
TIE-IN PRESSURE (BAR) > (P _R) 10.5		INLET DELUGE VALVE (BAR) > (P _W) 9.5		PRESSURE (BAR) >			
NOZZLE PRESSURE (BAR) > (P _N) 5							
							
WITNESS BY: TEA		WITNESS BY: USTL		TESTING BY: FIRE CODE CO., LTD.			
NAME: PAK		NAME: SP		NAME: A.K. SIVICHAI / HANONG			
SIGN: G		SIGN: SP		SIGN: A.K. SIVICHAI			
DATE: 12-7-09		DATE: 23-10-09		DATE: 23-10-09			

(20)

Fire code		FIRE WATER SUPPRESSION TEST FORM	
PROJECT NAME > THE ETHANOLAMINES PROJECT		PART >	
CLIENT NAME > THAI ETHANOLAMINES COMPANY LIMITED		ITEM NO. >	
JOB NO. > 30185-1080-2		REQ. QTY. >	
FIRE SUPPRESSION > WATER SPRAY SYSTEM		TESTING BY > FIRE CODE CO., LTD.	
AREA NAME > EO PROCESS LINE AREA		WITNESS BY > USTL / TEA	
		TESTING DATE >	
PROCESS AREA 2 (EO LINE)			
			
<p>AREA 1: MATCH</p> <p>AREA 2: 14 ESD VALVE</p> <p>AREA 3: ESD VALVE</p> <p>AREA 4: ESD VALVE</p> <p>AREA 5: ESD VALVE</p> <p>AREA 6: ESD VALVE</p> <p>AREA 7: ESD VALVE</p> <p>AREA 8: ESD VALVE</p>			
WITNESS BY: TEA		WITNESS BY: USTL	
NAME: PAK		NAME: SP	
SIGN: G		SIGN: SP	
DATE: 12-7-09		DATE: 23-10-09	
		TESTING BY: FIRE CODE CO., LTD.	
		NAME: A.K. SIVICHAI / HANONG	
		SIGN: A.K. SIVICHAI	
		DATE: 23-10-09	

(21)

THAI ETHANOLAMINE (TEA PROJECT)
File: C:\1.1.1\ASBULT FOR EO LINE.FHOHeads, Nozzles and Hydrant Data
Area: EO PROCESS LINE

Node No.	Head Code	Size mm	K Factor	Flow L/min	Area m ²	Reqd m ³ /min	Actual m ³ /min	Minimum bar	Actual bar	Height m
2258	22	-12.7	37.6	80.91	5.00	20.40	16.16	3.000	4.631	3.500
2260	22	12.7	95.7	204.71	5.00	20.40	40.94	3.000	4.575	2.500
2228	22	12.7	95.7	205.44	5.00	20.40	41.09	3.000	4.609	4.500
2278	22	12.7	95.7	202.52	5.00	20.40	40.61	3.000	4.475	3.500
2328	22	-12.7	37.6	79.84	5.00	20.40	15.97	3.000	4.509	12.500
2338	22	12.7	95.7	200.27	5.00	20.40	40.05	3.000	4.380	12.500
3528	22	12.7	95.7	186.81	5.00	20.40	37.36	3.000	3.810	-2.000
2528	22	12.7	95.7	195.55	5.00	20.40	39.11	3.000	4.175	-0.500
2538	22	12.7	95.7	194.47	5.00	20.40	38.89	3.000	4.128	-0.500
2548	22	12.7	95.7	195.11	5.00	20.40	39.03	3.000	4.157	-0.500
2928	22	12.7	95.7	190.15	5.00	20.40	38.03	3.000	3.948	-1.000
3228	22	12.7	95.7	187.82	5.00	20.40	37.56	3.000	3.852	-2.000
3328	22	-12.7	37.6	74.44	5.00	20.40	14.89	3.000	3.920	-2.000
4528	22	12.7	95.7	221.24	5.00	20.40	44.25	3.000	5.345	4.000
4638	22	-12.7	37.6	87.54	5.00	20.40	17.51	3.000	5.420	3.500
4728	22	12.7	95.7	218.27	5.00	20.40	43.65	3.000	5.202	4.000
4828	22	12.7	95.7	218.23	5.00	20.40	43.65	3.000	5.200	4.000
4228	22	-12.7	37.6	89.29	5.00	20.40	17.86	3.000	5.639	6.500
4238	22	-12.7	37.6	89.19	5.00	20.40	17.84	3.000	5.625	6.500
4248	22	-12.7	37.6	89.22	5.00	20.40	17.84	3.000	5.631	6.500
2206	22	12.7	95.7	220.96	5.00	20.40	42.13	3.000	4.858	5.500